

67th Anniversary



**Connecticut
Science &
Engineering
Fair**

March 10 - 14, 2015

Student Abstracts

Introduction

These abstracts provide an opportunity to review the projects prior to the fair. Please note the following:

- **The abstracts are the work of the students who are participating in the 2015 Connecticut Science & Engineering Fair. The CSEF reserves the right to withdraw an abstract at any time for modification.**
- **The abstracts are sorted by project number.**
- **In filling out their project registrations, the students identified the Technical Disciplines that relate to their project. Those Technical Disciplines are indicated in a field below the body of the abstract.**
- **The Fair Categories and Technical Disciplines are defined in a table that precedes the start of the abstracts.**
- **A listing of the projects associated with each Technical Discipline is provided at the end of this document. Keep in mind that the list of projects in each Technical Discipline may involve more than one page.**
- **Bookmarks have been added as an aid in navigating within this file.**
- **The abstracts will be available in book form at the Fair.**

Fair Categories

	Life Sciences	Physical Sciences
7th & 8th Grade Team	LT (1001 - 1999)	PT (4001 - 4999)
7th Grade	L7 (2001 - 2499)	P7 (5001 - 5499)
8th Grade	L8 (2501 - 2999)	P8 (5501 - 5999)
High School	LS (3001 - 3499)	PS (6001 - 6499)
High School Team	LST (3501 - 3999)	PST (6501 - 6999)

Technical Disciplines

AT = Applied Technology	EE = Engineering: Electrical & Mechanical
AS = Animal Science	ET = Energy & Transportation
BE = Behavioral & Social Sciences	EV = Environmental Analysis
BI = Biochemistry	EM = Environmental Management
CB = Cellular & Molecular Biology	MA = Mathematical Sciences
CH = Chemistry	ME = Medicine & Health Sciences
CS = Computer Science	MI = Microbiology
EA = Earth Science	PH = Physics & Astronomy
EN = Engineering: Materials & Bioengineering	PS = Plant Science

Technical Discipline Composites

Biotechnology	AS, BI, CB, EN, ME, MI, PS
Environmental Sciences	EV, EM
Engineering	EN, EE
Sustainability	EA, EN, EE, ET, EV, EM

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1002	Which cleanser will make a fresh face student?
1003	Do You See What I See?
1004	Vitamin H2Grow
1005	The effect of organic and non-organic compost produced by vermicomposting with eisenia foetida raphanus sativa.
1006	So You Think You Can Multitask? A Study of Multitasking: Help or Hindrance to Learning and Recall
1008	Analysis of Moisture and Retention of Body Lotions and Correlation to Microbial Growth
1009	Bridge Strength
1010	Which liquid helps prevent oxidation?
1012	Bacterial Invasion
1013	Gas Released by Yeast
1014	To Hatch or Not To Hatch: Brine Shrimp and Pollution
1015	Softening Sweets
1016	Analysis of Silicon's Effect On Bone Health, "Cell" Bioavailability, and "Skin" Absorption.
1017	The Impact of Acidic Water on Germinating Mung Beans
1018	The Relationship Between Font Style and Peoples' Ability to Remember Typed Information
1019	Pill bugs in volcanic ash
1020	Got White: Which toothpaste will whiten the best on stained limestone tiles?
1021	What is the Effect of Studying in Relation to a quiz grade.
1022	Acid Rain in Wilton
1024	The Effect of Different Heating Sources On How Fast Water Can Reach Boiling point.
1025	Survive with Salt Water
1026	Got Gas
2001	The Effects of Wi-Fi on Plant Growth
2002	How does Caffeine affect the growth of plants
2003	THE EFFECT OF pH LEVEL ON THE GROWTH OF ALGAE
2004	Diffusion Confusion: Which Liquid Does Blue Food Coloring Diffuse the Fastest In?
2005	Endomycorrhizal and Ectomycorrhizal Fungi and the Effect on Plant Communication Through the Common Mycelial Network
2006	Water: the Power of Life Hydroponics vs. Aquaponics
2007	Do different sources of light affect the rate that a plant transpires?
2009	What Liquid Germinates Seeds The Fastest
2010	"Pore" my way to cleaner water: The use of flocculants and porous ceramic pots for purifying drinking water in developing countries.
2011	The Effect of Acid Rain on the Growth of Tennessee Green Pod Bean Plants

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2012	Fresh vs. Frozen
2014	Operation Jason
2015	Troublesome Turf
2016	Music and Memory
2017	How Much Sugar Is Needed for Dough To Rise the Most?
2018	curious cuttings
2019	The Stroop Effect
2020	How sweet is it? Tracking down hidden sugar in drinks.
2021	Nothing but algae and duckweed
2022	Which Insulated Bag Lasts the Longest?
2023	The Microwave: Is It Safe For Life
2024	The Effects of Cell Phones on Narcissus Papyraceus Growth and Color
2025	Have Your Bread and Eat It Too
2026	Killing Blackspot: an Organic Struggle
2027	How Does Water Impact Plant Growth?
2028	Let's help plants grow!!!
2029	That Is The Reason Why Your Teeth Are Stained
2030	A Photosynthesis Lab: The Effect of Light Intensity, Water Temperature, Colored Lights, and Contaminated Water on the Rate of Photosynthesis of the Aquatic Plant, Elodea Densa
2031	Hypoxia in Long Island Sound
2032	Weed Control: Walnuts to the Rescuel
2033	"Why did the Chicken Cross the Road?"
2034	All About That Bait
2035	AS TEMPERATURE GOES, YEAST GROWS
2036	Does Music Affect Running Pace?
2037	The Effect of Sugar on Yeast Cells
2038	Smoking Wars:Cigarette Citation
2039	Using Vibrio Fischeri for an Energy Efficient Bioluminescent Display for Electronic Devices
2040	Hydroponics - How to grow plants with water?
2041	A Study of the Relationship between Apple Price and Vitamin C
2501	Does a Person's Eye Color Affect Their Ability to Identify Colors in Dim Light?
2502	Toxic Dangers in Detergent
2503	The Effects of Caffeine on the Heart Using Daphnia magna
2504	The Cocktail Party Effect: An Inside Look Into Multitasking
2505	Brine Shrimp Hatching

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2507	AQUA-LIFE
2508	Hand Hygiene Effectiveness in Reducing the Number of Bacterial Colonies
2509	The Effects of Honey on the Healing and Regeneration of Lumbriculus variegatus
2511	Analysis of Increased CO2 levels in Ocean Waters and Effect on Crustaceans and Bivalve Growth
2512	A Battery that makes cents
2513	Antacids: Which is Most Effective at Resolving Acid?
2514	Contemporary Bio-remediation
2515	The Impact of Acid Rain on the Flora of the Environment
2516	Effects of different levels of electromagnetic fields on a variety of grasses and their nutrient content
2517	Aquaponics: The impact of combining agriculture and aquaculture techniques on plant germination and growth
2518	Nutrient Comparison of Lettuce Grown Hydroponically and in Soil
2520	The Effects of Mnemonic Methods On Memory
2521	Electric energy production for varying electrogenic microbial samples in mediator-less microbial fuel cell
2522	Microwave Radiation
2523	Not Organic? Don't Panic!
2524	An Investigation of the Ingestion of Microscopic Plastic Particles by the Blue Mussel, Mytilus edulis
2525	How Different Milk Fat Concentrations Affect Bacterial Growth
2526	One Sticky Situation
2527	Viral Protein 35 Inhibition: A Novel Treatment for Ebola Virus Disease
2528	Electrolyte Challenge
2529	Indirect measurement of the pliability of vocal folds and singer comfort after direct steam inhalation.
2530	How the Cookie Crumbles
2531	water types and plant growth
2532	How Much Organic Material Can Earthworms Decompose?
2533	Taste: What Matters?
2534	Reaction Time
2535	Reducing the Environmental Impact of Methane Emissions in Waste Management Through the Use of Engineered Environments
2536	Nanoparticle Regenerative Film
2537	The Antimicrobial Properties of Papaya
2538	The Effect of Household Acids and Bases on pH of Dirt.
2539	The Impact of Different Water Pollutants on Biological Health Indices
2540	The Effect of Common Over-the-Counter Medications On the Growth of Human Gut Bacteria

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2543	Which side are you on?
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2546	The Effect of Brain Dominance on Memory
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3003	Antimicrobial Activity of <i>Flavoparmelia caperata</i> , <i>Usnea subfloridana</i> , and <i>Hypogymnia physodes</i>
3004	A Comparative Analysis of Systems of Genomic Loci for the Special Identification of <i>Vitis labrusca</i>
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3010	Deciphering the effects of aerobic glycolysis of tumor cells on host anti-tumor immunity
3011	Bioremediation of Low Density Polyethylene by <i>Streptomyces griseus</i> and <i>Aspergillus niger</i> in Sterilized Soil
3012	The Effects of pH on DNA Isolation
3013	The Effects of Organic and Chemical Fertilizers on Snails of the Long Island Sound
3014	Antimicrobial Properties of Various Plant Leaves on <i>Escherichia Coli</i> K-12
3015	The Effects of Sulfuric acid on <i>Petroselinum crispum</i> and Soil pH in Varying Temperatures
3017	Clinical application of 3D printing technology in cancer radiation therapy: A novel method to improve dose conformity with patient specific treatment aid device
3018	Exploring Strategies for Improved Calcium and Phosphate Compatibilities in Parenteral Nutrition
3019	Pollution and Its Detrimental Effects on Shrimp
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3022	Determining the Most Effective Tick Repellent in Replace of DEET Based Products
3024	Thin liquid films in improved oil recovery from low-salinity brine
3025	Suicide Reportings in New England Newspapers
3026	Does seed spacing affect plant height?
3027	MIRNA Target Sites in 3' UTR of West Nile Virus
3028	protection from acid rain
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3030	The Effets of GMO vs Non-GMO Bananas on the Life Span of Fruit Flies

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3034	The Effect of alcoholic, nicotinized, caffeinated, and adrenergic solutions on arrhythmias
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3038	Inhibiting Triple-Negative Breast Cancer Tumor Growth by Targetting Pro-Inflammatory Cytokine Expression
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3077	Exploration into the Effects of Anti-PAR2 Antibody on the Expression of Proliferative Metabolic Pathways and Apoptosis of Mouse Breast Cancer Cells
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5504	Green Energy Ferris Wheel
5506	Effect of Blade Angle and Wind Angle on Rotation Speed of a Home-Built Wind Turbine
5507	Music Metrics and Fractals: Analyzing Different Genres of Digitized to Identify Input Metrics for Programming Fractal Representations of the Music with Mathematica
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5509	The Effect of using foam to create a more sophisticated highway barrier on lessening the spike of g-forces during an impact.
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5512	Design, build, and program a robot using an Arduino Mega 2560 through an Android app to cheer up or relax children at a hospital
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CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1001

Title: The Effect of Different Liquids on Plant Growth

Student Name(s): R. Patel, C. Tobin, A. Wootton

Abstract:

More than one billion people in the world live on less than one dollar a day. In this experiment, we aimed to create bigger radishes by changing the liquid that was added to them. Three received water, three received radish juice, and three received a sugar-water mixture. Each plant received 1/4 cup of their assigned liquid every other day. We chose sugar-water because it's what plants make during photosynthesis. The added sugar along with the sugar produced by photosynthesis may have increased the growth of the radishes. The radish juice was chosen because we thought previously produced radishes in the radish juice would help the radishes grow bigger. After 20 days, we measured the sprouts. The plants that received water grew bigger than the other plants. The plants that received the water grew an average of 6 centimeters. The plants that received radish juice grew an average of 4.1 centimeters. The plants that received the sugar-water mixture grew an average of 3.7 centimeters. Overall the plants that received water had sprouts that were 1.9 centimeters longer than the plants that received water and 2.3 centimeters longer than the plants that received the sugar water mixture. In conclusion, the plants that were provided with water grew the biggest radishes. The difference between our independent variable and the control was that your control grew bigger radishes.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS EV EM

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1002

Title: Which cleanser will make a fresh face student?

Student Name(s): O. Golden, L. Elwood

Abstract:

We both go to the same dermatologist and they recommend Neutrogena facial cleanser to fight acne. Our goal was to determine if Neutrogena was in fact a better cleanser for cleaning dirt and bacteria from our faces compared to other popular cleansers on the market. We asked six volunteers to wash their faces with four different cleansers in separate areas of their face. We used water in one area as our control. After they washed each area of their face, we swabbed the spot with a sterile cotton swab. We applied the cotton swab on to our petri dishes containing nutrient agar. We labeled each dish with the date and cleanser or water that was used. Each day we monitored our petri dishes to see if any bacteria was growing. Each petri dish grew bacteria and we charted the results to make a comparison. Our results indicated Clearasil Rapid Acne treatment was the best at fighting bacteria. This was a surprise since our dermatologist did not even mention this product. We also found it interesting that plain water worked just as well as Neutrogena.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1003

Title: Do You See What I See?

Student Name(s): O. Casino, B. Gage

Abstract:

Ambiguous optical illusions are pictures that show two different images causing the viewer to see one or the other initially. Often, the viewer can only see one of them, and only realizes the second image exists after being told how to view it. This experiment explores the question, does age affect the way people see optical illusions? To test our hypothesis we set up two test groups; one had participants ranging in age from 10 – 18, the other had participants ranging in age from 40-55. Each participant in both groups was shown the same five optical illusions and asked to state the first thing they saw. Data was recorded and a percentage was calculated to show what percent of each group saw each different illusion. The independent variable in this experiment was the age of the participant. The dependent variable was the image that the participant saw when shown the illusion. The controlled variables were the optical illusions themselves; making sure each participant was shown the exact same illusions in the same order. The hypothesis stated that if you show children and adults the same optical illusions, they will initially see different images. The results showed the greatest percentage of test subjects in both groups saw the same thing first for all five illusions. Age did not have any effect on what image was initially observed. The results of this experiment proved the hypothesis to be incorrect.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BE ME

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- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1004

Title: Vitamin H2Grow

Student Name(s): K. Doolabh, H. Swaylik, B. Walsh

Abstract:

The project Vitamin H2Grow was created to test whether Glaceau Vitamin Water will help plants grow taller and faster compared to spring water. The hypothesis was that the plants would not be affected in a positive way due to the added chemicals. Four pots were filled with soil and two types of seeds were planted. The pots were watered, two with vitamin water and two with spring water. With the use of a plant light, the seeds were left to grow for a 10 week period. At the end of the first week, the duration of time the plant light was used was reduced from 14 hours to 10 hours in a 24 hour period. The results showed that the seeds watered with vitamin water sprouted first and grew taller than those watered with spring water, for both types of seeds. The hypothesis was therefore proven incorrect, as the vitamin water enhanced the plants' growth. An explanation for these results could be that the extra sugars in the Vitamin Water provided the plants with an additional source of nutrients. These extra sugars are hypothesized to have been converted into ATP (Adenosine Triphosphate) energy which allowed the plants to grow at a quicker rate. A future experiment that could be performed would be to use different dilutions of the vitamin water. This would show whether plants watered with concentrated Vitamin water solutions would grow taller and in a shorter period of time, than those watered with less concentrated Vitamin Water solutions.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1005

Title: The effect of organic and non-organic compost produced by vermicomposting with eisenia foetida raphanus sativa.

Student Name(s): A. Nazir, R. Paine

Abstract:

The Effect of Organic and Inorganic Compost Produced by Vermicomposting with Eisenia Foetida on the Growth of Raphanus Sativa Is human growth affected by whether or not we eat organic food? This was the idea for our project. However, due to the difficulties of conducting our research on humans, we decided to use radishes. To prepare for our experiment, we set up two vermicomposting bins using red wiggler worms and an identical selection of organically and non-organically grown fruit and vegetables, as well as cardboard for brown matter. We used Jiffy Natural and Organic Seed Starting Mix (pH neutral) combined 2:1 with water as our base. This was used for our six control plants. This same mixture was then combined 6:1 with compost. Six pots were planted with this mixture containing organic compost and six containing non-organic compost. The soil mixtures were tested for pH value, and nitrogen, phosphorous, and potash levels. Three seeds were planted in each pot at a depth of 1 cm. The plants were monitored each day for height and healthiness of appearance. So far, all the plants have grown except one of the six organic plants. They all appear healthy (they are standing up straight and not wilting, and are a very healthy-looking bright green). During the first five days of the experiment the control plants germinated first and grew the highest: an average of 6.67 cm. The plants with organic compost grew on average 3.77cm. The ones with non-organic compost grew on average 3.82cm.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

PS EV

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- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1006

Title: So You Think You Can Multitask? A Study of Multitasking: Help or Hindrance to Learning and Recall

Student Name(s): P. Engelhart, C. Coric

Abstract:

Many students claim that they can do homework or study while listening to music, watching television, or chewing gum, but could these distractions be detrimental to a student's learning or memory? The question that this project is looking at is "How does multitasking affect a student's recall of words?" Subjects were tested in a quiet environment, with music playing, with a television show on, and while chewing gum. The subjects were read four different lists of sixteen words during each trial. The total amount of words recalled in each four settings was obtained by adding the free and cued recall together. Our hypothesis was that students would recall the most words in the quiet environment. Our results supported my hypothesis by showing that the average amount of words recalled by students on the quiet test was the highest, and the average amount of words recalled during the gum-chewing test was the lowest.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

BE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1008

Title: Analysis of Moisture and Retention of Body Lotions and Correlation to Microbial Growth

Student Name(s): S. Yaffe, M. Yaffe

Abstract:

ABSTRACT To “Save Our Skin”, we investigated possible correlations between lotion ingredients and the skins’ moisture retention, loss, absorption, and possible bacterial growth. We thought the humectant agents would increase the absorption and the petrolatum based products would retain the moisture on the skin. We also thought the thinner lotions would be absorbed rapidly. We discovered: •Water based lotions were absorbed quickly (next: oil base) •Occlusive agents provided a barrier to moisture loss (especially lanolin) •Humectant agents are absorbed quickly (attracting moisture) •Repairing agents are steadily absorbed at a slower rate •Petrolatum products are not absorbed by skin •There was evidence of bacterial growth, especially humectant agents (presence of moisture) We found a positive correlation between moisture attracted or retained and bacterial growth. Although moisture benefits our skin, without proper cleansing, bacteria will thrive. So be wise and “Save Our Skin”.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BI MI ME

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1009

Title: Bridge Strength

Student Name(s): M. Malin, A. Albis

Abstract:

The purpose of this experiment is to gain knowledge on the strength of three different bridge structures commonly identified around the globe, including the basic beam bridge, the square truss, and the triangle truss, as well as the weight ranges each is most fit for. In this test, I precisely constructed each of the three designs out of balsa wood and wood glue, a support to secure the bridges made solely of Douglas fir wood and wood screws, and from the base of this, I fastened a turnbuckle and u-bolt. I then attached an adjustable chain to the bottom of the turnbuckle, along with a bucket of weights on the end of the chain to test the deflection of each bridge structure. Evidently, the rigid triangle truss came out on top with the lowest average deflection of 0.03 centimeters, the square truss resulting in a 0.43 centimeter bend, and the beam with a 0.83 centimeter average. So, the triangle truss is the strongest of all three bridge structures and is most suitable for safe transportation.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EN MA ET

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1010

Title: Which liquid helps prevent oxidation?

Student Name(s): M. Jubas, R. Marlowe

Abstract:

Oxidation is when polyphenol oxidase enzymes (also known as tyrosinase) are let out of the cells. So, when an apple is cut the cell is ruptured, and the enzymes are let out. They mix with the oxygen in the air, which produces something that resembles edible rust. For our experiment, we wanted to see how this process could be prevented. We dipped apples and bananas into different liquids, and observed the browning of the fruit to see which substance was best at preventing oxidation. The liquids we used were: tap water, vinegar, olive oil, and lemon juice. Our hypothesis was that the lemon juice would work the best. Having a pH level fewer than 5.00 is very good for preventing oxidation, and lemon juice has a pH level of 2. We used apples slices, which we cut to 1-½ inches thick, and we used 3 tablespoons of each liquid. All of the apples were then dipped into a substance, and then laid them down on labeled paper. Then we wrote down the time when each set of browning was seen in different groups of apples. The order went as follows: Control group, water, vinegar, lemon juice, and then olive oil. We think this is because the oil provided a physical barrier against the oxygen. If we were to repeat the experiment, we would consider changing the amounts of liquid we use because the apples sucked up all of the lemon juice, and didn't have any left to prevent the oxidation.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1012

Title: Bacterial Invasion

Student Name(s): S. Sarelli, V. Comeau, H. Carr

Abstract:

The purpose of this project was to determine which areas in our school had the most and most harmful bacteria. We used eleven petri dishes with various types of bacteria that we found throughout the school. We also had an extra dish labeled “control” that contained only agar. The “control” petri dish was used in order to have a controlled environment with no added bacteria to which the other petri dishes full of the various bacteria samples could be compared; this helps to make the experiment fair and accurate. Each petri dish was positioned in the same area, receiving the same amount of sunlight and living in the same temperature for the duration of the seven day experiment. Throughout the experiment, pictures were taken of the bacteria’s growth in the petri dishes. At the end of the seven day experiment, microscopes were used to diagnose the types of bacteria growing in the petri dishes. In doing so, we were able to identify which types of bacteria were in the petri dishes. We discovered that the petri dish containing bacteria swabbed from the toilet was the most harmful, for it contained various types of hazardous bacteria that could make someone ill, almost certainly resulting in missed school. The data was analyzed and we concluded that of the eleven areas swabbed for bacteria, the toilet seat had the most harmful bacteria.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

MI CB ME

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1013

Title: Gas Released by Yeast

Student Name(s): J. Jackman, S. Mathew

Abstract:

The primary purpose for conducting this experiment was to investigate the effect of water temperature on the production of carbon dioxide by yeast as it breaks down sugars. The importance of this experiment was to learn how temperature relates to the production of carbon dioxide because when yeast is mixed with sugar and water it produces carbon dioxide. Having this information would be applicable for bakers and wine-makers and enable them to use the most resourceful way to make yeast grow. This biochemical process is used to make bread rise and in the fermentation of beer and wine. During our experimental process, we used three water bottles with different temperatures, 54 degrees, 104 degrees, and 134 degrees. We added one tablespoon of sugar and 2 ¼ teaspoons of yeast. We then covered the opening of each water bottle with a different colored deflated balloon to signify the different water temperatures. After leaving each water bottle out for one hour, we measured the circumference of the balloon to determine which water temperature caused the yeast to yield the most carbon dioxide. By looking at the data collected from the experiment, it is evident that water temperature does have a measurable impact on the amount of carbon dioxide liberated by yeast. After performing the experiment, we observed that the water bottle containing 54 degree water, sugar, and yeast showed no inflation of the balloon. Ultimately, we learned that fermentation occurs ideally in water between 104 and 134 degrees.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CB BI MI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1014

Title: To Hatch or Not To Hatch: Brine Shrimp and Pollution

Student Name(s): G. Dweck, A. Ukhanov

Abstract:

In our science classroom, and even in the homes of one of the scientists in this project, there are many fish aquaria and ponds. We know that we are always careful not to use pesticides or special wood treatments around any of these fish. But we also know that there are a lot of pollutants that can get into the water in the world, from other people using pesticides and fertilizer. Even nature creates pollution from dirt, leaves, and everything else that can fall into the water. Connecticut has beautiful lakes, ponds, rivers and other bodies of water. Therefore, we decided to study how brine shrimp would hatch in water contaminated with four of the top pollutants in Connecticut, represented by an organic pesticide, fertilizer, soil and decomposing leaves. We chose to study hatching because if the brine shrimp can't hatch, survival does not matter. Also, we know that brine shrimp is a food source for many fish. We created different environments, each with one of the pollutants, and tested how many brine shrimp hatched in the first 24 hours. We hypothesized that all the pollutants would interfere with hatching. Our hypothesis was partly incorrect, as the brine shrimp in our control group did hatch at a fairly good rate, but the ones in the soil water hatched at a better rate. The organic insecticide was not as bad as we feared, and we were surprised that when we left the leaf in the water, the brine shrimp hatched well.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV AS

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CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1015

Title: Softening Sweets

Student Name(s): A. Korp, M. Mikosz

Abstract:

The purpose of our experiment was to show consumers that the heavily processed foods (candies) that they are eating aren't always what they appear to be. The substances that we used in our experiment (sprite, salt water, and tap water) changed the candies a lot, and we want people to think about what's inside of the food they're eating, and how what they are putting into their bodies isn't exactly what it seems to be. For our procedure we had to fill 15 cups, 5 with Sprite, 5 with Saltwater, and 5 with tap water. We then put one of each of the five candies into each substance. We let them sit in the substances for twenty four hours, and then we took them out to measure them. The results were amazing. The gummy bears sizes changed a lot. They all grew, no matter what substance they were in. The greatest change in size came from the gummy bear that was in the Tap water. The Gummy Bears started out with a size of 1 cm. After twenty four hours in the Tap Water, the Gummy Bears grew to 3.4 cm. In the end, all of the candies sizes changed during the experiment except for the smarties in the Tap water. Their size stayed the same. Many of the candies dissolved, however, the ones that didn't had a very large change in size. In conclusion, the processed foods that we eat everyday aren't always what they appear to be.

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ME CH

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CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1016

Title: Analysis of Silicon's Effect On Bone Health, "Cell" Bioavailability, and "Skin" Absorption.

Student Name(s): M. Kantor, c. katz

Abstract:

Abstract: Throughout the journey of our "Silicon Search" we have discovered that there is a way to gain benefits from silicon. We first started with the extraction and testing of silicon from many variables; successfully most of them tested positive for silicon. Next we investigated cell bioavailability of silicon in our food variables; we discovered that the cell absorption occurred at a very slow rate (from 640 mg/minute to 11 mg/minute). Because silicon is known to increase bone strength, we decided to add various metals found in food to hopefully enhance the slow absorption of silicon. We found: •Added calcium to silicon decreases cell absorption (by 200% to 300%) •Iron enhances silicon cell absorption (about doubled) •Combination of calcium, magnesium, and zinc enhances silicon cell absorption (about doubled) Finally we tested "skin" absorption of various cosmetic lotions with silicon, revealing: •Silicon compounds are absorbed quickly (within 24 hours) •Oil and petrolatum lotions/creams' absorption is tripled •Water based lotions' absorption is doubled Our "Silicon Search" revealed that eating the right combination of foods can increase silicon "cell" absorption- along with increased skin absorption by protective lotions. When your body cells or skin absorb a plentiful amount of silicon the benefits are huge, especially for stronger bones.

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BI ME MI

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CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1017

Title: The Impact of Acidic Water on Germinating Mung Beans

Student Name(s): J. Raich, T. Chamberlain

Abstract:

The purpose of this experiment was to find out how mung beans grew in an environment similar to an acid rain environment. We think the amount of vinegar and distilled water will have an effect on the germination process. We also think that it will not germinate well in a really low pH. In the experiment we tested the effect of acid rain on germinating mung beans. We recreated a climate with acid rain by setting mung beans in five different acidic solutions with various levels of pH. The levels of pH (from high to low acidity) were: 2.7, 3.4, 3.7, 4.5, and 5.3. In our method, we used a mix of white vinegar and distilled water for our solutions. We placed two tablespoons of each solution in five 4oz jars each with ten mung beans and a paper towel in it. Then we put them by the window for eight days. We took pictures of each group every day to show the difference in growth. At the end of eight days, we found out that mung beans germinate best in a pH of 4.5. Acid rain has a pH of 4.4 which means that mung beans would grow well, perhaps even better, if grown in acid rain. This shows that mung beans would be a great crop in a climate full of acid rain.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS EV

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CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1018

Title: The Relationship Between Font Style and Peoples' Ability to Remember Typed Information

Student Name(s): I. Morizio, C. DeAngelo, C. Lucey

Abstract:

The purpose of our experiment was to find a relationship between font style and a person's ability to remember typed information. We hope to find out how font style affects memory. With this information we will help teachers, website owners, and others, determine what font to use when typing documents. This experiment will help society's memory starting with small things like movie posters and progressing more dominant information like a study guide for a history exam. This is where we hope our project will go after the science fair. The procedure for our project was consistent of the following. We took one test subject at a time into a room and gave them a passage about a country and let them read it, after they were done we gave them three questions about what they have read. All of the passages were in ten different fonts. In conclusion, the font with the most correct answers was KaiTi, with a total of twenty five correct answers out of thirty. Other high scoring font styles included Impact and Freestyle with the total of twenty two correct answers out of thirty. From our research, we have learned that people reading material in a font that is unfamiliar and hard to read, retain the information easier, such as the fonts: Freestyle and Impact. Our lower scoring font, was Juice ITC with eighteen questions correct. In the end, we have learned that the difficult fonts to read is the most easiest to remember.

**Technical Disciplines Selected by the Student
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BE CS

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1019

Title: Pill bugs in volcanic ash

Student Name(s): s. kerr, t. underhill

Abstract:

In this project we wanted to observe if pill bugs could survive on Mars and thereby being initial colonizers with humans. We mimicked the soil on Mars by using volcanic rock from Hawaii. We used two terrariums. We placed the damp, crushed volcanic rock in one terrarium. Then put damp soil in the other terrarium. After this we split 48 pill bugs in to 24 in each terrarium and observed how long they survived. The end result was that the pill bugs died within 5 days of being in the volcanic rock. this determined that pillbugs, which are decomposers, would not be good candidates to initially colonize Mars with humans.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AS EM EA

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CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1020

Title: Got White: Which toothpaste will whiten the best on stained limestone tiles?

Student Name(s): T. Brock, H. Sousa

Abstract:

The purpose of our experiment was to find which toothpaste whitens the best: Brand A, B, C, or D. Our reason for wanting to do this experiment is because we wanted an experiment where the results would be practical for the outside world. In our experiment, we used twelve 1x1 inch limestone tiles (three trials for each toothpaste) because of the increased absorption of these tiles. We also used these tiles because of the calcium phosphate that is found in the tiles and in human teeth. First, we soaked the tiles in ten cups of coffee for 24 hours. We then took the tiles out of the coffee and let them sit on a dish towel for one hour. Next, we brushed the tiles with one of the four brands of toothpastes for one week, twice a day. To simulate the average brushing cycle for humans, we brushed the tiles at 6:00 AM and again at 8:00 PM. At the end of each brushing, we would use the whitening scale that many dentists use to determine the whiteness of teeth. We used the scale to determine the whiteness of the tiles. The results of our experiment is the following: Brand A was first, Brand C second, Brand D third, and finally Brand B fourth. In conclusion, finding out which toothpaste whitens the best will allow people to better understand which toothpaste will give them whiter teeth and allow them to be more confident in their buying decision.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME BI CH

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CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1021

Title: What is the Effect of Studying in Relation to a quiz grade.

Student Name(s): T. Karasinski, S. Borreli

Abstract:

CSEF Abstract: Stephen Borreli Tyler Karasinski North Haven Middle School

1. When students know there is a quiz or test soon those kids don't study, so one day we were wondering if it really does make a difference to study for a test or quiz. So, we are doing this experiment to see if studying really does help your grade.

3. Step 1: Give your participants the quiz and observe them as they take it. Record the scores. Step 2: give the participants the list of clues that go with the riddles and give them 15 minutes to study. Step 3: After the 15 minutes is spent studying have them take the same quiz, record their scores. Step 4: Compare the scores of the before and after the time was spent studying, then draw conclusions. Step 5: Repeat step 2 through 4 as many times as needed for every participant.

The Score of the Participants:

	Participant A	Participant B	Participant C	Participant D	Average
0 minutes	62%	25%	75%	75%	59%
15 minutes	87%	50%	100%	75%	78%

4. From this Data you can conclude that the more you study, the better you can score on a test. The average non-studying score was 59% and the average studying score was 78%. This is an increase of 19%. This is a significant change in score. So, in conclusion studying does improve your quiz grade.

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BE ME

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1022

Title: Acid Rain in Wilton

Student Name(s): E. Yoon, A. Yoon

Abstract:

Acidity of rain can ruin monuments, farmland and rivers jeopardizing our biome. Our experiment asked if precipitation in Wilton and the waters it joins are harmfully acidic. We collected, labeled, and tested water samples around our house: precipitation (snow on three occasions), tap water, house run off and stream water. First, pH strips quickly tested the possibility of acidity and compared it to common liquids. Then Rapitest and Phenol Test Kit gave pH values. The snow had pH of 6.5-7.0, above the criteria for acid rain. The well water pH was 7.5, slightly basic but normal for Tap water indicating that groundwater is likely safe. The house run off pH measured 7.5 and 7.2, also safe. The stream water was acidic at 6.7, perhaps due to surface run off from the road. Yet this is within normal pH for fresh water. In conclusion, Wilton's precipitation is acidic but not harmfully so.

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EV

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CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1024

Title: The Effect of Different Heating Sources On How Fast Water Can Reach Boiling point.

Student Name(s): G. Esposito, A. Henry

Abstract:

Abstract This experiment was conducted to determine the best alternative heating source to gas and oil. Not only are oil and gas expensive, it is also the leading cause to pollution and global warming. The three heating sources (fire, hotplate, and exothermic reaction) raced to see what one would make the water reach boiling point the fastest. A thermometer was taped to the inside of the pot which was holding the water and a stopwatch kept track of the time. The water was no longer being recorded when it reached boiling point. The source which heated the water to boiling point first was the fire with a time of 6 min. 2 sec., then the hotplate with a time of 14 min. 33 sec., and the exothermic was not strong enough to make the water reach boiling point. Since a flame is hotter than a hotplate and the flames of the fire surrounded the bowl the fire heated the water the fastest.

Technical Disciplines Selected by the Student
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EM EV BE

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CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1025

Title: Survive with Salt Water

Student Name(s): D. Mabes, N. Cotaj, T. McGrath

Abstract:

The purpose of our experiment was to design a portable desalination system, ideally for sailors stranded at sea, which would create enough drinkable water by using the condensation process. We learned from our research that a drink of seawater causes potentially fatal dehydration. Upon drinking seawater, the kidneys must generate urine to flush the salt away, but to do so, the kidneys need more water than is contained in the seawater itself, so the body pulls water from its cells which then leads to dehydration. Our model used a design to get fresh water out of saltwater by applying various heat processes. We wanted a design that would produce an amount of pure water close to what humans should get every day (64 ounces). We tried many different designs that used a heat lamp (as the sun) to cause the salt water when heated to give up water vapor. That water vapor was drinkable water. However, those designs, using the heat lamp, produced very little amounts of water over an extremely long period of time. We then resorted to using a Sterno fuel can as a source of heat. We thought that sailors may not have access to electricity. The Sterno is light, inexpensive and portable. It only requires a match/lighter to start. With the Sterno, our design created 4.3 ounces or 125ml. of drinkable water in 1 hour. After calculating the numbers, we deduced that our design could create @64 ounces of water in 15 hours.

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AT EN ET

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CSEF Official Abstract and Certification

Fair Category

LT

Proj.
Num

1026

Title: Got Gas

Student Name(s): R. Maxwell, B. Flaherty, R. Niland

Abstract:

Have you ever wondered which beverage produces the most gas? In our experiment our goal was to observe what beverage produces the most gas. We tested this to inform people about how gas affects them in their everyday life. Many people experience gas throughout the day and so it can be helpful if you know how to prevent it. The Gas is a common problem which most humans experience and it's important to know which beverages produce the most gas. The first step of our procedure was to gather materials and measure out the amount of liquids needed for each bottle. Then we put the bottles onto a heating tray and measured the amount of gas and recorded the data in our charts. In the experiment "Got Gas?" our hypothesis was proven wrong. Originally, it was thought that CocaCola would produce the most gas but Sprite won. Temperature had a big effect on the output of gas. During the first 10 minutes the average rate of gas output was 0.1 cubic inches per minute at a constant temperature of 100°F. In conclusion, our data supports three important findings that makes our experiment complete. The first is that sprite produces the most gas compared to other liquids tested. Also the gas production highly increased after ten minutes when all variables were held constant. Lastly there is a positive relationship between temperature and the volume of gas produced.

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BI

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- Yes No

CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2001

Title: The Effects of Wi-Fi on Plant Growth

Student Name(s): M. Bencivengo

Abstract:

Abstract In this day and age of technology Wi-Fi exposure is becoming increasingly prevalent. With the amount of EMF's (electromagnetic waves) that we are exposed to from cell phones, lap tops, and routers, the effect of exposure to Wi-Fi is definitely an area that requires more research. In this experiment I wanted to look at the effects of Wi-Fi exposure on plant growth using cress and bean seeds. The cress and bean seeds were placed next to a wireless router, (Wi-Fi exposed) and another set of cress and bean seeds were placed in a separate room with no Wi-Fi exposure. Both groups of seeds were placed a foot away from the window on the same side of the house so the amount of light and the temperatures in both rooms were the same, between 69-70 degrees. The hypothesis was that the plants close to the Wi-Fi router would not grow, as well as, the plants that were not exposed to a Wi-Fi signal. The results were not supportive of my hypothesis; the growth near the Wi-Fi router sprouted sooner grew taller and was a different color than the growth with no Wi-Fi exposure. While the results didn't support my hypothesis the experiment did show that Wi-Fi does affect plant growth. Our daily exposure to electromagnetic radiation and its effects on humans and our environment is an area that requires more extensive research to determine the safety of this type of exposure.

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PS EV

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L7

Proj.
Num

2002

Title: How does Caffeine affect the growth of plants

Student Name(s): M. Mysatyukow

Abstract:

I wanted to find out if caffeine affects the growth of plants. I bought some green bean seeds and I planted them in three gardening pots all the same size. I put 6 sups of potting soil in each pot and planted 4 beans in each. I watered them every other day and set them in a sunny window. Hypothesis – The caffeine stimulates the growing process. From day 1 to day 14 no growth was noticed. On day 15 the plants broke through. Procedure - At this point I added brewed coffee grounds into the soil in pot # 1, in pot # 2 I kept plain soil and watered with plain water and in pot #3 I kept plain soil and watered with a brewed coffee and water mixture. Over the next 15 days I measured the growth of the plants in each pot on a measuring stick that I put into each pot. Conclusion/Data – From this data I concluded that the caffeine grounds in the soil produced the fasting growing plants, the pot watered with the coffee – water mixture grew slower, and the pot with plain soil and plain water grew the slowest.

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PS

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L7

Proj.
Num

2003

Title: THE EFFECT OF pH LEVEL ON THE GROWTH OF ALGAE

Student Name(s): N. Sim

Abstract:

The purpose of this experiment is to find out if the pH of a solution affects the growth of algae. It is predicted that if alkaline, neutral, and acidic solutions are used to grow algae, the alkaline solution will produce the most algae growth. The experiment involved growing algae in three bottles of alkaline, three bottles of neutral, and three bottles of acidic solutions in a controlled environment for four weeks. All trials contained 95 mL of Alga-Gro® Freshwater Medium and 1 mL of live chlorella algae. The pH levels of each solution were changed by adding a small amount of vinegar for the acidic trials and small amount of hand soap for the alkaline trials. No additional substances were added to the Alga-Gro® Freshwater Medium for the neutral trials as the pH of the Alga-Gro® Freshwater Medium was already at a pH of 7 (neutral). The algae concentration levels for each individual trial were tested weekly using a spectrophotometer. At the end of the four week period, the data showed that the acidic trials produced the most algae growth out of the three groups. The algae concentration levels for the acidic trials averaged to about 0.684 mol/L, while the neutral trials averaged to about 0.644 mol/L and the alkaline trials averaged to about 0.391 mol/L. It is concluded that the hypothesis was incorrect as the data showed that algae concentration was highest in the acidic solution and not the alkaline solution as predicted.

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EV BI PS

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Fair Category

L7

Proj.
Num

2004

Title: Diffusion Confusion: Which Liquid Does Blue Food Coloring Diffuse the Fastest In?

Student Name(s): S. McAuliffe

Abstract:

In my experiment "Diffusion Confusion: Which Liquid Does Blue Food Coloring Diffuse the Fastest In?" I was testing blue food coloring diffusion in various liquids. My initial hypothesis was, if I put a drop of food coloring in four different liquids (orange juice, Sprite, water and 50% glycerol) and observe how long it takes for the color to diffuse throughout the liquids, it will diffuse into the orange juice the fastest. I say this because I think the acid in the orange juice will allow the color to diffuse faster. To test this theory I started with placing three glass cups on a table and put one cup of test liquid in each. Then I dropped one drop of food coloring in each and started a timer, while I waited for it to diffuse I recorded observations. Then once it was diffused I recorded the data. My research showed that the Sprite diffused the fastest out of the four liquids, with its fastest trial of fifty –six seconds. The next fastest one was water. The blue coloring sunk down to the bottom of the cup then it started to diffuse up. The glycerol solution started at the top and slowly trickled down and diffused. Lastly the orange juice remained the same the whole time. It just spread out over the top. It was interesting to see how the blue food coloring behaved differently in the different liquids even though these results did not match my intimal hypothesis.

**Technical Disciplines Selected by the Student
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CH BI

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Fair Category

L7

Proj.
Num

2005

Title: Endomycorrhizal and Ectomycorrhizal Fungi and the Effect on Plant Communication Through the Common Mycelial Network

Student Name(s): R. Bidwell

Abstract:

It has been recently proven that plants can communicate with each other through fungus in the soil. It has been shown that these plants warn their neighbors when exposed to a threat or stressor, allowing them to prepare a defense. The purpose of this experiment is to determine which type of mycorrhizal fungus works best in the process of plant communication through the common mycelial network and root systems. In this experiment pea plants were placed on two sides of three containers and isolated from each other except through the root system and mycelial network. Each container contained a different type of fungus in the soil- endomycorrhizal, ectomycorrhizal and a combination of the two. One of the two plants in each group was exposed to aphids, a common predator of this species of pea plant. After a set time, the barrier isolating them was removed and the aphids were allowed to migrate to the other plant in the container. My hypothesis was that the combination of both endomycorrhizal and ectomycorrhizal fungi would be better for communicating than one type alone and the second plant in this group would do better at repelling the aphids. The experiment results actually showed that the plants in the containers with endomycorrhizal fungi alone were better at repelling aphids on the second plant, the combination was second best and the ectomycorrhizal was the least effective. The results seem to imply that the amount of endomycorrhizal fungi in each container is important to plant communication.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

PS MI EV

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2006

Title: Water: the Power of Life Hydroponics vs. Aquaponics

Student Name(s): K. Doherty

Abstract:

The main purpose for this project was to compare hydroponics to aquaponics. The question I asked: "Is growing plants in a hydroponics system more effective than growing plants in an aquaponic system?" My hypothesis was, "If I use an aquaponics system, it will grow larger plants over three weeks, than plants grown in a hydroponics system." To test the hypothesis, I used 2 storage bins filled with water. In one, I put fish and plant conditioner. In the other, I put only plant conditioner. Next, I cut holes in the lids of both and placed net cups with gravel and a lettuce seed in each of them. Every three days I measured plant growth and made observations. I fed the fish every other day and once a week, I poured in plant conditioner. I concluded that the fish, my independent variable, affected the growth of the plants. The constants in this project were, amount of fish food, amount of water, amount of plant conditioner added to the water, amount of fish in the water, amount of time sunlight was on the plants, and the temperature of the water. The results were interesting, yet predicted. Initially, the plants using aquaponics, grew faster and appeared stronger. The hydroponic plants did grow, with one exception; they grew at a slower rate and appeared weak. That exception was too small to be measured. This project's results can effectively decrease world hunger. Overall it was a successful experiment based off of the results.

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CSEF Official Abstract and Certification

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Proj.
Num

2007

Title: Do different sources of light affect the rate that a plant transpires?

Student Name(s): J. Everard

Abstract:

This science fair project studies the effect of different types of light on transpiration. Transpiration is the process of the plant sweating through microscopic pores located on it (mostly in the leaves) and at the same time getting rid of the chemicals in the air. This project tested which of three different light sources causes the plant to use up water more quickly. This project solved the problem of plants using up more of the fresh water we need to survive by finding a way to have a plant use up less fresh water. This is particularly helpful for people who have a limited amount of freshwater due to droughts and dryness. I investigated the problem by testing three of the same kind of plants under three different light sources and weighing them before and after being under the light for 24 hours to find out about how many grams of water they lost. The results show that Natural Light caused the plant to use up water more quickly than incandescent light and fluorescent light. I met my personal objective because I found out what I wanted to know.

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Num

2009

Title: What Liquid Germinates Seeds The Fastest

Student Name(s): M. DiCicco

Abstract:

What if the soil was contaminated and we couldn't use it to grow our vegetables and other types of things? This was the question that drove me to test my science project. This project looks to see what type of liquid can germinate a seed the fastest by its natural growth period. I tested this by putting seeds into apple juice, distilled water, orange juice, and club soda and watching them germinate over a two week time period. My hypothesis was that the club soda would germinate the seeds the fastest. The experimental results supported my hypothesis by showing that the club soda caused the seed to germinate the fastest. The experiment also showed that apple juice and orange juice was not suitable for germination because they both contained too much sugar for the seed to process.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS AT EV

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3. This project was conducted at a Registered Research Institution. Yes No

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CSEF Official Abstract and Certification

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Proj.
Num

2010

Title: "Pore" my way to cleaner water: The use of flocculants and porous ceramic pots for purifying drinking water in developing countries.

Student Name(s): M. Maciejewski

Abstract:

Last year 783 million people were without clean drinking water and 3.4 million died (mostly children) from waterborne diseases caused by microorganisms, often from fecal matter. One cheap method for filtering contaminated water is passing it through porous ceramic pots, which were made popular by Potters for Peace. However, these pots clog easily; one possible solution is the use of flocculants, which are chemicals used by water treatment plants to settle colloids prior to filtration. One safe flocculant is alum, a spice used in pickling. In my project I (1) clarified contaminated water using flocculants and optimized their conditions, (2) made porous ceramic pots and tested if they clogged when filtering dirty water, and (3) tested if the pots could filter away bacteria. Porous ceramic pots were made from clay and sawdust, molded, and fired in a kiln. Various amounts of flocculants were added to dirty water and the rate at which colloids settled was measured. Alum settled dirty water efficiently and surprisingly lower amounts of alum settled floc faster. Dirty water filtered through porous pots was crystal clear and was bacteria free, while unfiltered water teemed with bacteria. Dirty water clarified with flocculants flowed through porous pots at around 750 ml/day while non-flocculated water clogged the pots causing a 50-fold reduction in flow rates. Thus, the strategy of flocculating contaminated water before filtering through porous pots proved effective at preventing clogging and produced clean purified water. This method has the possibility to reduce waterborne illnesses in developing countries.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV ME EN

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CSEF Official Abstract and Certification

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Proj.
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2011

Title: The Effect of Acid Rain on the Growth of Tennessee Green Pod Bean Plants

Student Name(s): S. Capodicci

Abstract:

The objective of this experiment was to determine how acid rain affects the growth of Tennessee Green Pod bean plants. It was hypothesized that the plants exposed to simulated acid rain at a pH of 4.5, the average acidity of acid rain in Connecticut, would not grow to be as tall as the plants watered with water at a pH of 5.6, the normal acidity of unpolluted rainwater in Connecticut. The procedure followed during the experiment stated that the plants be put in pots labeled "Water" and "Acid Rain" to grow for six weeks. Then, the pots labeled "Acid Rain" would begin to receive vinegar mixed in with their water. This acts as simulated acid rain. After 3 weeks, each plant would be measured with a metric ruler. The data revealed that the plants watered with a solution at a pH of 4.5, simulating acid rain, were inhibited in growth and were noticeably shorter than the plants watered with distilled water at a more neutral pH of 5.6, with 21.3 cm being the average height of the acid rain plants and 34.25 being the average height of the water plants. The plants watered with acid rain were only approximately 68% as tall as the plants watered with distilled water. It is concluded that the data supported the hypothesis and that the plants watered with acid rain were unable to grow as tall as the plants watered with distilled water.

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CSEF Official Abstract and Certification

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L7

2012

Title: Fresh vs. Frozen

Student Name(s): L. MacDonald

Abstract:

Have you ever wondered if frozen foods have less or more vitamin c and sugar content than fresh food? I chose this experiment because I am interested in cooking and nutrition, this project allowed me to study both subjects. I hypothesized that fresh food have more vitamins and less sugars than frozen food. I believe this because frozen food are picked at their ripest stage instead of ripening during the journey to the store. After food is picked they start to lose nutrients. Also, frozen foods go through many processes before they are frozen. In my experiment I used two different tests ,one to test vitamin C levels and the other to test sugar content. I used Iodine and cornstarch to test vitamin C and Benedict Solution to test sugar. These experiments allowed me to compare the difference between the fresh and frozen sugar and vitamin C content. Overall frozen food had more Vitamin C than fresh food. The fresh foods had overall more sugar . My hypothesis was proven incorrect but my results were inconclusive, further tests are needed to make better conclusions. If I could add anything to my experiment I would add more variety of food. I think this experiment can change the lifestyles of many people. Many employed parents don't have time to cook their children gourmet meals at home but at the same time want their children to lead healthy lifestyles. Well, they can because at times frozen foods can be healthier than fresh.

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ME

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- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): L. O'Donnell

Abstract:

The purpose of this experiment was to determine if common household items could change how fast a carved pumpkin could rot. To do this, one pumpkin was soaked in bleach, one was covered with hand sanitizer, one was covered with glue, one was soaked in salt water, and the last one was untreated. The pumpkins were placed outside and checked on a daily bases over three weeks. It was determined the pumpkin soaked in bleach slowed the pumpkin from rotting the most followed by one covered hand sanitizer and that the pumpkin covered in glue and the one soaked in salt water rotted faster than the control.

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CSEF Official Abstract and Certification

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Proj.
Num

2015

Title: Troublesome Turf

Student Name(s): T. Courts

Abstract:

My project, Troublesome Turf, tested the toxicity levels of artificial turf on daphnia. This was accomplished by boiling artificial turf and placing daphnia, a water flea, in the water extracted from the turf. I then observed and compared the life spans of the daphnia in each container of "tea". My hypothesis was neither proven nor disproven, resulting in the need of further and more comprehensive testing. My experiment can be applied to real life because artificial turf is often used on soccer fields, football fields, and many playgrounds. If parents are aware of the possible threats of this grass substitution, they will most likely think twice before taking their child to the local playground.

Technical Disciplines Selected by the Student
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AS BI ME

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3. This project was conducted at a Registered Research Institution. Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): A. Gordon

Abstract:

I decided to research the effect of music on one's mind because I play and listen to music, and I'm interested in the psychological effect of music on humans. My investigation was about which genre of music, (classical, electronic, or rock) had the most positive effect on one's memory. First, I had each test subject execute a simple matching game two times without music. This was to accustom the subject to the mechanics of the game, and establish their understanding of it as a controlled variable. Then, each test subject played the game three additional times: once with classical, once with electronic, and once with rock music. The times of each musical test were automatically calculated by the computer, and then recorded. After conducting this experiment with 14 people, each genre's times were averaged. The times were only minimally different, with classical being the slowest and rock being the fastest. However, I propose that the results correlated entirely with my procedure: classical, electronic, and rock, which was the exact testing order. Therefore, my experiment actually shows that there is a direct correlation between the amount of experience a subject had and how successfully they performed on the test. This concept can be applied to real world situations, such as memorizing flashcards, or studying for a test (short, frequent reviews). In conclusion, my results support the notion that a person's mind can be trained to perform tasks, and that repetition increases the speed and ease of which those tasks are performed.

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CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): S. Cohen

Abstract:

For this science fair project, I wanted to test out how much sugar is needed for dough to rise the most. My hypothesis was that the dough with the most sugar added would rise the most because sugar is food for yeast, and the dough would rise the most with the yeast consuming the most sugar. First, I began a recipe for bread. I prepared it three times, varying only the amounts of sugar to each recipe: 0 tablespoons, 2 tablespoons, and 4 tablespoons. Afterwards, I measured how high the dough rose every half hour for 2 hours. After 2 hours, I measured the final height of the dough balls. The results showed that my hypothesis was incorrect. The dough with 2 tablespoons of sugar rose the most, and the dough with the most sugar rose least. Sugar in moderate amounts, increases yeast's fermentation by providing yeast with food. Too much sugar will decrease or slow the process. In future experiments, I would be interested to study the results of sugar added to dry versus fresh yeast.

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CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): B. Foran

Abstract:

Abstract The title of my science fair project is Curious Cuttings. My project, is in summary: In what solutions do cuttings grow best,the solutions are hormone water, pure water, a pure nutrient solution, and hormone nutrient solution. This could be important because if you need to grow something fast you could use cuttings. I wanted to find out what was the best way to grow them.What I did was I put cuttings into different solutions, tested how well they survived, and how well their roots grew.What happened was that most of the tomato plants died and the ones that survived had lots of roots..But when I tested the milkweed I found that most survived but created little roots.What I learned was that a solution I called hormone water, using a plant growth hormone, more survived and produced roots than the other solutions for the tomatoes. But with the milkweed the hormone nutrient solution had the same amount survive as the straight water but the hormone nutrient had more roots.

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CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2019

Title: The Stroop Effect

Student Name(s): B. Canning

Abstract:

The Stroop Effect has been notable in the psychology world since John Ridley Stroop first performed the test in 1935. During Stroop's test, subjects were given written color words and asked to name the ink color of the word. The color words presented had the same ink color (blue) or a different ink color (blue). This project investigated if color blind males would have different results than non-color blind males. About 8% of males are color blind, which means they have trouble distinguishing between different colors. The hypothesis was that the color blind subjects would take longer and have more difficulty during the Stroop test than the non-color blind subjects. During the experiment, six color blind and six non-color blind subjects were given 10 sets of 10 typed color words each. In the first five sets, the color word was the same as the ink color. In the next five sets, the color word was different than the ink color. The results proved that the hypothesis was correct, as the color blind subjects took longer and made many more errors than the non-color blind subjects even when the color word matched the ink color. It was evident that the color blind subjects needed to take extra time to cope with the typical struggles of the Stroop Test as well as their own color blindness. Further research may investigate adaptations color blind males make during their daily lives to compensate for their deficiency.

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BE

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3. This project was conducted at a Registered Research Institution. Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): S. Kessler

Abstract:

The purpose of this experiment was to show how much sugar is hidden in sodas and juices and how the glucose we actually digest rises due to an enzyme breaking these sugars down into fructose and glucose during the digestion process. Orange juice, coke, orange Gatorade, apple juice and Mexican cola were tested.

The first necessary step in this experiment was to create a 10% dilution for each beverage. All food samples needed to be at room temperature. After that an initially glucose testing was required. Then 10 drops invertase were added to each cup and mixed. At the end of the reaction time of 50 min. a glucose strip was placed in each cup and after exactly 30 seconds matched to the color guide.

In summary the glucose rankings from highest to least after invertase reaction would be; coca cola, Mexican cola, orange juice and orange Gatorade tied, and finally apple juice. Fructose and the total amount of sugar weren't tested.

In conclusion the results of the experiment partially supported the hypothesis. This is because the results for the juices and Gatorade were close to the expectations. The results of the sodas were very similar even though the American coca cola was supposed to be made with high fructose corn syrup and the Mexican with sugar. This means that the results for Mexican cola were completely out of line. The result strongly suggests that it contains high fructose corn syrup and that the label is wrong.

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Title:

Student Name(s): C. Azore

Abstract:

Nutrients enable plants to grow, this includes water plants. This experiment studied whether traditional fertilizer (MiracleGro) or synthetic urine was the better fertilizer for 2 aquatic plants - duckweed and Chlamydomonas (algae). Synthetic urine was utilized since it contains some of the same ingredients as fertilizer. Algae and duckweed were placed in separate tanks. Dilutions of fertilizer and MiracleGro were then added and observed over a period of 15 days. At the end of the experiment, the traditional fertilizer allowed higher growth of duckweed versus the synthetic urine. The algae did not grow well in the synthetic urine or the traditional fertilizer.

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L7

Proj.
Num

2022

Title: Which Insulated Bag Lasts the Longest?

Student Name(s): D. Savino

Abstract:

Abstract- What you did: The student put an ice pack and a container of yogurt in several lunchboxes and recorded the temperature of the yogurt at half hour intervals. Why you did it: The student did this to see which cold bag could keep the yogurt cold the longest. What you learned: The student learned that an Arctic Zone lunchbox was a better bag than many others and that the age of the lunchbox does not affect the quality.

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ME MI EN

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CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): B. Agirman

Abstract:

This project is about the microwave people use in their everyday lives, and what effect it gives to the growth of plants. But it is not just plants. We all use microwaves, but is there an impact on us when we use them? After all, according to research, the microwave is in the electromagnetic spectrum and releases radiation. Is the microwave safe? This project has been done mainly for two reasons; worry and curiosity. Ever so curious, this project was made to discover if microwaves affect the growth of plants in any way because while this project did not have any testing on people, it could be possible that if the plants are getting affected, then we may as well. To see if microwaves affect plants, four ivy plants have been used. Two of them were exposed to microwaves through water, and two were not. For a total of 20 testing days, it is shown that the exposed plants, apart from being dull in color and health, were not affected by microwaved water. Comparing to the non exposed plants, they don't look that different. The testing shows that, for the most part, microwaves don't affect the growth of plants.

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CSEF Official Abstract and Certification

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L7

Proj.
Num

2024

Title: The Effects of Cell Phones on Narcissus Papyraceus Growth and Color

Student Name(s): M. Bachmann

Abstract:

The purpose of the experiment was to test the effects of cell phones on the growth and color of narcissus papyraceus. It was predicted that the plants living near the cell phone would die, and decrease in color and height. The experiment was conducted by measuring the height and color of all the narcissus papyraceus and recording them on the observation tables. Then placing six of the plants in a room with no cell phone, and placing the remaining six in a room with a cell phone. After three weeks the height and color of the plants were measured again and recorded on the observation table. The data showed that the plants not living near the cell phone grew an average of 24.833 centimeters and the plants living near the cell phone grew an average of 30.083 centimeters. The data also showed that neither the plants not living near the cell phone nor the plants living near the cell phone decreased in color. It was concluded that cell phones do not affect the height or color of narcissus papyraceus, in fact cell phones may even help plants grow because the plants living near the cell phone grew an average of 5.25 centimeters more than the plants not living near the cell phone. The experiment could have been made better by using different types of plants and cell phones, and by letting the plants live by the cell phone for longer.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS EV PH

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2025

Title: Have Your Bread and Eat It Too

Student Name(s): M. Ekstrom

Abstract:

Every day we consume foods that have been pre-prepared. These foods usually contain some form of preserving agent to make them last longer. Food that almost everyone eats pre-prepared is bread. I examined both chemical and natural preservatives that could be used to increase the shelf life of a loaf of bread. I believed that the chemical preservative most commonly found in bread, calcium propionate, would perform the best. I tested six preservatives against a control group with no preservative. Five loaves of bread were baked using each preservative: salt, ginger, rosemary, cloves, sodium bisulfite, and calcium propionate. All of the loaves were stored in a dark room, sealed in ziplock bags. They were opened daily to record the diameter of all the mold spots. The loaves that contained calcium propionate stayed mold free for 22 days. All others showed mold by day 9. The loaves with salt, ginger, and sodium bisulfite were very similar to those in the control group. Cloves and rosemary are relatively strong natural preservatives and they performed better than the salt, ginger, and sodium bisulfite. My hypothesis was proven correct. Nothing else was able to preserve the bread as well as the calcium propionate. Although sodium bisulfite is a chemical preservative it is not commonly found in bread. It is found in because it mainly preserves color, and does not inhibit bacteria. It is difficult to preserve bread for a long time using only natural ingredients.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH MI

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2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2026

Title: Killing Blackspot: an Organic Struggle

Student Name(s): J. Hoffman

Abstract:

Black spot fungus, also known as *Dicarpelon rosea* is a bane to the gardening community, causing dark spots with yellow margins to appear on the leaves of rose plants. Research on the subject would be important to many gardeners. This experiment tested a fungicide and an organic method on the fungus. In the end, there was no zone of inhibition around any of the methods of killing the fungus, however the paper towel square with the fungicide did a better job of not getting covered with fungus. Further research could be done with actual plants, or with different fungicides.

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- Yes No

CSEF Official Abstract and Certification

Fair Category

Proj.
Num

L7

2027

Title: How Does Water Impact Plant Growth?

Student Name(s): S. Adams

Abstract:

Like humans, plants need the correct amount of water to grow and survive. If a plant receives too much water the plant will not grow quickly if at all. When a plant gets too little water, its' growth can also be negatively impacted. This science project examines the impact of water on plant growth to determine the extent to which the amount of water will cause plants to grow the fastest. To accomplish this, pea seeds were planted in potting soil in plastic pots and were given various amounts of water over a twenty-day period. Three pots were given no water each day; three pots were given ½ cup of water each day; three pots were given 1 cup of water each day; and three pots were given 2 cups of water each day. In addition to measuring temperature and humidity each day, plant growth was measured and recorded for each of the twelve pots. My hypothesis was that the plants that were given a modest amount of water each day would grow faster than those plants that were given no water or too much water. The results of my experiment supported my hypothesis by showing that the plants that were given ½ cup and 1 cup of water grew faster than the plants that received no water or that were given 2 cups of water each day.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS EV

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): M. Rahman

Abstract:

Lets help plants grow!In my science fair project the problem is how does the amount of compost tea affect growth of plants? This is important because it helps us at ESM know if we should give our plants compost tea and if we should, how much should we add for our plants to grow the biggest.In my project I tested 18 basil plants and treated them with 11 ml of 1) compost tea; 2) 50% compost tea; or water. My finding was that the plants given the most compost tea will grew the most. What my findings mean is that pure compost tea grew the best plants.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

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 vertebrate animals controlled substances

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2029

Title: That Is The Reason Why Your Teeth Are Stained

Student Name(s): B. Chavez

Abstract:

The purpose of this project was to find out how much would your teeth get stained under the exposure of Coffee, Tea, and Coke. I used eggshells to represent the teeth, Coke, Tea, and Coffee. The way I started this experiment was by exposing the eggs for 10 hours and then for 10 days. I documented and compared the changes during this experiment. The first step for this experiment was to put three eggs into three cups of coke, tea, and coffee. I left the eggs in the cups for 10 hours, when the 10 hours were finished I checked the eggs and noticed that the egg in the cup of tea was darker than the egg in the cup of coffee. I gathered information of the changes I was noticing and took photos. 10 days later I checked the eggs, I had noticed that the egg in the coffee got darker than the egg in the tea. After being exposed for 10 days everything changed the exposure of tea was not as strong anymore at this time coffee became the stronger. The eggshell from the coffee changed its color to brown, to follow the tea and last the coke. These beverages may be delicious but they are not good for your teeth!

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2030

Title: A Photosynthesis Lab: The Effect of Light Intensity, Water Temperature, Colored Lights, and Contaminated Water on the Rate of Photosynthesis of the Aquatic Plant, Elodea Densa

Student Name(s): N. Sciallo

Abstract:

Light intensity, water temperature, colored lights, and contaminated water are known to have an effect on aquatic life. The purpose of my experiment was to build my very own photosynthesis lab and to measure the effect of these factors on the rate of photosynthesis of the aquatic plant, "Elodea Densa". My hypothesis indicated that these variables would have a negative effect on the rate of photosynthesis. I created an aquatic photosynthesis lab by placing the "Elodea Densa" into test tubes, adding dechlorinated water and sodium bicarbonate, and placing them into beakers. By measuring how many oxygen bubbles the plant produced per minute in each of these conditions, I was able to measure their effect on the rate of photosynthesis of the "Elodea Densa". The further my plants were from the light, the less oxygen bubbles were produced. Extreme water temperatures had a negative effect on my plants. Different types of colored lights decreased the amount of oxygen bubbles my plants produced. Also, engine oil and acidic water did not provide a healthy habitat for my plants. My experiment proved that light intensity, water temperature, colored lights, and contaminated water do affect the rate of photosynthesis of the "Elodea Densa".

**Technical Disciplines Selected by the Student
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CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2031

Title: Hypoxia in Long Island Sound

Student Name(s): C. Fabrizio

Abstract:

The objective of this project is to design and build a system to keep fertilizer out of Long Island Sound to prevent Hypoxia. The criteria and constraints were identified and considered when completing this project. It had to be safe, it must work, and it could not require any expensive materials unless they could already be found in the science lab or at home. The filtration systems underground were mimicked in a smaller scale with rocks and dirt. Holes were cut in the bottom of 3 buckets. Plastic tubes were attached for all of the water to flow through and put into one bucket to collect all of the water. Water mixed with fertilizer was poured into the system. At the bottom of the system there was a tube with small holes in it to work as a sprinkler in lieu of a water pump. The original design included a water pump but was later eliminated because the pump was not working. The "sprinkler" worked well and served its purpose. Once the water was flowing through the system, it became slightly dirty due to the rocks and dirt. The water was blue because of fertilizer in the beginning and once it sprayed out of the system, it was a greenish-brown color. In the end, the system did what it was supposed to do and would prevent polluted water from continuing to runoff into the Long Island Sound or any body of water.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EN EV EM

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2032

Title: Weed Control: Walnuts to the Rescue!

Student Name(s): A. Forsyth

Abstract:

The purpose of this experiment, was to find out if naturally-occurring phytotoxins were a safer and faster way to protect agricultural crops from different kinds of weeds. My hypothesis states that phytotoxin, such as juglone, would be to kill weeds faster than regular commercial herbicide, and it would better for the environment. If this procedure proves true, then we could use it in place of harmful chemicals. I set up two experimental groups, and tested them against a control group. One experimental group was exposed to five sprays of commercial herbicide, and the other was exposed to five sprays of a specific phytotoxin. These were tested against the control group, which was only given water. I recorded the decline of the plants health by taking a picture of one plant from each group every day, for 22 days. The weeds that received phytotoxin had completely died by the 16th day. The weeds that received commercial herbicide had degraded by 18 days, but had not completely died by the 22nd day. My hypothesis was supported, because the phytotoxin poisoned the weeds faster than the herbicide, and it completely killed them before the end of the testing period, whereas the commercial herbicide did not.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV PS BI

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4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2033

Title: "Why did the Chicken Cross the Road?"

Student Name(s): K. Logel

Abstract:

Abstract: In my science experiment, "Why Did the Chicken Cross the Road", my goal was to find out if chickens have color preference. Before I started my project, I found out the eye functions of a chicken. In my research I found that chickens have incredible eyesight and can additionally see ultraviolet rays. Now that I knew what I was working with, I could start my experiment. My hypothesis is that the chickens will gravitate toward the red bowl, they are surrounded with an environment with a red warmth light, like mine, then they will be more attracted to the color red. In the experiment I set out three different colored bowls. One was green, one blue and one red, and laid them across the driveway and filled them with food. Next letting the two chickens pick which one they liked most by approaching one. I repeated this experiment every Monday for about a month and took notes. In conclusion I found that my hypothesis was correct. The chickens preferred the red bowl over the green and blue. 8 out of 12 times the chickens pulled toward the red bowl. While blue 1 out of 12, and green 3 out of 12.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AS AS AS

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- Yes No

CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2034

Title: All About That Bait

Student Name(s): B. Valigorsky

Abstract:

I wanted to find out how certain baits attract fruit flies. Bait contents and locations were changed in each trial. I put fruit flies in an enclosed see-through container, then put bait cups in. For the first experiment, the bait cups contained varying amounts of water and vinegar, or were empty. Some of my data is that in the baits which contained 50% vinegar and 50% water, four of the baits attracted from one to three flies and the other bait contained 20 flies. For the second experiment, the cups contained just water, or vinegar, or were empty. I put one of each kind close together and one of each kind far apart. In the closer containers, the water and empty ones didn't end up with any flies. The vinegar cup had two flies. In the containers that were further apart, there were two flies in the empty one, none in the water, and 20 in the vinegar. These results didn't support my hypothesis exactly how I wanted. My hypothesis was not proven nor disproven 100%. Fruit flies were attracted to the vinegar but were also attracted to the vinegar/water solution, or empty containers. Even though my data didn't show a definitive pattern, the vinegar typically attracted more flies. When there was a large amount of flies (20), there was always vinegar in the cup.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV EM AS

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2035

Title: AS TEMPERATURE GOES, YEAST GROWS

Student Name(s): J. Ranelli

Abstract:

Yeast is a vital ingredient in many things with bread, baking, and the beer industry. The yeast industry is the oldest in the field of biotechnology. In this experiment I tested the best temperature for yeast growth,. The hypothesis was that yeast will grow best in 49-54°C. The yeast and sugar mixture were poured into five bottles each containing different temperatures of water, 20°C, 30°C, 40°C, 50°C and 60°C and the inflation of a balloon was measured. It was found that the bottle with 40°C and 50°C Water did best. The results of my experiment supported the hypotheses. Yeast has a large impact on baking and if one learns more about the ingredients that are being used, it can help improve the quality of the food. By using the proper conditions for yeast, you can make sure that your baked goods will be the best every time.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2036

Title: Does Music Affect Running Pace?

Student Name(s): M. Mancuso

Abstract:

Many runners use electronic devices to listen to music during regular runs. The objective of this project was to find out if listening to music while running can affect a runner's performance in a positive or negative way. My hypothesis was that listening to music while running would improve performance, because the music provides motivation and a steady rhythm to follow. The experiment was conducted on a publically available 2-mile loop course and utilized 3 volunteers who were experienced runners accustomed to distances of at least 2 miles. Each volunteer signed an informed consent form and ran the course a total of 4 times, twice with music and twice without music, on 4 separate days. The times that the volunteer listened or did not listen to music were determined randomly by flipping a coin. Each run was timed with a stopwatch and entered into a data chart. Results showed that for each pair of runs with music and without music, the runner had a lower time with the music. The advantage of the music ranged from 23 seconds to 2 minutes and 59 seconds. These results supported my hypothesis that running with music increased speed and resulted in lower times. My conclusion is that listening to music while running has a positive effect on a runner's pace. If I were to repeat this experiment, I would try to get more volunteers to strengthen the results.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BE

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2037

Title: The Effect of Sugar on Yeast Cells

Student Name(s): M. Norris

Abstract:

How does sugar affect yeast cells? This experiment was done so people could see how different amounts of sugar will affect yeast reproduction. Procedure: 1. Set up each test tube with 1 or 2 grams of sugar in the last two test tubes and 2 grams of yeast in each test tube. 2. Start the timer. 3. Record results. 4. Repeat four more times. Observations: One thing that occurred was that the the apple juice with extra sugar had less foam than the apple juice with no extra sugar, which was strange because of the higher sugar level in the two test tubes with extra sugar added to the apple juice. Conclusion: The hypothesis is that if a certain amount of sugar is put into apple juice, then the one with the most sugar will have the greatest foam height which shows yeast reproduction. This hypothesis was not supported because if there is too much sugar in the solution, the yeast won't produce as much foam. The results of this experiment was that the regular apple juice had the greatest foam height, 3.44 mms.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

MI

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2038

Title: Smoking Wars:Cigarette Citation

Student Name(s): W. Marks

Abstract:

As many of us know cigarettes contain very deadly toxins that over time have very harsh effects. But as technology has become more advanced we have almost ditched the idea of regular tobacco based cigarettes with these new electronic cigarettes. The companies have convinced smokers that e-cigarettes are a safer initiative. Although, some are skeptical about this new product. The real question is, are they really safer than regular tobacco based products? In this experiment I decided to put both to the test. I tested them both on small organisms called Daphnia. You will decide from my project and results if these cigarettes need a "Cigarette Citation".

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AS BI ME

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- Yes No

CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2039

Title: Using Vibrio Fischeri for an Energy Efficient Bioluminescent Display for Electronic Devices

Student Name(s): Y. Zaidi

Abstract:

The LCD display currently used in electronic devices consumes a large portion of the battery power. Can bioluminescent Vibrio Fischeri be used to light the LCD screens making electronic devices more energy efficient and environmentally friendly? The inspiration for this project came from UC San Diego and the furniture brand, Philips. Scientists at UC San Diego created a blinking shop sign using thousands of colonies of bioluminescent algae. Philips created an energy efficient bio light. With the reference of these brilliant works, there will be experimentation with bioluminescent bacteria Vibrio Fischeri to determine the amount of luminescence needed to power LCD screen. Determine if sub culturing will increase capacity to produce bioluminescence and if oxygenizing the bacteria will make it excite faster. To determine the amount of lumens necessary, the formula is $Lumen = Watts \times Lumens / Watts$ to be 1,200 lumens. The results show that the original, non-subcultured agar plate's lumens decreased from 120 to 96 after a couple of weeks. Sub culturing increased the bioluminescence by having newer and resistant strains of V. Fischeri. The initial amount of lumens was 120, after the first sub culture 137, and second subculture approximately 200. Hence 1/6th of the total goal was met. In conclusion, sub culturing did increase the amount of lumens produced and that by oxygenizing the bacteria it excites faster. The future goal is to determine if it is possible to apply this to a real world scenario.

**Technical Disciplines Selected by the Student
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BI EN AT

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- Yes No

CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2040

Title: Hydroponics - How to grow plants with water?

Student Name(s): W. Velez

Abstract:

Plants are mostly grown in soil, but I wondered if plants must be grown in soil. To create my experiment, I had to first learn how seeds germinate and what they need to grow. I saw on a TV show that with a hydroponic system you can grow plants using water. I decided to find out how to create a hydroponic system; I would have to be sure to have the necessary materials and understand all the correct methods and steps. I learned that seeds need warmth, moisture and air to sprout. For the embryo to continue to grow it needs moisture, warmth, air and nutrients. Once the leaves grow the plant also needs sunlight. The purpose of my experiment was to prove that if a seed is given everything that it needs it will grow healthy without soil.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS

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- Yes No

CSEF Official Abstract and Certification

Fair Category

L7

Proj.
Num

2041

Title: A Study of the Relationship between Apple Price and Vitamin C

Student Name(s): B. Lee

Abstract:

The purpose of this research is to find if there is a relationship between the price of an apple and the nutrition of an apple. The research questions are: (1) Are the prices related to the nutrition of the apple? (2) Do the organic apples have more nutrition than the non-organic apples? (3) Which apple has the most nutrition per dollar? My hypotheses are: (1) There is a relationship between the apple price and the vitamin C level. (2) Organic apples have a higher level of vitamin C. (3) There are differences among apple types. From Stop & Shop, I collect 17 varieties of apples with 3 apples of each variety. I blend an apple thoroughly and measure the blended apple with an ascorbic acid (vitamin C) test strip twice. After the measurement, I rinse the blender and repeat the process again for all 51 apples. Evidence supports Hypothesis 1. Results show a strong relationship between the apple price and the vitamin C level. Evidence does not support Hypothesis 2. The data shows no significant difference in vitamin C levels per dollar between the organic and non-organic apples. Evidence supports Hypothesis 3. The McIntosh apple is the best buy!

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME PS

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2501

Title: Does a Person's Eye Color Affect Their Ability to Identify Colors in Dim Light?

Student Name(s): I. Kunze

Abstract:

The purpose of this project is to test the ability of each individuals eye color to collect data so make a conclusion can be made about whether eye color does affect your ability to identify colors in dim light. Procedure 1.Administrator should number all the color cards for easy resorting. 2.Make sure your dim room is prepared and ready for testing. 3.Use 5 test subjects of the following each eye color: a.blue b.green c.brown d.hazel 4.One at a time, bring each test subject in with the blindfold over their eyes (test subjects with glasses or contacts will remove them for accurate test results) 5.Administrator stand opposite where the test subject is seated.Test subject may now remove blindfold. 6.Explain to test subject that he/she will be tested on basic colors that he/she should know. 7.Before you start the test make sure to turn on the voice recorder to record the results. Begin testing by 1 at a time, holding up the color cards and asking test subject "what color is this?". 8.Once the full test has been conducted, the test subject may leave. 9.Repeat numbers 3-9 untill all test subjects have been tested. Data The data has proven that brown eyes are the strongest,blue and hazel are cecond strongest, and green eyes weakest when identifying colors in dim light. My hypothesis which was "If a person has blue eyes,then it will be harder for them to identify basic colors in low light." was disproven. Conclusion:I learned eye color does affect vision.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BI ME

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5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): S. Foye

Abstract:

Environmental materials have been trending as recently humans have taken a new, more friendly outlooks on life to preserve parts of the natural Earth. This project has proved the leading brand of environmental friendly detergent, Seventh Generation, actually is more toxic than the conventional detergent. The assumed hypothesis that Seventh Generation and Dreft, a conventional baby detergent that is supposed to be low in toxicity, would longly outlast any leading conventional brand of detergent (in this case Tide). The project began with placing the test subjects (red earthworms) into 5 different test cups of Tide-Dirt Solution, 5 cups of Dreft-Dirt Solution, and 5 cups of Seventh Generation-Dirt Solution. All of the worms that were placed into the Seventh Generation-Dirt Solution and the Dreft-Dirt Solution all were confirmed to be dead on Day 3 of experimentation. The worms in the Tide-Dirt Solution lived through the experiment's running time and were still living two weeks later during cleaning up the project.

**Technical Disciplines Selected by the Student
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- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2503

Title: The Effects of Caffeine on the Heart Using Daphnia magna

Student Name(s): A. Agnew

Abstract:

The purpose of this project was to discover the effects of caffeine on a Daphnia magna's heartbeat. There were four different specimen cups containing different amounts of caffeine diluted in 100mL of spring water. One Daphnia magna was placed in the 20mg specimen cup. It was left in the cup for about two minutes. After two minutes, the Daphnia magna was pipetted into a depression slide. This made it easy for the invertebrate to be observed under the microscope. The number of heartbeats of the invertebrate was observed for fifteen seconds. To discover how many beats per minute there were, the number was multiplied by four. These steps were repeated for the different amounts of caffeine. Overall, the amount of caffeine that produced the greatest number of beats was the 20mg of caffeine. There was a 6.71% increase from the control heartbeat to the heartbeat obtained in the 20mg test. For the 40 mg test, the Daphnia magna was closer to dying so there were fewer heartbeats. Lastly, for the 60 and 80mg of caffeine, the invertebrate died too quickly to determine the heartbeat. Assuming that 80mg of caffeine would produce the greatest number of beats, the hypothesis was not supported, but measurable results were determined. Humans have to be mindful of what is consumed, and how it can be harmful. If humans do not recognize the potential dangers of caffeine, there could be major consequences, and the main outcome would be heart issues.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME CB AS

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2504

Title: The Cocktail Party Effect: An Inside Look Into Multitasking

Student Name(s): S. Gordon Wexler

Abstract:

This experiment investigates how well people of different ages retain information in a multi-sensory environment. The Cocktail Party Effect was researched as a means to determine its relationship to multitasking. The Cocktail Party Effect is someone's ability to focus on a single thing in a multi-sensory environment. The hypothesis in this experiment is if people of different ages can retain information while in a multi-sensory environment, then teenagers/tweens can retain more information while in a multi-sensory environment than adults ages 20+, because teenagers can multitask better than adults. The procedure of this experiment requires reading a script to the test subject that describes a made-up person while a movie clip (Upscene) and song (SweetCaroline) plays. After two minutes, the test subject takes a testing questions about the movie, speech, and song. The subject then takes the control part of the experiment that requires listening to a different speech without a song or movie playing. After waiting two minutes, the subject is tested on the speech. Based on the data collected, the teenagers/tweens and adults had similar test scores on their multi-sensory tests. However, on the control test, the adults did notably better than the teenagers/tweens. My experiment falsified my hypothesis, because I predicted the teenagers would do better than adults on the multi-sensory test. However, they performed similarly. The answer to my testable question is there is no difference between how both adults and teenagers/tweens can retain information in a multi-sensory environment

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): T. Reeve

Abstract:

In my science fair project, I was testing to see if changing the type or shape of a hatchery would affect the rate in which the brine shrimp would hatch. This problem could be important if someone was wondering if changing the type or shape of their hatchery would make their brine shrimp hatch faster. In my experiment I designed 2 different types of hatcheries (with the help of a guide and a teacher). One type was made from a soda bottle and the other type was made from a small plastic tub. I used 2 of each type. 750 ml went into each hatchery. Then, I added eggs and once they started to hatch, I counted them under a microscope. (See more details in the procedure). My data varied a lot and I discovered that it depends on where in the hatchery you are taking samples from. So, I learned it doesn't really make a difference if you change the type of hatchery.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2506

Title: Can Daphnia be used to study chemicals that can interfere with substances that can cause Obesity and Diabetes.

Student Name(s): D. Villalona

Abstract:

Before medicines are made, chemicals are tested on animals to see if they have an effect in the animal in order for those chemicals to be made into medicine. The problem is that many people don't like to see animals being used in a lab to test chemicals. In this study, I tried to see if Daphnia, an organism found in water, can be used as an organism to test chemicals that can potentially stop substances that are known to cause diabetes and obesity such as sugars. The hypothesis is, if dextrose and fructose have an effect on daphnia then daphnia can be used as a testing organism to test chemicals that can potentially stop obesity and diabetes. The experiment was done by mixing different concentrations of dextrose and fructose with three daphnias in 5 ml of water. I checked everyday to see if they multiplied and to see for how many days they will survive. Three daphnias that were not treated with dextrose or fructose served as the controlled group. The results show that the daphnias in the 0.5% dextrose lived for 20 days longer than the control. Also the results show that 1.0% fructose lived for 16 days shorter than the control. The highest number of daphnia was 6 and was found in 0.1% dextrose. Based on the results, one can say that chemicals that can stop the effect of dextrose and fructose on organisms, can potentially be tested in daphnia.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

ME

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2507

Title: AQUA-LIFE

Student Name(s): B. Clark

Abstract:

Long Island Sound is a valuable resource that is under tremendous environmental pressure from the land-based activities around it. One of the more detrimental concerns is excess nitrogen and its effect on marine populations. When excess nitrogen enters the Sound (primarily as a result of over-application of fertilizers) the existing algae grows much faster than normal. When the algae dies and sinks, the aerobic process of decomposition depletes the dissolved oxygen (hypoxia) that fish and other marine creatures need to survive. As the National Parks Service Youth Ambassador, water quality issues are paramount to me. This project examines the effect of nitrogen on macro invertebrate populations. Two colonies of brine shrimp (approx. 100 eggs/750mL) were established prior to the testing. In one sample (Jar A), high-nitrogen fertilizer (1 tbs) was added and the other colony (Jar B) was left alone as a control sample. Over a five day period, algae was clearly visible at the surface of Jar A. It was observed that the algae continued to grow rapidly over the testing period. The initial population in both jars was estimated at 100 shrimp/jar. By day 3, the number in the Jar A had dwindled to approximately 50%. The colony in Jar B had negligible loss; the population stayed consistently "healthy" for the duration of the testing. However the entire colony in the high-nitrogen environment had been eliminated by day 5. Further studies would be needed to determine safe levels of nitrogen to enter Long Island Sound due to runoff.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EM BI EV

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2508

Title: Hand Hygiene Effectiveness in Reducing the Number of Bacterial Colonies

Student Name(s): A. Turcotte

Abstract:

Handwashing with soap has been recommended as the most effective way to reduce microbes and stay healthy. The problem arises when handwashing facilities are not available, then hand sanitizers should be used. The purpose of this project is to determine if hand sanitizers are as effective as handwashing in removing transient bacteria. Draw a dividing line on the bottom of six agar plates. Label three plates side "A" and side "B" and label the other three side "C" and side "D". Number the lids for each group (A/B and C/D) one through three. The plates are to be used in consecutive order for all procedures. Press the left thumb gently down onto side "A" of each of the three plates. Plates labeled "C/D" will have the right thumb gently pressed down onto side "C". Sanitize the left hand with a 70% ethyl alcohol hand rub and press the left thumb gently on side "B" in each plate. Wash hands with soap, air dry and then press right thumb onto side "D" of each plate. Incubate at 30⁰C for 55 hours. Remove plates from incubator and record the number of visible colonies for each side of each plate. Reductions in the number of visible bacterial colonies were found after handwashing and hand sanitizing. Handwashing was found more effective with higher numbers of microbes. Results varied between the trials leading to further studies to establish a conclusion. Perhaps the best application is intermittent handwashing enhanced with frequent use of hand sanitizers.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME MI

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2509

Title: The Effects of Honey on the Healing and Regeneration of Lumbriculus variegatus

Student Name(s): L. Wells

Abstract:

Honey, although an unorthodox method of treatment in the field of modern medicine, has gained prominence in the medical community since 1990 as an antimicrobial agent to treat wounds, burns and ulcers. With an evolving pathogenic ecosystem adapting rapidly to mainstream treatments, honey is an approach that more health care providers are turning to. The healing process of organisms treated with honey has been documented to stimulate the growth and rebuilding of cells faster than those treated with water. In this investigative lab, the effects of honey on the healing and regeneration of Lumbriculus variegatus (black worm) was explored. In these trials, black worms were cut with a razor blade and placed in vials, which contained various solutions of honey and water. The black worm acted in this experiment as both a cell and a model for larger organisms. The regenerative properties of the black worm were applied to a cell as it regenerated and healed, and the worm itself was regarded as an organism, whose wound's healed at a faster rate with the honey solution. The results were overwhelmingly in favor of the spoonable honey option. These results support the argument that honey should be used for healing. This unconventional solution has affected the healing and regeneration of Lumbriculus variegatus in an extremely positive fashion. Therefore, it is crucial that honey be used in the mainstream medical society to heal and counteract microbes.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME AS CB

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title: Analysis of Increased CO₂ levels in Ocean Waters and Effect on Crustaceans and Bivalve Growth

Student Name(s): A. Katz

Abstract:

Abstract I was "Shell Shocked" that the Long Island Sound did in fact have high levels of CO₂. This in turn is causing increased acid levels, which is harmful to shell development. After analyzing CO₂, O₂, pH, temperature, and nutrients in water, sediment, and oyster shells, I discovered: •Norwalk: highest CO₂ levels (it is a big business industrial area) •West Haven: lowest CO₂ levels (not as populous or factory clustered) •Increased CO₂ levels have made water more acidic (pH around 4-6) •Oyster shells: weakened by increased acid levels due to higher CO₂ •Long Island Sound: unhealthy levels of O₂ (less than 3ppm) •Long Island Sound: high levels of coliform bacteria (90% especially Norwalk) •Nutrient levels: low (deficient to barely adequate) in water, oyster shells, and sediment. My evidence from many tests, reveals unhealthy conditions for growth of shell structures. High CO₂ levels and resulting increased acid levels plus poor nutrient levels seem to cause most harm to shell development-yes, "Shell Shocked".

**Technical Disciplines Selected by the Student
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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2512

Title: A Battery that makes cents

Student Name(s): N. Lawton

Abstract:

Batteries are expensive, so I wanted to make batteries out of pocket change. My hypothesis is that the dimes and quarters will produce more millivolts and milliamps than the pennies and nickels. I made 6 different batteries with more coins than the other. I mixed vinegar and salt in a bowl and cut up paper towels into 1 centimeter squares. I soaked the squares into the vinegar and salt and washed the coins in dish soap. I built a stack of coins on a dry paper towel on a plate. I put down a penny first, then placed a square of vinegar soaked paper towel on top, and then added a nickel. I repeated the layers until there was a stack of four coins and ending with a nickel on top. I attached the leads of the multimeter to the two ends of the battery by touching one lead to the penny on the bottom and the other to the nickel on the top. The voltage produced was measured by the battery in millivolts and milliamps. I repeated with different and more coins. The results were not what I expected. I thought the dimes and quarters would produce more voltage but they did not. The pennies and nickels gave more voltage than I thought they would. The experiment showed smaller coins give more voltage and power than larger coins do.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ET EE

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2513

Title: Antacids: Which is Most Effective at Resolving Acid?

Student Name(s): J. Hewitt

Abstract:

This experiment asked the question, "Which antacid is most effective at resolving acid?". This experiment had two hypotheses: #1) If hydrochloric acid is added to natural antacids such as bananas, gingerroot tea, and mustard and over the counter antacids such as Tums, Alka-Seltzer, and Gaviscon, then the over the counter antacids will resolve acid more effectively than the natural antacids, and #2) If hydrochloric acid is added Tums, Alka-Seltzer and Gaviscon, then Alka-Seltzer will be the most effective at resolving acid. Trials were completed using antacids that are available for anyone to purchase at a grocery or drug store, as well as natural remedies for relieving heartburn that were found on a website. The items were prepared as the directions or website stated and distilled water added to each. Distilled water was tested as the control. 1M hydrochloric acid was added in 2.5 ml, and then 5 ml, increments. The pH of the sample was monitored using a pH meter. Additional hydrochloric acid was added until either the pH level dropped below 1.5 or a total of 50 ml of hydrochloric acid was added; whichever came first. Data shows that Alza-Seltzer was able to buffer the largest volume of hydrochloric acid, with the control of distilled water and the samples of mustard and gingerroot tea buffering the least. This experiment supported both hypotheses as the data shows that over the counter antacids were more effective than the natural remedies tested and that Alka-Seltzer was the most effective at resolving acid.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

BI CH

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2514

Title: Contemporary Bio-remediation

Student Name(s): R. Bandaru

Abstract:

The purpose of my experiment is to find out how plant life can be used in bio-remediation of grey water from household emissions such as kitchen sinks, bath water, and washing machines. I chose this project because I realized how in America, we take simple things such as safe water for granted, while in other parts of world many others do not have the same luxury. Grey water is commonly found in densely populated cities & towns, often serving as breeding ground for several diseases. This led me to wonder how waste water can be recycled by using cost effective means. Therefore, I decided to test how grey water can be recycled by bio-remediation. To test this, I put grey water in a cup with soil and burr-reed seeds native to North America. I used another cup with safe tap water and another with only grey water to compare my measurements. In the period of week, I measured the pH level every day at the same time in all the cups. The data collected showed that, grey water with the soil and burr-reed seeds reduced pH. The burr-reed seeds amplified the speed that the pH of the grey water decreases. Ideally, the experiment would have taken place in the summer for a more realistic environment. The result, bio-remediation can indeed be used to recycle grey water while being cost effective at the same time. Benefits include improved public health and the replenishment of water tables to improve ground water reserves.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV EM PS

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2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2515

Title: The Impact of Acid Rain on the Flora of the Environment

Student Name(s): K. Caple

Abstract:

Have you ever heard of a Quiver tree? There is a possibility you have not due to the tree becoming extinct from acid rain. My project is "The Impact of Acid Rain on the Flora of the Environment". The purpose is to see how long it takes for a plant to die when being fed acid rain. To begin my experiment I grew thirty Pansy plants, fifteen were given acid rain and fifteen were given rainwater. The acidic value of the acid rain was a pH of 3.0 and the rainwater had a pH of 6. I measured, in days, how long it took for the plants to die. After just one day of watering with acid rain, a plant died. By that plant dying it proves how harmful acid rain is to the flora of the environment. My hypothesis was correct, due to the acid rain the plants are not getting the nutrients they need to grow, they did not survive, but the regular rainwater plants did survive. The fact that I observed a plant dying within the first twenty-four hour period of being fed acid rain, supports my research and hypothesis that acid rain has a detrimental affect on the flora of the environment.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV PS CH

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2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2516

Title: Effects of different levels of electromagnetic fields on a variety of grasses and their nutrient content

Student Name(s): A. Snyder

Abstract:

The goal of my experiment was to see if an electromagnetic field (EMF) affected the rate of growth for different kinds of grasses. I planted 5 different kinds of grass with 4 different pots each. One pot had 1 coil, one had 3 coils, another had 6 coils, and the control had no coils. More coils created more electric charge and a stronger EMF. I watered, measured, and observed each pot daily. Each grass had a different reaction to the EMFs. •The Rye grass reacted well to all of the EMF levels. •The 3 Blend responded poorly to all the EMF levels. After growth, I tested grass and soil samples from each pot for different nutrients (nitrates, carbonates, phosphates, potassium, and pH level). Pre-tests of soil were done for comparison. •Over time, nutrient content of soil and grass was affected by the EMF. •With the increase of EMF, the nitrate and carbonate content in the soil tended to decrease, while it gained in the grass. •The number of coils that got the best results for grass height was 1 coil. •Grass nutrient had positive results with 1 coil. •Soil nutrient content had positive results with 1 coil. Over all, my “Electric Fertilizer” made of 1 coil had the most positive results.

**Technical Disciplines Selected by the Student
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PS EV EE

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2517

Title: Aquaponics: The impact of combining agriculture and aquaculture techniques on plant germination and growth

Student Name(s): A. Petschek

Abstract:

Over the years of factory- sized agriculture and culturing fish, there have always been the issues of efficiently raising and harvesting fish, as well as using the least amount of water possible. Aquaponics is an option to combine the two together and solve many problems found with fish culture and agriculture/ hydroponics used separately. Prior beliefs and research had found that aquaponics used less water when compared to growing fish and plants in separate habitats. Building an aquaponics system growing *Carassius auratus auratus* and lettuce were used to test this hypothesis, which, in the end, was unsupported. After a ten week test with a control tank and control soil bins, the results collected showed that the controls together used only six more liters of water than the aquaponics system, but the aquaponics did have a larger harvest of lettuce in those ten weeks. The system produced 42 grams of lettuce in total compared to only 2 grams produced by the control. This data showed that aquaponics produced more salad in the course of ten weeks at the time of planting, and kept the water cleaner and clearer longer, while needing less maintenance than growing the fish and lettuce separately. Aquaponics could help solve many problems such as the disposal of waste that comes from hydroponics, and the need for more space in farming. It could also promote self-farming and agriculture by having smaller versions of the systems being sold in stores across the world.

**Technical Disciplines Selected by the Student
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PS EA EV

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2518

Title: Nutrient Comparison of Lettuce Grown Hydroponically and in Soil

Student Name(s): H. Platt

Abstract:

Does store-bought hydroponically grown lettuce have the same amount of nutrients as store-bought soil grown lettuce? Hydroponics is a possible solution for locations that don't have a lot of farming land or water. This experiment is important because people who are eating lettuce grown hydroponically think they are getting the same nutrients as soil grown lettuce. After eating soil grown lettuce this past summer, my vision was crisper. This was not noticed after eating the hydroponically grown lettuce. This made me want to investigate if both types of lettuce had the same nutrient content. If farmers are monitoring the nutrients, they should. Two heads of soil grown lettuce and two heads of hydroponically grown lettuce were tested. Samples from each head of lettuce were crushed with a mortar and pestle until the juice was separated. Testing was done for Vitamin C (reagent), protein (Biuret solution), and the Brix scale (Refractometer). Each test was repeated three times per sample. The negative control was water for all tests. The Brix scale test revealed differences in nutrient levels, nearly twice the level on the Brix scale reading for soil grown. Preliminary tests support soil grown lettuce has more nutrients. The greater the level of dissolved solids indicating nutrients, the greater the light will bend and the greater the number indicated on the scale.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS CH

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2520

Title: The Effects of Mnemonic Methods On Memory

Student Name(s): K. Remmert

Abstract:

I was working on an English paper and I got hungry. By the time I had eaten, I had forgotten what I was working on. That got me thinking about the human memory. I did some research on memory and methods of remembrance and made it the topic of my science fair project. I learned humans start storing memory at 3 to 4 years old, how cause and effect impacts memory, and how we remember things more easily when we're exposed to similar things as before. That research led to the purpose of my experiment - to find the best method of remembrance. I researched methods of remembrance, also known as mnemonics, and used three in my experiments. They were the 8 Second Window, Repetition, and Acronyms. Each method had a cause and effect on memory. I also gave my subjects a control list and allowed them to try to remember the list however they could. My experiment had ten subjects who had four lists each consisting of ten items. For each list the subjects would have to use each of the methods to try to remember the items and they would have 30 seconds to do so except for the 8 Second Window. My data resulted in the conclusion that the 8 Second Window is the least effective way to remember things. The test results for Repetition, Acronyms, and the Control List were nearly identical in average number of list items remembered with no method showing better results.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BE ME

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2521

Title: Electric energy production for varying electrogenic microbial samples in mediator-less microbial fuel cell

Student Name(s): S. Kondapalli

Abstract:

In today's world we always need more electricity to give power to the billions of people. A microbial fuel cell (MFC) does that using micro-organisms. If we could determine if a mixed bio-film of bacteria or certain species of bacteria performs more efficiently and produces more electricity we could widely increase the use and implementation of the MFC. To carry out this experiment I used a small cylinder container and filled a small amount with liquid agar and placed my bacterial/fungal sample on top of it; then placed an anode on top of it and put some more of the bacterial sample and filled nearly the rest of the cylinder with liquid agar. I put the cathode on top, checking hourly until my sample went inactive and repeated with my control and bacterial/fungal samples. The results I obtained were interesting, E.coli gradually increased to a high of 0.41 volts in 3 hours then immediately dropped within an hour or so. On contrast baker's yeast produced a high of 0.24 volts in 4 hours but remained active with a slight decline for nearly 6 hours after. Furthermore my control group a benthic mud sample produced a high of 0.72 volts in 2 hours and slowly declined in the process of nearly 8 hours. With these results I can conclude that yeast produces less electricity but is stable for a longer period of time while E.coli produces a higher amount but declines quite quickly. My project can further understandings of mediator-less MFC's.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

MI EM AT

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): S. Sankar

Abstract:

Microwave radiation is electromagnetic radiation or waves of electrical and magnetic radiation moving together through space and it is thought to have numerous harmful effects on living organisms. This project looks at which primrose plant dies; the primrose plant watered with distilled water at 70°F or the primrose plant watered with microwaved distilled water at 70°F. The hypothesis was if the primrose plant is watered with microwaved distilled water at 70°F every day for twenty-four days, then the plant will die because the radiation in the microwave will harm the primrose plant. The experimental results supported the hypothesis by showing that over the time period of four weeks, the primrose plant that was watered with microwaved distilled water at 70°F had died and the primrose plant that was watered with distilled water at 70°F had survived. This experiment proved that microwave radiation is harmful to living organisms.

**Technical Disciplines Selected by the Student
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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

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L8

Proj.
Num

2523

Title: Not Organic? Don't Panic!

Student Name(s): A. Saidman

Abstract:

Purpose:

The purpose of conducting this experiment was to find out if organic fruits contain more vitamin C than their conventional partners.

Procedure: 1. Collect one ounce of juice from each fruit being tested and put each ounce in a separate labeled cup. 2. Mix 5 tablespoons of bottled water with 1 tablespoon of baking soda. 3. In one juice, add 10 drops of the starch solution mixing after each drop. 4. Add povidone iodine to the solution, mixing after each drop, until a color change persists. 5. Record the number of drops of iodine added. 6. Repeat steps 3-5 for each fruit.

Data: The organic navel orange, organic lemon, and organic Fuji apple had more vitamin C than their conventional partners while the conventional Bosc pear and conventional kiwis had more vitamin C than their organic partners. Other than the lemons, which had 37 more drops of iodine added to the organic juice than the conventional juice, the spread between the drops added to both juices was five or less. In total, there were 324 drops of iodine put into conventional fruit juice compared to 362 put in organic fruit juice.

Conclusion: In all, there was not enough evidence acquired from this experiment to show organic fruits definitively have more vitamin C than their conventional partners.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV PS

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2. Student independently performed all procedures as outlined in this abstract. Yes No

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2524

Title: An Investigation of the Ingestion of Microscopic Plastic Particles by the Blue Mussel, *Mytilus edulis*

Student Name(s): C. Herrick

Abstract:

Clothing is made up of synthetic materials. When washed, they release microscopic plastic fibers into the water supply, contaminating marine life. The objective was to examine mussel feeding behavior to see if they would ingest microscopic plastic fibers. Mussel feeding behavior was examined by looking at microscopic plastic particle capture on the gills and the transportation of the particles to the labial palps for ingestion or rejection. The rejection was studied by examining the pseudofeces and the ingestion by examining the feces.

Microscopic plastic particles smaller than 0.5 mm from household clothes were used in the experiment. The microalgae, *Tetraselmis* sp. (a known food for mussels), was added to ten samples in individual containers containing filtered LIS water. The plastic particles were added to five of these samples. Mussels were introduced to nine containers; the tenth was a settling control. Water samples were taken before the mussels were added and two hours after the mussels were added and fed. Pseudofeces and feces produced by the mussels were collected, isolated by centrifuge, counted microscopically for plastic-particle content using rafter cells and the concentration of plastic particles was determined. Clearance rates were calculated from the change in plastic-particle concentration over time. Mussels cleared the plastic particles from suspension at an average rate of 150.6. On average, mussels rejected 73.03% of all plastic particles captured. On average, only 26.97% of the plastic particles were ingested. This is worrisome because the ingested plastic particle fibers could be harmful both to humans and aquatic health.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV ME AS

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Proj.
Num

2525

Title: How Different Milk Fat Concentrations Affect Bacterial Growth

Student Name(s): M. Gesell

Abstract:

Beverages from drink dispensers, which are used widely in public areas, can often carry harmful, infectious bacteria due to poor upkeep and low levels of sanitation. With the growing number of antibiotic resistant bacterial strains, it has become increasingly important to eliminate bacteria found in beverages, as treating an antibiotic resistant bacterial infection is difficult. Certain drinks contain bactericidal properties, while others have properties that encourage bacterial growth. The purpose of this study was to determine which fat concentrations of milk, a beverage commonly found in public drink dispensers, are most bactericidal and therefore safest to drink, and which concentrations of fat promote bacterial growth. It was hypothesized that milk with higher fat concentrations would promote bacterial growth the most, as milk with high fat concentration is rich in nutrients that encourage growth. E. coli K12, a nonpathogenic strain of E. coli that closely resembles a pathogenic strain, was first cultured in LB to establish stable growth, then transferred to nutrient agar plates to visualize colony growth. After 24 hours, equal amounts of milk of different fat percentage were added to separate plates. Bacterial growth was observed using the dotting method after 24 hours. Based on the number of colonies counted, higher fat concentrations in milk were seen to promote bacterial growth. This investigation should be used to help educate people about what they should be drinking to reduce the risk of contamination.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

MI CB

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CSEF Official Abstract and Certification

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L8

Proj.
Num

2526

Title: One Sticky Situation

Student Name(s): A. Conway

Abstract:

I performed my experiment because I wanted to ultimately find an alternative way for volunteers to clean the crude oil off birds and other animals. The question I am testing is, will Dawn dishwashing liquid clean oil off birds' feathers the fastest, most thorough, and most effectively? To test this I made four pans, and in the first I made an oil mixture containing vegetable oil, Alka-Seltzer, water, and Wilton frosting dye(oil based). I used the Alka-Seltzer as a bonding agent so the dye would stay in the oil. In these conditions I mixed one cup of water and one tablespoon of Dawn dishwashing liquid, in the second, one cup of water and one tablespoon of Seventh Generation dishwashing liquid, and in the third, one cup of water and one tablespoon of Stop and Shop store brand dishwashing liquid. Then I individually put three feathers into the oil pan, and let them soak for thirty minutes each. After soaking, I thoroughly cleaned each feather in each solution for two minutes with a sponge. After being cleansed, I let the feathers dry overnight, then compared my results. As my hypothesis stated, Dawn dishwashing liquid cleaned the oil off the feathers the most effectively, then Seventh Generation, then Stop and Shop. Dawn worked the best because it's petroleum based. To make my project better and more accurate I suggest using clean or dirty motor oil (my intended variable till complications), or slathering petroleum jelly on the feathers, while cleaning the same.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH BI

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CSEF Official Abstract and Certification

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L8

Proj.
Num

2527

Title: Viral Protein 35 Inhibition: A Novel Treatment for Ebola Virus Disease

Student Name(s): A. Agarwal

Abstract:

Ebola Virus Disease (EVD) is an infectious illness with fatality rates of up to 90%. According to the CDC, there have been about 19,000 cases of EVD as of December 19, 2014. Out of these 19,000, about 7,300 deaths have been confirmed. Clearly, EVD is a deadly disease that must be taken care of, but there are currently no treatments. EVD is characterized by Viral Protein 35 (VP35), a protein that is responsible for EVD replication. VP35 also interferes with a host's interferon production. Interferon boosts the immune system, so with VP35, the immune system is damaged. EVD is expected to have a half-life of less than 24 hours, so if VP35 were to be inhibited, then the disease could be stopped. Following this theory, 6 million drug like compounds were selected, and their HTVS Glide Scores were calculated. Glide Scores reflect how well a compound binds with the protein. The Standard Precision Glide Scores were then calculated, followed by Extra Precision Scores. After sorting the compounds based on their Glide Scores, the Binding Energies were calculated. The lower the score, the better the compound will bind. The list was narrowed down to the top 20 compounds. I was successful in identifying inhibitors of VP35 that are predicted to bind tightly. I strongly believe that the inhibition of Viral Protein 35 can cure Ebola Virus Disease.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME BI CH

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Fair Category Proj. Num

Title:

Student Name(s): M. Garden

Abstract:

Exercise and sports are very fun and useful, but they can start to lose their description if you are not participating in these activities in a healthy way. Part of staying healthy and energized is keeping a balance of electrolytes. The Electrolyte Challenge will show the best choices to make when looking for electrolytes in a drink for your exercise. Healthier habits and choices lead to more enjoyable and helpful sports and other physical activities. If you do not have enough electrolytes, your body will not function properly. Electrolytes control how movements in your body work. One big question is what drink will give the best results when participating in physical activities. The Electrolyte Challenge investigates this question to find the best choice between energy drinks, sports drinks, water, enhanced water, or medicine when looking for a drink with electrolytes. In this experiment, electrolytes levels were counted to see what drinks will be most useful when exercising and keeping your body maintained and healthy. Enhanced water had the highest levels of electrolytes in the results. Water and medicine had middle levels of electrolytes. Sport and energy drinks had the lowest levels of electrolytes. I found that when you are choosing the right drink for physical activities you need to include many different factors of the drink and the activity before picking the best one.

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CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2529

Title: Indirect measurement of the pliability of vocal folds and singer comfort after direct steam inhalation.

Student Name(s): T. Casey

Abstract:

Everyday singers run into many problems. Many singers' voices change day to day. The throat can be dehydrated depending on the season, where one sleeps, the amount of water one drinks, and the humidity level in the air. Singers have said that hydration has a large impact on vocal fold pliability, so the study indirectly tested this using a personal steam inhaler. Throughout the tests, the Singing Voice Handicap Index, a Phonetogram, Maximum Phonation Time, Maximum Phonation Range, and an S:Z ratio were used. The concluded results showed that the vocal fold vibration and pliability increased after inhaling steam.

Technical Disciplines Selected by the Student
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BE ME AT

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CSEF Official Abstract and Certification

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Proj.
Num

2530

Title: How the Cookie Crumbles

Student Name(s): M. Henderson

Abstract:

Everyone loves cookies, this experiment is designed to show which kind of cookie is best to eat. It will show how much preservatives there are in the cookies since preservatives have many bad side effects such as difficulty breathing, behavioral changes, heart damage, and cancer. The amount of preservatives in the cookies will be determined by how fast they go stale. I bought several different kinds of cookies and placed them in jars. I also added some fruit because I wanted to compare the cookies and fruit. I left the cookies and fruit for three weeks because I believed that signs of going stale would start to have appeared by then. Then, due to no change, I waited two more weeks. After that I checked the cookies, for staleness by touching them to see how stale they were and fruit every week and recorded their staleness number. The homemade and price chopper cookies went stale first which means they had fewer preservatives. Some cookies did not go stale at all showing they had more preservatives. The homemade and price chopper cookies were evidently healthier for you than the other store bought cookies, but since the fruit had less preservatives and more moisture than cookies they decayed very quickly. In the end fruit is always a better choice than cookies, but if you really want a cookie then you should have a homemade or price chopper cookie is than another store bought cookie because they have fewer preservatives

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ME MI

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Proj.
Num

2531

Title: water types and plant growth

Student Name(s): J. Drury

Abstract:

Introduction What type of water is best for growing plants? Black water, grey water, or tap water? My hypothesis is that tap water will be the best water to use to grow plants. I feel that tap water is better because it hasn't come in contact with chemicals. Black water is water that has come in contact with bodily waste and toilet water. Grey water is water that may have come in contact with washing machines, sinks, and showers. I'm also assuming that if these two waters have come in contact with all these things and tap water hasn't, it may be the best solution.. **Procedure** First, I set up the cat grass its. Then I watered each plant with ¼ cup of the necessary water for the next couple of days in a sunny area. **Results** The tap water and grey water were fighting for the tallest height. The black water was shorter than them by a lot though. The tap watered plant was 4.5 inches tall. The grey watered plant was 4.2 inches tall. And the black watered plant was 3.2 inches tall. **Conclusions** In conclusion, I think that you could water a plant with either tap water or grey water. If you can afford tap water, I suggest that because if there are more food oils than the water I used, it will most likely affect the plant growth.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EA EV PS

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Proj.
Num

2532

Title: How Much Organic Material Can Earthworms Decompose?

Student Name(s): C. Stevens

Abstract:

Earthworms decompose organic material and produce castings which provide fertile soil. The purpose of this project is to determine the amount of organic material that earthworms can decompose in a compost bin. The hypothesis is that if earthworms are exposed organic material in a compost bin, they will decompose all of the material they are fed. To test the hypothesis, two compost bins were created. Each contained the same amounts of earthworm bedding and earthworms. Other variables that were controlled included; size and composition of the compost bin, temperature, sunlight, water, and the amount of organic material added. The mass of each bin was recorded at the start of the experiment which took place over a one month period. The organic material included lettuce and bread which were weighed before adding to the bins. Additional organic material was added when as needed, approximately every three day. The data collected included the total mass of organic material that was added and decomposed over the course of the experiment and the final mass of each bin. The final mass was compared to the start mass and the total mass of the organic material to determine if the earthworms added soil to the compost bins. This project has important applications for farmers and gardeners who are interested in increasing the fertility of soil for growing crops. Composting with earthworms can reduce the amount of wastes that are put in the garbage and landfills while contributing to the health of the environment.

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EV AS

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Fair Category

L8

Proj.
Num

2533

Title: Taste: What Matters?

Student Name(s): C. Landry

Abstract:

Why will toddlers, much like my younger brother, eat puréed foods but resist the food when presented in a more natural form? The purpose of this project was to determine whether or not sight or texture has an effect on liking or disliking a food. After signing a waiver, each subject was given various foods in two distinct forms, the product's natural shape and the product in a blended, or pulverized form. For each of these textures, the subject was blindfolded. Finally, the food was administered in its natural shape without a blindfold. My hypothesis for this experiments, does texture and or sight effect taste? Each subject was given the array of foods in area designated for just the subject and I. Upon completion of the study, subjects were not to discuss the experiments, the foods or their results with other untested subjects. Untested subjects were separated from tested subjects to avoid any possible discussion. Each result was recorded; observations and reactions to the foods were also recorded. Foods included Oreo cookies, apples, Honeycomb cereal, pasta dinner and sugar cookies. After consuming the food, the subject was asked a series of questions. These questions were presented after each food and its changed texture or appearance. The research shows that the texture does affect one's approval of a food while the visual contribution (sight) also plays a role in the level of one's approval of that food.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BE

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Proj.
Num

2534

Title: Reaction Time

Student Name(s): A. Feliciano

Abstract:

Abstract: What I experimented was if “People who played videogames had a faster reaction time then people who don’t play”. I chose to do this experiment because I had thought about reaction and ways us people use our reflexes, so I combined reaction with videogames and got my problem. Four Volunteers would play a mini reaction game on a laptop or computer that would test and show how fast there reaction time was, When the results showed up my Hypothesis was right. People who do play videogames had a higher reaction times than others who didn't. I really like what I did for my science project and I believe I met my objectives.

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BE ME

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2535

Title: Reducing the Environmental Impact of Methane Emissions in Waste Management Through the Use of Engineered Environments

Student Name(s): J. Feuerstein

Abstract:

Global warming, a significant problem, is caused by greenhouse gases, specifically methane. A major source of methane production is garbage, which releases methane as organic matter decays. This experiment explores the feasibility of decreasing negative environmental impact of waste management through practical, economical methods. This project examined how several different engineered environments impact methane emissions from waste. My hypothesis stated that a high surface area of garbage to air would produce significantly less methane, as this would allow more oxygen to react with the waste, thereby increasing the conversion of methane to carbon dioxide. Conversely, an additional hypothesis was that more methane would be released in the environments with lower surface area to air ratios. Five structurally manipulated environments of the same volume were created, using gridded, thinly spread, layered, thickly spread, and basic layouts. Mixed, homogeneous compost waste was added to each environment in equal quantities of 9 lbs. each, and cultures of *Methylobacterium* bacteria, a bacteria that naturally occurs in garbage, were added. Methane release levels were measured every other day for 28 days. The lowest levels of methane release were found in the environment with the most exposed surface area. This partially supports my hypothesis in that this environment did dictate methane production and release in such a way that less methane was produced. The results indicate that simple physical changes in the layout of garbage as it decays can impact methane emissions, and that we may be able to decrease greenhouse gas in this uncomplicated way.

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Num

2536

Title: Nanoparticle Regenerative Film

Student Name(s): L. Woods

Abstract:

For my research project, I have decided to work on a regenerative nanoparticle film. These nanoparticle films can be used much more extensively to help patients that have diseases that need to be treated once or twice a day. Usually, these patients take pills, or they have another way of receiving a drug. These patients (with pills) can suffer from choking, or even missing their treatment. Nanoparticle films can eliminate these problems faced by pills by it's dissolvable state which makes taking their drug much more easily. Though, for my project I am not focusing on diseases and nanoparticles, I am focusing on regeneration and nanoparticles. These regenerative nanoparticle films have the same attributes I had just stated, but they can be useful by acting as a cell stimulant to regenerate broken tissue. These nanoparticle films will work as an internal "band-aid" and can be used on a daily basis for their vitamins (that help stimulate the cells), and for regular minor injuries. For my experiment, I will test these nanoparticle films against dissolvable tablets and films, seeing how long it these drugs will stay in a blood streams, using water as a simulation. When my experiment is finished I will compare the three drugs, and find which one had stayed in the bloodstream the longest. This is my science research experiment.

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BI ME CH

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2537

Title: The Antimicrobial Properties of Papaya

Student Name(s): Z. Waskowicz

Abstract:

The Antimicrobial Properties of Papaya

Abstract The purpose of this project is to determine the effect of papaya seeds on bacteria and its efficacy as compared to synthesized drugs. The hypothesis is that papaya seeds will have a small, but noticeable effect on the bacteria, and will be more effective than some of the synthesized drugs used in experimentation. Once the papaya seeds were removed from a papaya, half were incubated, and half left non-dried. Both groups were ground in a mortar and pestle. Half of each group was dissolved in Ethanol, and the other was dissolved in Methanol. These four mixtures were placed on a rocking plate for 24 hours. Then each was poured into separate tubes, and spun in a centrifuge for 10 minutes. The papaya extracts were then filtered into tubes and placed in boiling water to evaporate excess solvent. The finished extracts were injected into DMSO blanks. This was done ten times, making 40 papaya discs in total. These were placed on petri dishes of E.Coli, B.Cereus, B.Subtilis, E.Aerogenes, and S.Epidermidis. Tetracycline, Chloramphenicol, Kanamycin, Piperacillin, Erythromycin, Bacitracin, Nalidixic Acid, Ciprofloxacin, and Penicillin were put on each dish of bacteria. Once incubated, the antimicrobial effect was determined by measuring the zones of inhibition around the antibacterials and compared to that of papaya. The result of this experiment was the non-dried papaya extracted in ethanol inhibited S.Epidermidis, surpassing Penicillin and Bacitracin. It was also more effective than Tetracycline.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

MI PS ME

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Num

2538

Title: The Effect of Household Acids and Bases on pH of Dirt.

Student Name(s): R. Daly

Abstract:

My project's goal this year was to find a common base that could neutralize the acid in soil. The reason I decided to do this project was that during summer in my hometown, Brookfield, Connecticut, it rained heavily, and I noticed that after heavy rainfall, the trees would grow less than if you watered them. I decided to research this and I found that more acidic rain was the reason why they were growing less than normal. My question in this project was, "What substance best neutralizes the acid in soil?" My hypothesis was that baking soda is the best possible substance to neutralize the acid in soil. When I completed the project, I found that my hypothesis, "Baking soda is the best possible substance to neutralize the acid in soil," was not supported by the results of my experiment. The best possible substance to neutralize the acid in soil was actually laundry detergent. I noticed that the substances I used were by different providers, so I would use different brands to see whether the results changed, and if so, to what extent. I believe that the season I took the soil sample could also change the results, so I would recommend doing this project over a year so as to avoid any possible errors. I'd also recommend trying to experiment with other variables, such as the sun. While there are many variables that could change this, I found the best possible substance is laundry detergent.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH PS EV

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4. Is this project a continuation? Yes No

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Proj.
Num

2539

Title: The Impact of Different Water Pollutants on Biological Health Indices

Student Name(s): K. Kaltschnee

Abstract:

The purpose of this project was to find out if the heart rate of Daphnia could be a biological indicator of water toxicity. For this experiment, I collected water samples from the West Lake Reservoir and the Still River in Danbury. My hypothesis was that if the Daphnia were exposed to the polluted water samples, their heart rate would increase. I presumed the sample from the Still River would cause a more dramatic increase in the heart rate than the sample from the West Lake Reservoir, therefore indicating lower water quality, because the Still River is more polluted. First, a controlled experiment was conducted, where I measured the heart rate of the Daphnia while they were in unpolluted spring water. Next, I measured their heart rate after exposing them to the water samples. What I found from this experiment was that the heart rate of the Daphnia increased as I exposed them to the polluted waters. Overall, my hypothesis was correct. I have concluded that the heart rate of the Daphnia can be a biological indicator in the health of a body of water. This would mean that if the heart rate of the Daphnia was above 180 bpm, there water could be contaminated with pollutants. As the danger of the water increases, the heart rate of the Daphnia seems to rise. To clarify this, I could study how other pollutants with different toxicity/concentration levels affect the heart rate of Daphnia in the future.

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EV

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2540

Title: The Effect of Common Over-the-Counter Medications On the Growth of Human Gut Bacteria

Student Name(s): R. Subramaniam

Abstract:

Human gut bacteria are critical to humans' well-being in diseases such as cancer, autoimmune diseases and diabetes. Many species are still being discovered and little is known about their interaction with drugs. Since many drugs upset the stomach as a side effect, this experiment investigated the effect of common over-the-counter medicines on the growth of gut bacteria in vitro, using three common drugs: acetaminophen (in Tylenol), ibuprofen (in Advil), and acetylsalicylic acid (in aspirin). A representative population of gut bacteria was isolated through fecal culture using an inexpensive anaerobic glove bag and used for experiments. Commercial pre-reduced beef heart infusion broth with resazurin as an oxygen (O₂) indicator was used as growth medium. Using the recommended maximum single dosages and assuming an empty stomach volume of 1.5 L of liquid, six concentrations around the recommended dosage were tested and growth was measured spectrophotometrically. Ibuprofen was found to inhibit growth the most: 37.4% at 0.53 mg/ml, equal to 1/2 the recommended daily dose (1600 mg for adults), and aspirin also inhibited growth by 15% at the maximum concentration (0.86 mg/ml) or 1/3rd the daily dose (3900 mg). Acetaminophen did not inhibit bacterial growth at all at the maximum concentration tested. These results reflect the prominent stomach-related side effects listed for ibuprofen and less so for aspirin, while acetaminophen is generally not regarded as such. They also suggest that many other drugs could cause larger systemic effects through the gut microbiome.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

ME MI BI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2541

Title: Inexpensive Treatment for Plants Affected From Contaminated Soils by Oil Spills

Student Name(s): R. Ahmed

Abstract:

I planted cat grass seeds into ten pots with dirt mixed in with crude oil and another two pots with regular dirt. Each sets of two pots were labelled as Base 1, Base 2, Acid 1, Acid 2, Control (plants with regular dirt), and Control Oil. Each set of two were treated with solutions made from acid and base components except my control and control oil that were treated with water. The acidic solution was made with vinegar containing 5% acid. The basic solution was made using liquid soap containing ammonia, a compound with hydrogen and nitrogen atoms. Acid 1 and Acid 2 have different ratios in vinegar and water, as well as Base 1 and Base 2 with liquid soap and water. I observed the plants and recorded down whether the Basic or Acidic solution is a better treatment to the plants. If this treatment works, it will be an inexpensive way to treat plants affected by oil spills.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH EV PS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2542

Title: Think Before You Drink

Student Name(s): B. LoCicero

Abstract:

This project was conducted to determine the impact on the body of consuming certain beverages. My results are based on extrapolating the information gathered to illustrate the potential impact on the human body. No humans consumed the beverages. It is a visual illustration of what can be left behind in the body after consuming these beverages. Four popular beverages were selected. The sugar content per twenty four ounce serving was recorded. Each twenty four ounce serving of Water, Arizona Iced Tea, Gatorade, and Coke. was poured into its own pan and reduced until the liquid was removed. The residue that was left in each pan was gathered and weighed. The water did not leave any residue as it does not contain any sugar or additives. The Gatorade, after reduction, left 2.0 ounces of a sugary residue. The Arizona Iced Tea left 2.1 ounces of sugary residue followed by Coke which left 2.8 ounces of residue. These results follow the sugar content in each beverage. Coke had the highest sugar content and left the highest residue. This project is a simple illustration that provides a visual reference of what is contained in the beverages that are consumed. Schools are concerned with the menu items they sell for lunch yet many schools freely sell sugary drinks in vending machines. I am attempting to illustrate the impact these drinks can have in a society battling obesity.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH BI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2543

Title: Which side are you on?

Student Name(s): Z. Gordon

Abstract:

My science project is an experiment to show whether the dominant side of the brain, ear, foot, and eye is connected to the dominant hand. I am trying to find out if it is more likely to have the same dominant side of these body parts as your hand. I got 5 left handed people and 5 right-handed people. I tested them for their dominant eye, ear, foot, and brain. After I did all of the testing, I found that it is more likely to have the same dominant side of the ear foot and eye as your hand(ex: if someone is right handed, it is more likely for them to be dominant in the right ear, eye, and foot.) , but that it is less likely for you to have the same dominant brain side (ex:if you are right handed, it is less likely for you to be dominant in the right brain.) An extra is that for the left handed people, you can either be dominant in the right brain or dominant in both.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME BE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2544

Title: Fruit Fly Fatality

Student Name(s): H. Rego

Abstract:

I conducted this experiment to determine if nematodes (a microscopic worm that infects and kills certain insect larvae to reproduce) affect the mortality rate of fruit fly larvae, and control fruit flies. I thought that the nematodes would increase the mortality rate. I treated fruit fly larvae with nematodes and compared them to larvae not treated with nematodes. The fruit fly larvae treated with nematodes had a higher mortality rate (72%) than the larvae not treated with nematodes (10%). The nematodes slowed development of the larvae. In the treated sample, 6 percent of the live fruit flies were pupae or adults on the first day of observation compared to 86 percent in the untreated sample. Nematode reproduction was not observed. Nematodes may be useful in controlling fruit flies, but repeated treatment would be necessary the nematodes do not reproduce.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AS MI EV

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2545

Title: The Effect of Certain Foods on Yeast Respiration

Student Name(s): J. Laham

Abstract:

Yeast infections, both external and internal, are common health problems in humans. By eating certain foods that contain naturally-occurring substances which are known to control the growth rate of yeast cells, it might be possible to reduce the overgrowth of yeast in the body and prevent yeast infections. One way to test this is to monitor the rate of yeast respiration. In this experiment, six different foods (garlic, onion, ginger, cloves, cinnamon and cayenne pepper) were used to see which one was the most effective in reducing yeast respiration. Each food was added to its own test jar, and a yeast solution consisting of a 1:1 baking yeast to sugar ratio was poured into each jar. One control of only the yeast solution was also tested. Individual test systems were set up to measure the amount of respiration occurring - as the yeast consumed the sugar, the result was bubble formation. The bubbles indicated the release of carbon dioxide as a result of yeast respiration. As the bubbles continued to form and pop, more carbon dioxide was released, and was measured by water displacement (in ml). The respiration occurring in each test system was observed over a period of 50 minutes. The results showed that cinnamon was the most effective in reducing respiration of yeast cells, as its test system produced the least amount of water displacement. These findings could be used in a future experiment, testing how ingesting cinnamon could possibly help control human yeast infections.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

L8

Proj.
Num

2546

Title: The Effect of Brain Dominance on Memory

Student Name(s): O. Rotter

Abstract:

This investigation is designed to assess whether a person's ability to memorize icons and words is related to whether he/she is classified as "right brain" dominant, "left brain" dominant, or ambidextrous. I predicted that a person, if given a series of icons and words, will remember more of one series because one side of their brain is dominant. In the experiment, the test subject was asked to close their eyes until the count of three. Then they studied and memorized a series of ten pictures with a thirty second time limit. At the end of thirty seconds, they were instructed to turn around and to write the names of the pictures that they could recall. They were given one minute to complete this task. When the procedure for the icons finished, the same process was repeated with a series of ten words. When both tests were finished, the test subject was given an online evaluation. This evaluation assessed whether they were "right brain" dominant, "left brain" dominant, or ambidextrous. Based on the consistency of the results collected, my hypothesis was supported. The data derived from this experiment clearly displays that a person's ability to remember a collection of icons or a collection of words is influenced by whether the person is "right brain" dominant, "left brain" dominant, or ambidextrous. It can, therefore, be suggested that considering brain dominance may be beneficial when designing an optimal method for studying and learning.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): A. Shaw

Abstract:

This report presents the effect of pure spices against the growth of Escherichia coli. E. coli was grown onto 6 different petri dishes; 4 of the dishes contained pure spices, one contained penicillin, and the other contained distilled water. Each dish was cultivated for 3 days max, and measurements of the zone of inhibition were taken every 24 hours in millimeters. Most of the results were astonishing and unpredictable. The penicillin was not very effective against the E. coli, and cumin proves to be more effective with a zone of inhibition of 2mm average. This shows that cumin may just be as effective as or maybe even more effective than other antibiotics when fighting against E. coli.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3002

Title: The Effects of Atypical pH on Bay Scallops (*Argopecten irradians*)

Student Name(s): D. Perry

Abstract:

This project studied the effects of low pH on bay scallops. A drop in ocean pH is expected due to acidification, so it is necessary to understand how this can affect wildlife such as scallops. The hypothesis was that a decrease in pH will cause an increase in mortality and a lesser growth rate for the height, width, length, and mass of the scallops. Three salt water tanks were set up to contain 10 or 11 scallops each. The pH of the first tank was 8.1, the natural pH. The other two had pHs of 7.8 and 7.5. The pHs were lowered daily with a CO₂ pump that operated on sodium bicarbonate and HCl. The scallops were fed 60 ml of algae daily and measurements were recorded with a caliper and a mass scale. The results show that pH does affect mortality. The tank with a pH of 7.5 experienced a mortality rate of 100% in 43 days. From the tank with a pH of 7.8, the mortality rate was 18%. All survived in the tank with a pH of 8.1. The results from measurements of mass, length, width, and height have not yet been statistically analyzed. It can be tentatively concluded that pH affects scallop mortality. This information is vital to know for scallop farmers and environmentalists alike, to protect bay scallops in captivity and in the wild. In ecosystems, a reduction of scallops similar to what was demonstrated by the experiment could be detrimental to many marine organisms.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AS EV EM

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3003

Title: Antimicrobial Activity of Flavoparmelia caperata, Usnea subfloridana, and Hypogymnia physodes

Student Name(s): P. Onorato

Abstract:

A lichen is considered one organism, although it is composed of two components, a mycobiont and a phycobiont. Since ancient times, lichens have been used for medicinal purposes. Lichens are helpful in stopping the growth of several cell types. Since it has been shown that lichens have antimicrobial activity, the aim of this study is to further investigate antimicrobial activity of several different types of lichens. The antimicrobial substance was soaked with phosphate buffer saline to yield a crude extract. The extract was assayed against the bacteria, *Bacillus subtilis*. The antimicrobial activities of the extracts were estimated by the inhibition of bacteria growth when treated with the lichen extracts using the cylinder plate procedure. Several species of lichens were used to determine if there are any differences in antimicrobial activity between species and growth forms. Thus far, positive results have been obtained with one species of lichen, and the experiment is going to be repeated to verify the findings. This experiment is important because positive results may lead to the use of lichen extracts as antioxidant, antifungal, or anticancer medicine. Current antibiotics that are being used in the medical field are becoming less effective due to antibiotic resistant pathogens. If a natural substance was discovered or created to have antimicrobial activity, such as a lichen extract, it could alleviate the problem of antibiotic resistance in certain bacteria.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV ME

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3004

Title: A Comparative Analysis of Systems of Genomic Loci for the Special Identification of *Vitis labrusca*

Student Name(s): C. Provost

Abstract:

The error rates involved in the sequencing of DNA differ based on the region of the genome being examined for a given species. This project examines eight genomic loci of *Vitis labrusca*, Fox Grape, to develop an effective means of special identification, investigates the efficacy of established systems currently used in DNA barcoding, and evaluates the effects of primer combinations on the deviation of collected sequences from accepted genomes. Grapevines were pulverized and DNA was extracted using Instagene Matrix, a substance that separated the excess protein material from the target substance and acted as a chelating agent. Two primers were added to each tube of extracted DNA, and several different primer combinations were used to perform polymerase chain reaction on the same locus for the purpose of examining the effects of the primers on the error rate of the sequenced product. Polymerase chain reaction was carried out with each sample, and a pellet of DNA was gathered after segregation of the target substance and centrifugation. The samples were submitted to Genewiz, a DNA service group, for sequencing, and the chromatograms of the results were analyzed. Many months were spent examining possible species for testing, selecting primers and loci, complying with DNA barcoding protocol, and researching past work done regarding this topic in addition to the time spent processing the samples. This project is an analyzation of standard and variant methodology used in the field of DNA barcoding and in the identification of species.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

CB PS MA

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3005

Title: Investigating Inhibitors of Dihydrofolate Reductase Enzymes of *S. pyogenes* and *S. aureus*

Student Name(s): S. Tavakoli

Abstract:

Streptococcus pyogenes and *Staphylococcus aureus* bacteria are responsible for the majority of hospital-acquired infections. *S. pyogenes* causes complicated skin and skin structure infections (SSTI). *S. aureus* causes bacterial infections in the bloodstream, skin and soft tissue, ventilator-assisted pneumonia and catheters. Often, *Streptococcus pyogenes* is acquired along with *Staphylococcus aureus*. Although there is sufficient knowledge about effective drugs for *S. pyogenes* and *S. aureus* individually, further research is required to find a drug that will be effective against both strains of bacteria. This study aims to find Dihydrofolate Reductase inhibitors that are effective against DHFR enzymes in *S. pyogenes* and *S. aureus*. In order to find an effective drug against both bacteria, DHFR, is targeted. DHFR inhibitors exert their activity through blocking the synthesis of DNA, RNA, and proteins, eventually leading to cell death. Finding effective inhibitors will be accomplished through testing the activity of DHFR in different compounds. Half maximal inhibitory concentrations (IC₅₀) will be used as indicators of compounds potency against enzyme activity by use of a photospectrometer. Compounds that prevent the growth of the microorganism and inhibit the enzyme are likely to be effective against a combined infection by both bacterial strains. Some of the compounds show strong enzyme inhibition activity against both *S. pyogenes* and *S. aureus* DHFR enzymes. Therefore they are potential inhibitors. In the future, these compounds could potentially be used in a drug to help fight a combined infection.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME MI BI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3006

Title: Awareness and Knowledge of HPV Among High School Students

Student Name(s): D. Chung

Abstract:

Human Papillomavirus (HPV) is a sexually transmitted pathogen that causes 33,200 cases of associated cancers in the US. Despite the available vaccines, many teens are unaware of the existence of HPV, effective vaccinations and potential healthcare consequences. The purpose of this project is to investigate the awareness and knowledge of HPV infection among students with respect to their gender, academic achievement and socioeconomic status. It is hypothesized that students are not aware of the health risks of HPV infection. To conduct this study, participants with different backgrounds from both suburban/urban schools and various pediatric centers will be administered a questionnaire. The questionnaire will require the student to answer a series of multiple-choice questions regarding HPV and the vaccine. The questionnaire requires the student to answer questions about grade level, age, academic achievement and socioeconomic class. Results collected thus far show that a significantly low number (26%) of high school students were fully vaccinated for HPV. It was determined that boys have lower rates of knowledge than girls (41% and 59%, respectively). Also, it was determined that there is a positive correlation between students with a GPA over 3.5 and knowledge of HPV and the vaccine ($r=0.51$). Sources of error and limitations of this project result from a smaller sample size and questionnaire bias. Further studies ought to be conducted to validate conclusions. This project was completed under the guidance of Dr. Angelique W. Levi MD, Department of Pathology at Yale University School of Medicine.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME BE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3007

Title: The Quantitation of the Rate of Regeneration in Planaria

Student Name(s): A. Mignucci

Abstract:

Planarians are a type of small flatworms that have a large population of adult stem cells. This allows them to regenerate at extremely fast rates. Planarians have sensory detectors that can perceive light, magnetic fields, chemical gradients, and vibrations. Planaria are ideal model organisms because of their ability to regenerate so quickly. Although they are used so often in experiments, there is not a universally known way to care for the organism. In this project, planarians were cut horizontally and measured under a microscope to view the rate of regeneration. This project offers solutions on the best ways to take care of the animals and a way to measure their growth after they are cut. If this project is successful in finding efficient ways to maintain these organisms, this can have beneficial effects for anyone who wants to experiment with planaria in the future and make them easier to use.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3008

Title: The Accuracy of DNA Barcoding Compared to Morphological Taxonomy

Student Name(s): P. Shelat

Abstract:

The Accuracy of DNA Barcoding Compared to Morphological Taxonomy was a study focused within the plant kingdom. The goal of the study was to find discrepancies between classifications made by a normal barcoding kit found on the market and classifications made by studying the ecology and the physical features of a plant, which include leaf structure and reproductive systems, and using online databases. Since DNA Barcoding utilizes different, specific loci for each kingdom to determine and classify species, it was expected that there would be minimal amounts of discrepancy. Three plants were tested, two local and one foreign. First, each was classified, or given a name based on binomial nomenclature, using two different databases online. This was done by determining whether each was an angiosperm or not, since plant kingdom divisions are largely based on the reproductive methods of the plants. Their leaves, seeds, and stems also tell which division, class, and order each belongs to. The family, genus, and species can be determined by location and specific traits. After each plant had two classifications based on morphology, they had their DNA extracted, replicated, and analyzed through gel electrophoresis and were classified using genewiz and DNALC's DNA Subway website. Although it was a small sample set with multiple trials, the data shows that DNA Barcoding is highly accurate in regards to plant classification with only minor variations in species determination.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS EV BI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

Title: Novel Ultrasonic-Induced Antibiotic Deterioration of Borrelia Biofilms for the Treatment of Chronic Lyme Disease

Student Name(s): S. Ertel

Abstract:
 Lyme disease is a tickborne illness caused by the spirochete *Borrelia burgdorferi*(Bb). Often, Lyme disease develops into a chronic illness due to the ability of the Bb to change morphological forms. Over time, Bb-spirochetes adhere to surfaces within the body in dense groups and produce an extracellular-polymeric biofilm that coats the colony, making it almost impenetrable by immune responses and antibiotic treatment. Five antibiotics are currently coupled to treat chronic Lyme. These antibiotics reduce 80-90% of *Borrelia* in its spirochete and roundbody forms; however, are only marginally successful at reducing biofilm colonies. Restricted from diffusing across the biofilm matrix, antibiotics are rendered ineffective. This research investigates the novel application of ultrasonic agitation to the generic combination of antibiotics, in the hope of penetrating and deteriorating the biofilm’s exopolymer matrix. *B. turcica*-IST7(Bt) was used as a less hazardous, yet morphologically similar organism. Bt was cultured in 2-3%Agarose(6%rabbit serum BSK-H) and subjected to solutions of minocycline, sulfamethoxazole, hydroxychloroquine, and tinidazole antibiotics, and the 4-antibiotic mixture. 5min/4kHz ultrasonic pulsation was performed on these cultures, and compared to similar cultures without ultrasonics via SEM/ImageJ analysis. Singular antibiotics, without ultrasonic treatment, produced 0.31-2.99% Bt biofilm deterioration; addition of 5min of 4kHz vibrations causes each to increase to as much as 4.41%. Ultrasonic assistance for the 4-antibiotic treatment raised the %deterioration of biofilm from 4.56%(no ultrasound) to 25.78%. These results provide compelling evidence that the combined, 4kHz ultrasonic-induced 4-antibiotic treatment can effectively break down the protective layer of *Borrelia*, enabling antibacterials to reach spirochete and roundbody forms.

Technical Disciplines Selected by the Student
 (Listed in order of relevance to the project) ME MI EN

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

<input type="checkbox"/> human subjects	<input checked="" type="checkbox"/> potentially hazardous biological agents
<input type="checkbox"/> vertebrate animals	<input type="checkbox"/> controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No
3. This project was conducted at a Registered Research Institution. Yes No
4. Is this project a continuation? Yes No
5. My display board includes photographs/visual depictions of humans (other than myself or my family):

<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
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CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s):

Abstract:

In the presence of sufficient oxygen (normoxia), normal cells consume glucose by engaging oxidative phosphorylation (OXPHOS), a highly efficient metabolic pathway that produces 36 ATP. In contrast, normal cells produce only 2 ATP and lactate through the inefficient metabolic pathway of glycolysis in the oxygen-deficient condition. Interestingly, despite aerobic conditions, cancer cells engage a similar glycolysis pathway (aerobic glycolysis) to maintain their energy demand and proliferation. This causes the tumor microenvironment to have a low pH and possibly lead to fewer nutrients for the infiltrating T cells, resulting in the development of metabolic problems and a decreased ability to function. This study will examine whether tumor cells possess distinct metabolic features that have different effect on suppressing anti-tumor responses. To do so, we used tumor cell engraftment to compare the immune response of tumors that possess different reliance on aerobic glycolysis and oxidative phosphorylation. Results showed that tumor microenvironment is glucose deprived and causes decreased effector function of infiltrating T cells. The information gained from this study may lead to a new venue of therapies combining drugs to target cancer metabolism and boost host anti-tumor immunity.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3011

Title: Bioremediation of Low Density Polyethylene by *Streptomyces griseus* and *Aspergillus niger* in Sterilized Soil

Student Name(s): N. Pirtel

Abstract:

The complete degradation of plastic occurs over hundreds of thousands of years when underground in landfill type settings due to the lack of oxygen. This extremely slow decomposition causes polymers to build up in society as dependence on the material continues to increase. In previous studies, it has been shown that *Aspergillus* fungal strains and *Streptomyces* bacterial strains can commonly degrade polyethylene due to its simple chemical structure. Therefore, this research was conducted to test the possibility of combining the different organism types for increased degradation, which is generally considered contamination. To test this theory, polyethylene beads were scattered on top of sand that was heated to eliminate outside contaminants. 20 mL of beef broth media with solely fungus, bacteria or a combination was added to 5 evaporating dishes each. A control without added medium was included for comparative purposes. Results, however, indicate that bioremediation activity in terms of weight loss was negligible in all tests and physical impurities were few. Due to limitations experienced throughout, bioremediation is therefore not a reliable degradation method of contaminants for the common individual.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

EV MI CB

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- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3012

Title: The Effects of pH on DNA Isolation

Student Name(s): S. Parker

Abstract:

The Effects of pH on DNA Isolation Forensic scientists and crime scene technicians are required to extract DNA at crime scenes in all types of environments. This project will assist the forensic science field by discovering how pH affects DNA isolation. The objective of this project is to analyze if pH affects deoxyribonucleic acid (DNA) isolation. It is hypothesized that high or low pH will affect DNA isolation. The current method used was extracting DNA from strawberries using a detailed protocol which included items such as: dish soap, salt, and rubbing alcohol. The experiment is testing if adding an acid or base to the fruit will affect this procedure. Due to the low yield of DNA with the addition of vinegar or baking soda, it was concluded that high or low pH affects the DNA isolation process. This shows importance in the forensic science field because if a scientist is to extract DNA from a crime scene that is on soil with high or low pH it may be challenging. While being aware of these challenges and finding further data to overcome such issues, this can lead the scientist to have a successful outcome of the DNA isolation experimentation.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS CB CH

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3013

Title: The Effects of Organic and Chemical Fertilizers on Snails of the Long Island Sound

Student Name(s): A. Ziobron

Abstract:

Many people use fertilizers, whether they may be chemical or organic, while they farm or garden. However, what many people may not be aware of is that these fertilizers can be soaked up by the ground, and can make their way into the ground water run-off. This fertilizer run-off, then, can end in up oceans, such as the Long Island Sound, and other major bodies of water. Here, the run-off even affects the wildlife among these bodies of water. The purpose of this experiment was designed to test the effects of fertilizer run-offs from chemical and organic fertilizers on snails from the Long Island Sound. To test this, thirty-six snails were collected at the Long Island Sound, and they were placed evenly among three containers labeled "control," "organic," and "chemical." Next, run-offs were created using pieces of sod, water, and fertilizers. These run-offs were then tested on the snails in each of the corresponding habitats and observations of their behavior and activity was recorded. This experiment shows how damaging fertilizers can be, even in small amounts found in run-off. On a larger scale, fertilizer run-off may be harming much of the marine life, besides snails, that are essential to the Long Island Sound ecosystem. Hopefully, the results from this experiment will bring an awareness that fertilizer run-off can become a serious environmental concern.

**Technical Disciplines Selected by the Student
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EV AS EM

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CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3014

Title: Antimicrobial Properties of Various Plant Leaves on Escherichia Coli K-12

Student Name(s): D. Giedrimas

Abstract:

Antibiotics used for treatment of various diseases have become ineffective over time, as bacterial resistance to them develops. Therefore the discovery of natural compounds which may also demonstrate antimicrobial properties are necessary for the production of new medicines and disinfectants. In my experiment, orchids, jasmine, white lilies, and roses were investigated for such properties. The production of plant extracts involved drying, mixing with solvent, filtering, and concentrating. The effectiveness of three different solvents was investigated: aqueous (water), ethanol, and acetone. Each is capable of extracting different phytochemicals from the plants, which are the compounds responsible for the properties of these plants in inhibiting bacterial growth. Escherichia Coli was the model organism, and plates of top agar were seeded with these bacteria to produce homogenous "lawns." Before incubation, paper disks impregnated with different concentrations (10, 20, and 80 $\mu\text{g}/\text{mL}$ of concentrated extract diluted with water), were placed on these dishes, and their respective diameters of the Zones of Inhibition which they caused were measured. All plants indicated ability in inhibiting bacterial growth. Of strong performance were orchids and lilies, two species which have already indicated such properties in previous experiments. The production of growth curves will have indication of these results as well, for concentrations greater than the Minimum Inhibitory Concentration for each extract/plant combination. The process of looking at both Inhibitory Zones and Bacterial Growth curves provides insight into both strength of the compounds that could potentially be used in antibiotics and also the speed with which this is accomplished.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

MI CB PS

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CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3015

Title: The Effects of Sulfuric acid on Petroselinum crispum and Soil pH in Varying Temperatures

Student Name(s): H. Villhauer

Abstract:

The purpose of this research is to discover how Petroselinum crispum, or Italian parsley, is affected by sulfuric acid depending on the temperature of the environment. Sulfuric acid is commonly used and produced as an industrial chemical in the United States, for example, in the manufacturing of fertilizers (“Poison...”). Sulfuric acid is also a main component of acid rain, which is known to have detrimental effects on plants and their development. Furthermore, by 2100, there could be an 11°F rise in the average temperature of the planet (“Future...”). This experiment would test to see if the temperature increase due to global climate change would amplify the detrimental effects of sulfuric acid on soil and plants. To do this, the visible damage to the plants and height of the plants at 68°F and 78°F (being watered with 4.0 pH acid rain) will be measured. Throughout the experiment the pH of the soil will also be tested in order to see if the temperature affects how sulfuric acid moves through the soil. I have observed so far that the soil pH does in fact lower at a faster pace in the heated soil subject to acid rain compared to the unheated soil. However, I must collect more data to determine whether or not the increased temperature affects the acid rain’s effect on parsley growth. With this information, conclusions can be made about how critical reducing the levels of sulfuric acid is today in order to protect our crops.

**Technical Disciplines Selected by the Student
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CSEF Official Abstract and Certification

Fair Category Proj. Num

Title: Clinical application of 3D printing technology in cancer radiation therapy: A novel method to improve dose conformity with patient specific treatment aid device

Student Name(s): D. Chen

Abstract:

In clinical radiation therapy for cancer, a patient-specific treatment aid device known as a bolus is usually placed on a patient's skin to ensure sufficient radiation dosage reaches the tumor cells. However, these bolus devices do not conform perfectly to the irregular surface of a patient's skin. The resulting air gap between the bolus and the skin can cause a considerable under- or over-dose to both tumor and normal tissues, increasing the probability of cancer recurrence or normal tissue toxicity. The goal of this project was to investigate the feasibility of using 3D printing technology to create a patient-specific bolus highly fitted to the skin, which can potentially improve radiation dose conformity for better cancer control and reduced side effects. The method using 3D printing was developed and tested using a human head phantom. A customized bolus highly fitted to the nose was designed and created with a 3D printer. After multiple comparisons with both a commercial bolus and an ideal computer-simulated bolus, a printing method with the best conformity was eventually found. The 3D printed bolus was found to conform very well to the skin surface, which was essentially indiscernible to the ideal computer-simulated bolus. Compared to the commercial bolus, the 3D printed bolus significantly improved radiation dose conformity and uniformity. The 3D printing method developed in this project can be readily implemented in clinical practice of radiation therapy with the potential benefits of improved cancer control and reduced side effects.

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CSEF Official Abstract and Certification

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LS

Proj.
Num

3018

Title: Exploring Strategies for Improved Calcium and Phosphate Compatibilities in Parenteral Nutrition

Student Name(s): M. Geradi

Abstract:

Parenteral nutrition is provided in hospitals, under certain medical conditions, when oral feeding is not possible. Providing sufficient calcium and phosphate for neonates (infants) in total parenteral nutrition is important. However, calcium and phosphate at higher levels is incompatible due to risk of precipitation in the parenteral solution, which is fatal. This project aims to maximize compatibility of calcium and phosphate in parenteral nutrition. Towards this goal, ranging concentrations of calcium and phosphate solutions were tested for precipitation. Stability of the compounded solutions was determined by visual inspection with the aid of white light for crystal or precipitate formation. Observations were done to a maximum of 24 hours after the solutions were compounded at room temperature (23o-25o C). Calcium chloride and calcium gluconate were compared for their compatibility with potassium phosphate under identical concentrations. The same compounding concentrations were studied with varying pH ranging 5-9. Incompatibility points were mapped and solubility curves were obtained. Precipitation at body temperature was explored, by incubating ambiguous and highest passing combinations at 37o C for 30 minutes. The effect of aspartate, glutamate and vitamin C were also examined for improvement in compatibility, in both sources of calcium and pH (ranging 6-8). I found that with decreasing pH, there is higher compatibility and with increasing temperature, there is more precipitation. Aspartate and glutamate were able to improve compatibility and successfully rescue failure/precipitation points. Addition of higher concentrations of aspartate and glutamate are novel and promising approaches to improving parenteral nutrition compatibility .

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3019

Title: Pollution and Its Detrimental Effects on Shrimp

Student Name(s): E. McCarthy

Abstract:

For many years, marine ecosystems have been challenged by pollutants such as salinity, acidity, and temperature. However, the affects of these pollutants are not always immediately noticeable. This is because they tend to effect the animals lower on the food chain first, and then work their way up. In this experiment, I placed ghost shrimp in four separate tanks to simulate environments impacted by the three aforementioned pollutants. To assess the impact, I had a person blind to the condition in each tank watch the shrimp and grade their feeding on a scale of 1-7. One meant no activity at all, and seven meant all the food was eaten and there was competition. The results indicated that decreasing pH from 7 to 6.4, to simulate acid rain in a body of water, affected the shrimp in the most drastic way. The average eating behavior score for acidity was 1.6. Next in severity was an increase in temperature representative of the increase one might associate with a power plant. This increase of temperature from 33°C to 37°C produced an average eating behavior score of 2.6. The least impactful was salinity. I raised the salinity from 0 ppt to 6 ppt to simulate salt runoff. The average eating behavior score for that was 5.8. All conditions were compared to a control tank that was not subject to pollution. The average eating score in that tank was 5.2. This pattern of results is consistent with my hypothesis.

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- Yes No

Title: Effective Optimization of Biogas Production through Alpha-Amylase Utilization

Student Name(s): B. Anderson

Abstract:

On average, nearly one-third of prepared food is discarded. This waste-food can be converted into useful energy (Biogas) through anaerobic digestion. The main hindrance towards adoption of this renewable energy resource, however, continues to be the duration of the digestion process. Since nearly one-third of waste-food is composed of polysaccharides, catalysis and optimization of the hydrolysis of long-chain carbohydrates would be highly desirable to increase the viability of this renewable energy resource. This research examines the effectiveness of a low-cost enzyme, alpha-amylase (AA), in expediting the anaerobic digestion of carbohydrates and subsequent Biogas production from waste-food. Five separate batches of homogenized potatoes (~25g) were combined with 10ml of digested thickener underflow sludge (waste-water inoculum) and 30ml di-H₂O, in a custom closed-loop 100-ml digestion chamber, maintained at 35oC. Alpha-amylase catalyst was separately added to each of the five batch reactions at 0, 4, 8, 12, and 16% (m/m) relative to potato mass. For each reactor, the Biogas content was determined daily via Gas Chromatography, with Flame Ionization Detection, and reported as % methane. For the (0% AA) un-catalyzed reaction, nearly 17.7% methane was produced in 8 days following inoculation. Methane production increased slightly, and was consistent for all AA-catalyzed reactions at ~18.1%. The time required for peak biogas production, however, decreased significantly with an increase in %AA content, ranging from 6 days post-inoculum for 4% AA, to only 2 days with 12% or greater AA catalyst. For the most efficient reaction (12% AA), as much as 3.6ml CH₄-gram foodstock-1 was produced.

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3022

Title: Determining the Most Effective Tick Repellent in Replace of DEET Based Products

Student Name(s): E. Criscuolo

Abstract:

Ticks containing hazardous bacterium are extremely prevalent in the North East; the recommended repellents thus far are products containing DEET. However, DEET based products pose health risks the more they're used. In an attempt to replace DEET, Picaridin, Nikethamide, and PMD, a compound used to imitate Oil of Lemon Eucalyptus, will be tested in this study. Due to its chemical structure and previous literature on the topic, it is hypothesized that Picaridin will be the most effective in repelling ticks. To investigate the question, Ixodes scapularis nymphs were placed individually on a petri dish with each chemical applied to two opposite quadrants. The ticks' behavior was examined, first without a chemical to take note of their random movement, then with each chemical applied in turn. DEET acted as the control, each chemical was the independent variable, and the tick's response to each agent was the dependent variable. It was determined that all of the chemicals were effective in repelling ticks to a certain extent, and induced varying behaviors. As expected, all of the ticks exposed to DEET and Picaridin were repelled, confirming the original predictions that Picaridin would be the most effective. With a similar response, the PMD reflected an efficacy of 83%. When exposed to Nikethamide, the nymphs became more sluggish, demonstrated symptoms of confusion, and curled up their legs; its presence undoubtedly resulted in intriguing changes in the tick's behavior which could be further examined in continued research concerning the chemical effect on ticks' cognitive functioning.

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CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3024

Title: Thin liquid films in improved oil recovery from low-salinity brine

Student Name(s): H. Catalbasoglu

Abstract:

Despite society's best efforts towards developing renewable energy sources, more than 70% of the global energy consumption in the coming decades is expected to come from fossil fuels. To meet this demand, the petroleum research community has continually strived to develop methods for improved oil recovery. One such method that has gained attention in the past two decades is low-salinity waterflooding. It is generally believed that low-salinity brine alters the wettability of oil reservoir rocks toward a wetting state that is optimal for recovery. The mechanism(s) by which the wettability alteration occurs is currently an unsettled issue. For the experiment, three different types of substrates that make up oil reservoir walls, two different types of oils, and various concentrations of brine are used. The substrates are submerged into different concentrations of brine with a droplet of oil under underneath them. Then, the contact angle between the substrate and the oil is measured. As the contact angle increases, the oil bubble's curvature also increases. Likewise, the rounder the oil bubble is, the less it sticks to the substrates, which, in turn, makes the oil easier to extract. In conclusion, all contact angle measurements show a systematic decrease at low salinity water and then an increase at higher concentrations. These results will help oil companies extract oil more efficiently from dried up reservoirs. Future measurements will include more data when the type of salt, pH, and temperatures are changed. The film-based mechanisms provide a good, qualitative picture of this very complicated problem.

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EV BI CB

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CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3025

Title: Suicide Reportings in New England Newspapers

Student Name(s): M. Tiroff

Abstract:

When someone commits suicide, the story is often covered in the newspaper that is associated with the area where the suicide takes place. What is said and how the story is presented in the newspaper reports has been proven to have a large impact on the rate of suicide. This being known has led to the creation of media guidelines that keep reporters who are covering such sensitive topics from assisting the increase in suicide rates. The purpose of this study is to assess how closely the guidelines put in place for media reporters are being followed. The Hartford Curreant, The New York Times and The Boston Globe were all analyzed daily for their reports on suicide. Each article is reviewed using a coding sheet created based on the guidelines presented by the national office for suicide prevention. Each coding sheet shows which aspects of a suicide report should be included and which should be left out so it is easy to see which paper follows the guidelines most accurately. From the newspapers, I've found that the more reputable papers (Boston Globe and New York Times) follow the media guidelines most accurately. This finding might be explained by the fact that both newspapers have more of a reputation to uphold with a greater population of people than the local newspaper of The Hartford Curreant. However, all three newspapers could work on improving their positive effect on suicide in society today and how the country perceives suicide as a whole.

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BE ME

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CSEF Official Abstract and Certification

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LS

Proj.
Num

3026

Title: Does seed spacing affect plant height?

Student Name(s): J. Repass

Abstract:

The experiment that was performed tested: Will the density/seed spacing of basil plants affect the plant's growth in height? I had hypothesized that if I tested the effect of the plant population density on the height of the plant, then the plants will grow the tallest in a higher populated environment (2cm apart) because the plants should experience mutualism, where 2 species live together and benefit from interaction, therefore growing taller. After measuring my plants for 4 weeks, I concluded that the plants planted 2cm apart had a final average height of 4.5cm; the plants planted 4cm apart had a final average height of 5.1cm, and the plants planted 6cm apart had a final average of 4.4cm. This data shows that the group that grew the tallest were the plants planted 4cm apart, therefore not supporting my hypothesis. This experiment can be useful to future gardeners that need to know the most ideal seed spacing for their basil. They could use this data to get the perfect spacing, therefore growing their plants the tallest and the fastest.

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PS EV

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CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3027

Title: MiRNA Target Sites in 3' UTR of West Nile Virus

Student Name(s): A. Agarwal

Abstract:

West Nile Virus (WNV) is an arthropod-borne flavivirus. WNV is the most common cause of epidemic viral meningoencephalitis in the United States. Approximately 1% of individuals will develop a condition known as West Nile Neuroinvasive Disease (WNND), which can cause extreme illness and death. In 2012, the CDC reported the highest number of human WNV cases in the U.S. since 2003. Of the 5,674 cases, 51% were reported to be neuroinvasive. Currently, there is no treatment or vaccine. The genome of WNV is single-stranded RNA. There is no explanation for WNV neuroinvasion. WNV replicates in other areas before spreading to the brain. It is unknown if microRNAs (miRNA) play a role in the pathogenesis of WNV. miRNAs are 21-23 nucleotide host-encoded RNAs that are specific and bind to the untranslated regions (UTRs) of host messenger RNAs (mRNAs). Sequence complementarity of miRNAs leads to a block in translation, degradation, or both. Four miRNA prediction algorithms (PITA, miRANDA, Target Scan, and RNA Hybrid) identified several binding sites for miRNAs in the 3' UTR. The result was calculated (minimum free energy). Through further analysis, 21 miRNAs were identified. After considering tissue specificity, four miRNAs were selected. hsa-miR-10a-5p is predicted to suppress replication. hsa-miR-29a, hsa-miR-29b, and hsa-miR-29c are predicted to enhance replication. In this project, the 3' UTR of WNV was successfully analyzed. Four miRNAs were found to have potent minimum free energies, tissue specificity and effective scores. The discovery of miRNA which bind to a flavivirus could greatly improve treatment of WNV.

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BI ME ME

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Proj.
Num

3028

Title: protection from acid rain

Student Name(s): C. Davis

Abstract:

The purpose of this project was to test different coatings on pieces of limestone to prevent them from being corroded by vinegar. This simulated acid rain corroding statues and monuments around the world. It was hypothesized that the polyurethane would protect the limestone the best. For the experiment, pieces of limestone were coated with either dual component epoxy, polyurethane, shellac, or left untouched as a control. They were weighed and submerged in vinegar. Five days later, they were taken out, dried, and re-weighed. Then, the final weight was subtracted from the initial weight. Observing the pieces of limestone after they had been submerged in vinegar for five days, revealed that they polyurethane left a coating that peeled off upon removal from the vinegar. When the vinegar was first being poured on the limestone, the ones without a coating reacted immediately and started to bubble up. By measuring each stone before and after and subtracting the final weight from the initial weight, it was concluded that the dual- component- epoxy worked the best in protecting the limestone as evidenced by a significantly small decrease in weight from the beginning of the experiment to the weight at the end of the experiment. On average, the dual-component- epoxy lost only 3.78 grams where the shellac lost an average of 9.45 grams.

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EV EN

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CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3029

Title: Can Metabolism Rates be used to differentiate between genetically distinct cells?

Student Name(s): K. Mackey

Abstract:

Recent studies have shown that dogs are able to differentiate cancer cells from normal cells. They are able to smell a special metabolites made by cancer cells. Since cancer cells and normal cells have genomic differences as well, we decided to test if the differences in metabolism could be ascribed to differences at the genetic level. We decided to test the idea if these differences in metabolism between genetically distinct cells could be simulated with genetically diverse bacterial strains. One such important metabolic process in cells is Cell respiration, a process that breaks down glucose into useable energy units and produces CO₂ as a waste product. To test if metabolism rates varied in genetically different cells, rates of metabolism with addition to 5% glucose concentration, four strains of bacteria, B. Cereus, E-coli, and S. Marcescens, were chosen. The CO₂ levels were measured using a Vernier CO₂ probe. The data indicated that genetically distinct bacteria had different levels of CO₂ (indicator of rates of metabolism). This finding can be connected to cancer cells as well to further understanding of the mechanism of cancer cell metabolism and thus how they spread. A better understanding of cancer cells and their processes could help scientists to come up with ways to block/inhibit their growth.

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CSEF Official Abstract and Certification

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Proj.
Num

3030

Title: The Effets of GMO vs Non-GMO Bananas on the Life Span of Fruit Flies

Student Name(s): A. Siranaula

Abstract:

GMOs, or genetically modified organisms, are live organisms that undergo genetic engineering in a lab, which artificially changes their original genetic makeup. Some consumers became skeptical of this scientific discovery because it is not natural. More so, the toxic herbicides used on these genetically modified foods are what disturbs people. Monsanto, the giant in the market for genetically modified crops, does its best to prevent the research and investigation of its crops. The company is also strictly against the labeling of GMO products, adding to consumer's doubts. Fruit flies will be used in this experiment because they have a lifespan of about 40 days. Furthermore, the species (*Drosophila melanogaster*) became a popular live organism to test on after the rediscovery of Mendel's rule in 1900, because of their practical use in experiments: they are small, reproduce quickly, and have a short lifespan. The purpose of this experiment was to find the effects of a GMO and non-GMO diet on the longevity of fruit flies. To do this, 50 fruit flies were divided into 2 separate jars. Group A was fed from a GMO banana for 5 weeks; Group B was fed from a non-GMO banana. The fruit flies that were alive by the end of each week were recorded. The results show that Group A was affected by their GMO diet, versus Group B's non-GMO diet. A similar project was previously done by Ria Chhabra. Her results also showed that the group fed with GMO bananas had a shorter lifespan.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME BI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3031

Title: Chocolate's Theobromine, and not Caffeine, Significantly Reduces Sleep in Drosophila

Student Name(s): R. Radulovacki

Abstract:

Chocolate and caffeine are well-known to affect the quality of sleep. Chocolate, however, contains only minimal traces of caffeine but larger amounts of theobromine, a related alkaloid stimulant, whose effect on sleep has not been documented. Studying the effect of theobromine on the sleep/wake cycle of *Drosophila melanogaster*, whose circadian cycles are the same as humans, may allow us to better understand its impact on human sleep. This research investigates whether theobromine increases wakefulness and reduces sleep for *D. melanogaster*, relative to caffeine, a known stimulant. Theobromine and caffeine were separately administered to the Sucrose/Agar food supply of white-eyed adult *D. melanogaster* at relative concentrations of 8:1 (respectively) typically found in chocolate. For each alkaloid added, the Circadian sleep pattern (24-hour fly activity) for single test subjects was monitored for five days using a Trikinetics Sleep Chamber and *Drosophila* Activity Monitor (DAM). Sleep and wake times were collected, and later processed using pySolo. Analysis of circadian sleep cycle data in *D. melanogaster*, for relative amounts of theobromine to caffeine (8:1 ratio) found in chocolate, suggests that theobromine disrupts sleep, while caffeine plays only a limited role. Theobromine-fed flies register 30% less total sleep at night versus the control group, while for caffeine-fed flies, only a 4% reduction in sleep is observed. Moreover, theobromine-fed flies demonstrate a 90% increase in activity during the daytime vs. both caffeine-fed and control flies. These results suggest that theobromine, and not caffeine, may be the dominant chemical in chocolate that affects the human sleep/wake cycle.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME CH BI

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3032

Title: Enhancing the Collagen Yield from Aurelia aurita through Bio Encapsulated Highly Saturated Fatty Acid Feed

Student Name(s): M. Prizio

Abstract:

Collagen is a high demand product due to its promising applications in the medical field and the billion dollar anti-aging market. Commonly used Bovine collagen faces the negative aspects of high production cost and social concerns about its propensity to carry mammalian diseases. Collagen derived from the jellyfish Aurelia aurita (moon jellyfish) has the potential to substitute bovine collagen. Smacks of A. aurita can be raised to a mature state in kreisel tanks over three to six months. They reproduce both sexually and asexually in large groups which provides a constant sustainable supply of A. aurita. For this experiment three groups of A. aurita were farmed and fed varying diets. Group one received brine shrimp, group two nutrient enriched brine shrimp, and group three a nutrient rich aquarium diet. The brine shrimp enhanced with vitamins and oils were expected to increase the collagen production for the most efficient yield. The two groups were harvested and run through a pepsin soluble collagen procedure to collect the collagen. The yields of the groups were similar with group one producing .0076grams of collagen per gram of dried A. aurita and group three producing .0074grams of collagen per gram of dried A. aurita. The results show that the diet had minimal effect on the yield so the unenhanced brine shrimp can be used as an inexpensive feed when farming A. aurita. A. aurita collagen can be used to treat burn victims and create skin grafts, but first its purity has to be further examined.

**Technical Disciplines Selected by the Student
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AS ME EV

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CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3033

Title: Is it Possible to Graft the Scion of a Non-Leguminous Plant (tomato) to the Root Stock of a Leguminous Plant (soybeans)?

Student Name(s): K. Onorato

Abstract:

This paper investigated the possibility of grafting a non-leguminous plant onto a leguminous plant. The goal of this experiment was to promote interactions between non-leguminous plants and leguminous plants. Leguminous plants have a symbiotic relationship with Rhizobia bacteria. Therefore some leguminous plants require smaller amounts of fertilizers than non-leguminous plants because their interaction with the Rhizobia bacteria produces enough nitrogen for the plant. However, most farmers need to apply various forms of fertilizers for the majority of other plants which is both costly and detrimental to the environment. In order to solve this problem a tomato plant scion was grafted onto the rootstock of a soybean plant using the Japanese grafting method. Two other types of grafts were also performed which act as a control for the current grafting techniques: tomato to tomato and a soybean to soybean. After several trials were conducted, the data was statistically analyzed via bootstrapping. The results showed that there was no statistical difference in terms of survival of the grafted soybean-soybeans plants and the grafted tomato-soybean plants. Therefore, the grafted plants using this technique are just as likely to survive as the grafted plants using current grafting methods. This will help farmers in two ways: improving crop productivity (by eliminating the need for crop rotation) and decreasing costs of production (due to decreased use of fertilizers). This will protect the environment against the harmful effects of run off. Overall, this technique will help create natural food, at a lower cost, to more people.

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PS EV

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3034

Title: The Effect of alcoholic, nicotinized, caffeinated, and adrenergic solutions on arrhythmias

Student Name(s): V. Sarmiento

Abstract:

It is hypothesized when daphnia magna are exposed to a nicotinized solution, they will attain a greater number of heart beats per minute. This experiment was conducted to conclude which stimulant would cause the highest tachycardia during arrhythmia. Four different solutions were used to test the purpose of the experiment; ethanol, nicotine, caffeine (in the form of coke), and adrenaline chloride. Substituting humans, daphnia magna, a group of freshwater crustaceans were exposed to the various solutions under a microscope. The number of heart beats of each daphnia was recorded and averaged out to find the beats under the controlled substance. Then for each stimulant solution, two daphnia's heart pulses were recorded to derive more accurate data. The number of beats under each solution was averaged out and the results were taken into observation. After testing all four solutions, the hypothesis proposed was disapproved. The stimulant solution causing the most tachycardia and prone to give off cardiovascular diseases was caffeine. Nicotine ended up coming in second place and following it in third was ethanol. The lowest palpations were produced by adrenaline chloride. The change each solution had on the daphnia magnas' heart was calculated to further expound on the resulting outcome. The daphnia exposed to nicotine had a 104% change, while the daphnia influenced under caffeine experienced a 119% change from the controlled solution to the stimulant. Through this experiment it was made known that caffeinated solutions are more perilous to a human's heart than any of the other three.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BI ME AS

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CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3035

Title: Global Climate Change Affects the Ecosystem by Elevating Carbon Emissions, Nitrogen Emissions, and Temperature, which Increases Allergies

Student Name(s): A. Gontzes

Abstract:

Naturally, greenhouse gases trap heat in the atmosphere. In 1990, greenhouse gas emissions tallied 30,000+ million metric tons, then in 2005, greenhouse gas increased 35,500+ million metric tons. With rising emissions and temperatures, chain reactions create a setting in which pollen in the air can increase symptoms of asthma and allergies of humans. I predicted, as time increases, the number of allergy reports will increase due to the increase of carbon and nitrogen emissions in the atmosphere. Plants will undergo more photosynthesis, thus there will be more plants to create a longer pollen season. In addition, if greenhouse gases increase over time, global temperature will increase, then faster plant growth and more plants will create a longer pollen season. I completed T-tests with the percentage of Americans with asthma and rate of U.S. physician visits with asthma as first-listed diagnosis vs. U.S. carbon emissions, U.S. nitrogen emissions, and global temperature anomaly. All of the null hypothesis were rejected because the T-test P-values were less than .05. Therefore, the associations exist. Those with allergies and environmentalists can unite as a community to create legislation promoting clean energy (limiting carbon dioxide-producing machinery) or promoting farms without the use of artificially enriched soil (using the nitrogen that flows from naturally-nitrated water). There will be less greenhouse gases that are introduced to the environment, therefore not disrupting the cycles and temperature balance. The pollen season would become shorter and weaker, thus more bearable for those with allergies.

**Technical Disciplines Selected by the Student
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EV ME PS

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3036

Title: Does the Color of a Room Effect Learning Comprehension?

Student Name(s): C. Beverly

Abstract:

The purpose of this project was to determine how the color of a room effects learning comprehension. Ten participants took two tests (one test per room color), and were placed in a small room one at a time and listened to a pre-recorded lesson on two similar, obscure topics, which were brief lessons on the history of the U.S. Lifesaving Service and the U.S. Coast Guard. At the end of each lesson, the participants took a ten question true or false quiz to measure their comprehension. The colors used consisted of green, the control color, and yellow, the experimental color. Green, a cool color is known to stimulate learning. While the room was green, participants listened to the history of the U.S. Lifesaving Service. While the room was yellow, participants listened to the history of the U.S. Coast Guard. I hypothesized that the cooler color, green would yield higher test scores, which was proven correct. According to my data, 80% of scores were higher when the participants were tested in the control (green) room. 10% of scores decreased from green to yellow, and 10% of scores remained the same on both tests. I also found in the data that adult participants scored an average of 80% out of the possible 100% on the test in the green room, whereas children scored an average of 75% out of 100% in the green room. In the yellow room, however children scored 0.83% higher than adults.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BE

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3037

Title: The Effect of Iron Levels on the Growth of Macro and Micro Algae

Student Name(s): L. Stover

Abstract:

The objective of this experiment was to determine the relationship between iron levels in water and the growth of macro and micro algae within marine aquariums. Based on previous research, the hypothesis was that increased iron levels would stimulate growth in both micro and macro algae. To test this three tanks were set up to control the salinity and the temperature. In one tank, no iron supplements were added to the water; in the second tank small iron supplements of 400 ul were added twice a week; while in the last tank 800 ul of iron was supplemented twice a week. The independent variable in this experiment was the amount of iron being supplemented in each aquarium tank. The dependent variable was the amount of growth observed in the algae. After performing the experiment and observing the data collected, it was concluded that while some algae grew more in the tank that had been supplemented with the most iron, while other algae grew much better in the tank with no supplemented iron, while still others did better in the tank containing more minute levels iron. In conclusion, the presence of iron either had a positive or negative effect on each species of algae.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV PS BI

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

Title: Inhibiting Triple-Negative Breast Cancer Tumor Growth by Targetting Pro-Inflammatory Cytokine Expression

Student Name(s): M. Zhou

Abstract:

Triple-negative breast cancer (TNBC) is the most aggressive form of breast cancer, as there currently is no targeted therapy to treat it. However, steps to create this sort of treatment have been taken by using compounds to inhibit the expression of pro-inflammatory cytokines, specifically IL-6 and IL-8, produced by TNBC cells. These cytokines give breast cancer cells their metastatic characteristic. Compounds such as CM873 and CM905 are designed to inhibit proteins BET and CBP that function to activate pro-inflammatory cytokine expression, and they reduce the expression of both IL-6 and IL-8, which, in turn, prevent cancer cells from spreading. To test the effectiveness of CM873 and CM905, ELISA trials were performed for various TNBC cell supernatants (obtained from cell lines SUM149, SUM1315, MDA-MB-231, SUM159, and MDA-MB-157) that were treated with these compounds at different concentrations from 0 μ M to 0.5 μ M. Readings from a multi-label reader showed that these compounds were effective in inhibiting the expression of IL-6 and IL-8, and cell lines MDA-MB-157 and SUM1315 were particularly sensitive. These results demonstrate that these two compounds can potentially be used in a targeted therapy for TNBC. However, future plans including tests to evaluate possible side effects and how the compounds work in the human body are needed before a new therapy is developed to fight against TNBC.

Technical Disciplines Selected by the Student
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ME CB

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3039

Title: The Effects of Zeolite on the Proliferation Rate of Cancer Cells

Student Name(s): J. Klepinger

Abstract:

Cancer remains one of the most difficult human health issues in the world. My curiosity began with this research-based project and wanting to test my own reagent in cell culture on mouse mammary carcinoma on vitro. The problem being examined is the effect of zeolite on the proliferation rate of my cancer cells. Natural zeolites are crystalline aluminosilicates with unique absorption, cation-exchange, and catalytic properties that have multiple uses in industry and agriculture. It has a unique formula that has been proven to absorb the toxins, free radicals, and metals from your body, as well as boost the immune system. It's composed of silica (SiO₂) and alumina (Al₂O₃), in various proportions plus metallic oxides. The mineral Zeolite has a honeycomb shape that allows it to trap the toxins and heavy metals as it passes through the body, boosting the immune system. Media changes occurred often in order for the cells to remain in viable living conditions along with keeping the cells in an incubator at a specific temperature, humidity and CO₂% level. The concentrations of zeolite I chose to administer to my plates were: 5mg/mL, 10mg/mL and 20mg/mL. After applying the concentrations to the plates, there was a dramatic change of the clustered cancer cells and several cells appeared to be performing apoptosis. Zeolite had similar reactions on the normal cell line used with the concentrations I used. I plan to continue my research with even smaller concentrations, hoping to learn more about the inhibition of proliferation until Science Fair.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CB ME MI

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3040

Title: Utilizing Piscivorous Birds as Low-Impact Biological Indicators of Heavy Metal Contamination in Long Island Sound

Student Name(s): S. Kay

Abstract:

Currently, metal concentrations are determined via sacrificing fish, which is a highly invasive technique. The Phalacrocorax auritus, Double Crested Cormorant, is an excellent candidate for primary biological indication of heavy metal contamination. Due to the territorial feeding behavior of the Double Crested Cormorant, they tend to fish only in areas that are close to their nesting sites. Fecal matter, pellets, and feathers were examined to observe the pathway of sequestration the heavy metals would take in the birds. The samples were non-invasively collected from two geographically specific locations in Bridgeport, CT, in order to determine if the concentrations would differ between the two locations. They were prepared in the Microwave Digester and then run on the Atomic Absorption Spectrophotometer in order to examine the Zinc, Chromium, and Lead concentrations found in the bird matter. The results showed varying concentrations of Zinc and Chromium detected from the different locations; the mean value for the feathers collected from the two locations varied by about 360.37mg/kg, though the concentrations of Lead were below the detector limits in all samples. The cormorant feathers, which were separated from the other piscivorous bird feathers, showed higher concentrations of Chromium and Zinc, which supports the process of using cormorants for primary biological indication. If initial concentrations of metal are observed using this technique, further investigation in particular geographic regions can be assessed only on a need base.

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BI EM AS

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3041

Title: Remediating Rivalry?

Student Name(s): M. Switz

Abstract:

The purpose of this experiment was to determine the most effective bio-remediation method for diesel fuel in a marine environment. The procedure tested the amount of diesel fuel decomposed by a naturally occurring bacteria, *Pseudomonas putida* and a genetically engineered bacteria, *Corynebacterium pseudodiphtheriticum*. The species of bacteria were tested in isolation and in conjunction with each other and at two temperatures because *Pseudomonas putida* and *Corynebacterium pseudodiphtheriticum* have different ideal growth temperatures 20° and 37° Celsius respectively. The six scenarios were also tested to determine if fertilizer increases the rate of bio-remediation. The results showed that bio-augmentation (the combination of *Pseudomonas putida* and *Corynebacterium pseudodiphtheriticum*) had the most decomposition out of all the arrangements in both temperatures. Although, there was significantly more decomposition at 37°C, the optimum temperature for *Corynebacterium pseudodiphtheriticum*. Additionally, there was not any decomposition from the naturally occurring *Pseudomonas putida* or methods involving fertilizer. Thus, the conclusion stated that there was a mutualistic relationship between the naturally occurring bacteria and genetically engineered bacteria. Moreover, it is suspected that the lack of decomposition in conditions with fertilizer was caused because the nutrients were added according to ratios, and thus the concentrations were too high. Therefore, indicating that in the future this experiment should be based on concentrations and not ratios, consequently with the possibility with a different outcome. However, this would not change the conclusion that bio-remediation is best preformed at the ideal temperature of the genetically engineered bacteria and in symbiosis with the naturally occurring bacteria.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

MI EV AT

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- Yes No

CSEF Official Abstract and Certification

Fair Category

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Proj.
Num

3042

Title: Investigation of osteoclast activity as an explanation for lack of bone maturation in tissue implantation

Student Name(s): B. Lerner

Abstract:

Prior research showed that when mesenchymal stem cells differentiated from human iPS cells were implanted into an NSG mouse with calvarial defects, bone was formed, yet the bone was unable to mature. It was hypothesized that the lack of at least one factor related to osteoclast formation caused the lack of bone maturation. This research used cDNA samples from human bone tissue that was formed within the calvarial defect and from the bone of a control mouse. PCR was conducted targeting factors related to osteoclast formation, specifically RANKL, RANK, and OPG. Species-specific primers were used due to the presence of mouse cells within the human tissue. RANK is a receptor on osteoclast progenitors that is active in the signal transduction pathway for the formation of osteoclasts. RANKL is the ligand of RANK. OPG is a decoy receptor for RANKL. This research showed that the OPG and RANKL were expressed in both the human and the mouse tissue. In contrast, RANK was only expressed in the mouse tissue. The absence of RANK expression in the human tissue indicates that there was likely no potential for the formation of human osteoclasts. No osteoclasts can be formed in the absence of RANK, and thus no bone resorption can occur. If human osteoblasts were implanted into a human with a bone defect, the formed bone would perhaps be able to mature due to the presence of human RANK. This research gives hope for future testing; it suggests that same-species implantations may be more successful.

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BI CB

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LS

Proj.
Num

3043

Title: The Spread Zebra Mussels in Lake Lillinonah in 2013 and 2014

Student Name(s): N. Racz

Abstract:

Zebra mussels are an aquatic invasive species that have been found in thousands of lakes in the United States. Zebra mussels can cause harm to lakes because they affect the ecosystem's food chain by changing the nutrients in the lakes making it more difficult for native species. Zebra mussels are able to attach to the bottom of boats causing them to spread easily from lake to lake. In 2010 the Connecticut Department of Energy and Environmental Protection (CT DEEP) reported that zebra mussels were found in Lake Lillinonah and Lake Zoar. To learn more about activity of zebra mussels, substrates were placed in 12 locations in Lakes Lillinonah and Zoar in 2013. These substrates were ideal for zebra mussels to attach to and they were left in the lakes from early June to late October. When the substrates were removed the zebra mussels were taken off of them, counted, and then measured. This process was repeated in 2014 and the results were compared. The results showed that there were more adult zebra mussels downstream in the lake than upstream in both years. The numbers increased at all sites showing that the zebra mussel population in Lake Lillinonah is getting larger. The zebra mussels are able to reproduce in all areas of the lake making it easier for them to keep colonizing.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AS EM MI

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CSEF Official Abstract and Certification

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LS

Proj.
Num

3044

Title: The Effect of Beta Carotene on the Proliferation of Mouse Mammary Carcinoma

Student Name(s): R. Gokhale

Abstract:

Beta Carotene is a type of carotenoid that can metabolize into retinol, a naturally occurring form of vitamin A in the blood, which in turn regulates the growth, development, and death of cells. The purpose of my experiment was to grow breast cancer cells and test the effects of Beta Carotene on their proliferation through dose responses. The cells were mouse mammary carcinoma, and were grown in Waymouth's media. In addition, noncancerous breast cells were grown as well in a medium called DMEM for the control of the experiment. In total, 4 cell plates of cancer cells were grown and 4 plates of noncancerous cells were grown. Substances such as Penicillin-Streptomycin were added to protect cells from infection as well fetal bovine serum to stimulate growth. Procedures such as media change kept the media viable for cell growth. As a result, the cancerous cells proliferated at a rapid rate. To investigate proliferation, a hemocytometer was used to count the cells. If the proliferation rate remains the same or has only a small change after treatment, then the dose of beta carotene had only a small or no effect at all. Crystalline Beta Carotene was then added (at 50 femtomoles per liter), and the cancer cells proliferated at a slightly slower rate, but not significantly. My results showed that beta carotene has the capacity to decrease proliferation rates, because of its ability to induce apoptosis. The results also indicate cancer fighting properties in carotenoids.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CB ME

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3046

Title: Correlation of Frequency of Cancer Stem Cells to Patient Outcome in Osteosarcoma

Student Name(s): M. Schneider

Abstract:

Stem cells are part of the normal developmental process and form a reserve of dividing cells that are capable of differentiating into more specialized cells as needed. Cancer stem cells (CSCs) are cells within a tumor that have a similar capacity for self-renewal and differentiation as well as resistance to chemotherapy and radiation. Osteosarcoma is the most common primary cancer of bone and the most common sarcoma of childhood. Gibbs et al discovered the existence of osteosarcoma tumor stem cells within the tumors and postulated that these were responsible for the relapse of an osteosarcoma following treatment. Osteosarcomas are composed of a heterogeneous population of tumor stem and non-stem cells and the number of tumor stem cells within the tumor appears to vary. The aim of this study is to determine if the number or density of CSCs in a tumor sample correlates with clinical stage or outcome. To do this, it is necessary to enumerate the number of CSCs within each osteosarcoma. A "genetic signature" of genes that are expressed in the osteosarcoma tumor stem cells can be used to identify these cells. Co-localization of expression of this genetic signature by immunofluorescence analysis will identify the CSCs. Once the number of CSCs within each tumor will be counted, a statistical analyses will be conducted to determine if the correlation between density or frequency of CSCs within a tumor correlate with clinical outcome.

**Technical Disciplines Selected by the Student
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CB ME

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3047

Title: The Effect of Cold Stress on the Frequency of CD8+ T Cells in Aged Mice

Student Name(s): E. McGonagle

Abstract:

Standard housing conditions, such as temperature and age for mice, in cancer research are being called into question due to the impacts in tumor growth and immune responses in mice. In this study the impact of cold stress on both young and old mice was examined. For this experiment, young mice (4-6 weeks) were separated into chambers at room temperature and thermoneutral temperature (30-31 °C), as were old mice (1-2 years). Mice were acclimated prior to tumor implantation and tumor growth measurement. The tumors were dissected, molded into frozen blocks and sectioned. The slides were then stained via immunohistochemistry and viewed under light microscopy to determine the frequency of CD8 + T cells. The averages of CD8+ T cells per 450 μm for each group were as follows: 9 for young thermoneutral mice, 6.5 for young standard temperature mice, 5.6 for old thermoneutral mice, and 4.4 for old standard temperature mice. Analysis of the frequency of cells suggested that there was a lower overall frequency of CD8+ T cells in the tumor microenvironment in old mice than in young mice, but within both groups the thermoneutral temperature mice had a higher frequency of CD8+ T cells than the standard temperature mice. This observation supports the conclusion of cold stress and old age having a negative effect on the immune system's ability to fight off cancer in mice. These promising findings may elucidate more accurate standard housing conditions to model for clinical cancer research.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME AS CB

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4. Is this project a continuation? Yes No

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- Yes No

Title: Targeted Release of Moringa oleifera Cationic Proteins from Starch-g-poly (sodium acrylate-co-HEMA) Hydrogels for the Remediation of Aqueous Polychlorinated Biphenyls

Student Name(s): V. Kadiyala

Abstract:

Carcinogenic PCB's do not naturally decompose; methods for remediation on the large scale are limited by high cost and inefficiency. This research proposes a novel, cost-effective and sustainable solution for in situ removal by combining two disparate materials: Moringa oleifera (MO) seeds and hydrogels. Cationic proteins contained within MO seeds have traditionally been used as a flocculant to reduce turbidity of drinking water. Starch-g-poly-hydrogels are pH and temperature-sensitive polymeric structures that can be loaded with isolated proteins. The research investigated whether (MO) protein-loaded hydrogels would release the crude protein extract (CPE) through osmosis to trigger a flocculation mechanism in PCB-polluted water, to bind and ultimately remediate the carcinogen through physical removal of the newly-formed solid-state pellet. A CPE was made by mixing 1.23g of ground MO seeds into 200mL di-water, creating a filtered CPE concentration of 0.65mg/ml. Starch hydrogels were synthesized according to a procedure adapted from Sadhegi. For CPE-loading, 0.17g of hydrogel was placed in 4ml of crude extract solution. A280 was monitored to establish that 0.028mg protein was successfully loaded in 30min, for a hydrogel load-capacity of 37.7mgprotein-ghydrogel-1-hr-1. To determine release efficiency, the loaded hydrogel was placed in 4ml di-water. A280 suggests that 0.018mg CPE were released, for 64% release efficiency. Finally, 0.65mg/ml CPE was added to a solution containing 50ppm Aroclor-1254 and 200ppm colloidal silver (for turbidity). GC-FID analysis of the standing aqueous solution indicated that ~88% of the PCB had been bound to the protein- silver particulates, and removed from the water-supply in only one day.

Technical Disciplines Selected by the Student
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EM EN CH

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3. This project was conducted at a Registered Research Institution. Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3050

Title: Poetic Mind

Student Name(s): J. Minano

Abstract:

The brain is in important thing in our life. An organ that is about the size of a small head of a cauliflower. It handles physical movement also give us the right to think, dream and learn. Gives us everything we need, our brain has a speedy and a huge capacity. Each brain has different speed some might be fast other will be slower. Some brain will weight more than other. Memory is the ability to encode, store and retain. Memory is something you could memorize in a speedy way. Our memory is based in our pass experiences and capability to learn from others as well by ourselves. But it's interesting to know that researches have found that elder's people brain are slower because they have stored up more information's. But for younger ones it's easier to memorize visually. Younger ones have a capacity because they haven't memorized or store as much as older people. My experiment was based on ten people, five female and five males. Also along with that two poems of different languages such as Spanish and English. I give the poem to that person for two minutes then I will take the poem away. After that they will tell me how much as words they memorized in those two minutes. I will record them over and over into they memorize the entire poems. Over all based on my data it has been proving that older people have a harder time to memorize than younger ones.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BE ME MA

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3051

Title: Exploring the Tunicate *Ascidia callosa* and its Associated Bacteria for Antimicrobial Compounds and other Marine Natural Products

Student Name(s): A. Molkenhain

Abstract:

Tunicates are marine invertebrates that live on the ocean floor and grow on rocks and hulls of ships. A mutualistic relationship with unicellular marine bacteria helps tunicates survive. These bacteria produce secondary metabolites that tunicates utilize to protect themselves from pathogens. There is potential for these marine bacterial compounds to be used in treatment of human pathogens through antimicrobial pharmaceuticals. An invasive Alaskan tunicate species, *Ascidia callosa*, was sampled and its associated bacteria was isolated, extracted, and observed. The sample was fractionated using methanol, dichloromethane, and ethyl acetate and tested for activity using the LC-MS and proton NMR machines. Sample E, which had 100% ethyl acetate, was found to have the most recorded activity based on data results from the LC-MS and NMR. A series of bioassays were run on the bacterial strain, methicillin-susceptible *Staphylococcus aureus* (MSSA). No antibacterial activity was detected. The control antibiotic, Vancomycin, showed a 12-mm ZOI (zone of inhibition), while the fractions of Sample E showed 0-mm zones. The hypothesis that a useful compound would be discovered was refuted. The sample will be retested on methicillin-resistant *Staphylococcus aureus* (MRSA), a gram-positive bacterium such as *Bacillus subtilis*, and one fungal cell line, *Candida albicans*, in the future.

**Technical Disciplines Selected by the Student
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CH BI

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3052

Title: The Analysis of Clay Flocculation's Effect on the Benthic Zone Used as a Mitigation Technique for Harmful Algal Blooms (HABs)

Student Name(s): J. Ennis

Abstract:

Clay Flocculation has emerged as a promising mitigation technique for the rapid removal of Harmful Algal Blooms' (HABs) presence in the water column. However, little research had been conducted to analyze the resultant effect of the process on the benthic zone. HABs pose a major threat to the environment, beyond the risk of severe hypoxia; a HAB is accompanied by the release of toxins into the water column (examples include Paralytic, Amnesic, and Nuerotoxic Shellfish Poisoning). HABs are becoming more prevalent due to the increase in both the world's water temperature and it's nutrient availability, the two leading stimulants for algal blooms. The first stage of this project involved the growth and sustention of a dinoflagellate bloom and its subjection to clay flocculation. After the algal bloom reached a similar morphology, clay flocculation was performed using Montmorillonite, data indicates it achieved an average 89.2% reduction rate on the total particle count. The second stage then determined the survivability of benthos under the conditions of an environment subjected to clay flocculation. The testing of nitrite, ammonia, dissolved oxygen, and pH (.205 mg/L, 0mg/L, 4.1 mg/L, 7.75) all remained within their individually documented biotic threshold limits within the benthic zone, while phosphate tested far above range (.625 mg/L), although its increased abundance is not dangerous. The process of clay flocculation remains an effective technique for the mitigation of HABs due to its acceptable impact on the benthic zone reflected by the water quality testing that largely remained within established benthic threshold limits.

Technical Disciplines Selected by the Student
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PS EM AT

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3053

Title: The Efficiency of Bivalve Mollusk Filter Feeding in the Long Island Sound

Student Name(s): E. Rodriguez

Abstract:

Envision a time where environmental dilemmas are nonexistent in the Long Island Sound. Fortunately, that time is now. As these environmental dilemmas are on the rise, only a few solutions are being developed and funded. One solution is presented below. The purpose of this inquiry was to determine which Long Island Sound native bivalve mollusk filters out particulate matter found in the water column most efficiently. This can aid the restoration of the Long Island Sound and prevent environmental issues caused by nitrogenase organic substances, such as detritus, causing the recent hypoxia epidemic. In order to conduct this experiment, I collected six bivalve mollusks, varying two of each species, along with eight gallons of sample water collected from the Long Island Sound. I then placed each individual species into one of three identical three gallon fish tanks along with two gallons of sample water per tank. Next, I used an alternate form of measurement, modeled after the secchi disk. I recorded the clarity of the water every fifteen minutes for seventy five minutes. My hypothesis suggested that the selected species of oyster would be most efficient, however the selected species of clam filtered the water most efficiently.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV AS EM

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3054

Title: Preparation and Comparison of EGCG-Loaded PLGA and Cellulose Acetate Microparticles for Osteoarthritis Treatment

Student Name(s): A. Mathur

Abstract:

Osteoarthritis (OA) is a degenerative joint disease that affects an estimated 27 million Americans. Current pharmacologic treatments for OA tend to focus on symptomatic relief and improving joint function rather than addressing the disease's developmental nature. Epigallocatechin gallate (EGCG), a potent antioxidant found in green tea extract, has been identified as a therapeutically effective inhibitor of collagenase enzymes that degrade connective tissue. Specifically, the molecule inhibits interleukin-1 β -induced production of matrix metalloproteinases-1 and -13. This suggests that EGCG is an appropriate biomolecule for arresting the progressive degradation of cartilage tissue and targeting the causal factors of OA. This study presents formulations of porous EGCG-loaded poly (lactic-co-glycolic acid) (PLGA) and cellulose acetate microparticles as candidates for novel OA treatments. The physicochemical and morphological properties of the prepared microparticles were examined via Fourier transform infrared (FT-IR) spectroscopy, scanning electron microscopy (SEM), and in vitro release of EGCG. Baker-Lonsdale and Peppas kinetics parameters were considered as models for the observed burst release of EGCG from the microparticles. The EGCG-loaded microparticles were identified via glycosaminoglycan (GAG) release assays to inhibit cartilage matrix degeneration. Favorable results demonstrate that both PLGA and cellulose acetate microparticle systems have potential as efficient carriers of EGCG for OA treatment.

Technical Disciplines Selected by the Student
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EN ME AT

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): L. Mocchiola

Abstract:

Fresh water is our most precious natural resource. Conservation is key in preserving our fresh water supply. Reusing water in our homes is an important measure to support this global crisis. Grey water is water used in a home, like washing machine, sink, and shower water. Using grey water to irrigate grass is ideal. My project is to observe the effects of grey water on the growth of *Triticum aestivum*, *Festuca rubra molate*, and *Elymus trachycaulus*. It was hypothesized that if a grass species is watered with pure grey water, then the growth of that grass species will be less compared to that of a grass species watered with filtered grey water or tap water. Fifty seeds of each of the three grass species were planted in individual containers and watered with grey water, filtered grey water, or tap water. Three trials of each were performed for a total of 27 containers. I observed the days it took for each to sprout and measured the growth of each of the grasses initially daily and then every 5 days for a total of 60 days. Germination tests were performed with the different waters. A homemade filtration system was used to make filtered grey water. The pH of the different waters was also recorded. The average of the three trials showed that the grasses watered with tap water or filtered grey water grew 19-26% more. The data collected proved my hypothesis to be true, but, overall, all the grasses grew similarly.

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3056

Title: Analysis of Transport of Nitrogen Species through Right-of-way-Bioswales

Student Name(s): G. Schwabacher

Abstract:

Urban stormwater runoff has become an increasingly major source of nitrogen (N) contamination to nearby water systems. (Collins et al 2010) An increase of nitrogen levels can cause serious environmental damage to surrounding ecosystems of coastal cities. Sewage overflow into coastal waters is a growing problem caused by the impervious nature of urban settings, compounded in cities with combined sewer overflows. A solution to this imperviousness is green infrastructure (GI). In the coastal urban settings, GI has two major purposes: (1) to decrease the rate and amount at which stormwater enters the sewer system and (2) to filter the stormwater that enters the watershed. In general, stormwater control systems (SCMs) have been good at reducing the speed at which stormwater enters the sewer system. This project focuses on testing the effectiveness of a certain SCM called bioretention cells (street gardens). This project consisted of running soil column experiments with multiple nitrogen tests to determine total nitrogen and field samples from current bioretention cells. It was found that the current design of bioretention cells is no effective in filtering out nitrogen from the stormwater and that design changes are required to improve efficiency.

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EV EM EN

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3057

Title: Can color words affect the Stroop Effect ?

Student Name(s): Y. Ortiz-Morales

Abstract:

The Stroop Effect is a demonstration of the phenomenon that the brain's reaction time slows down when it has to deal with conflicting information. The slowed reaction time happens because of interference. The effect became widely known after John Ridley Stroop, an American psychologist, published a paper on it in 1935, but it had been studied by several other researchers before Stroop. In this experiment there are other things that are affected or are used in a way in this experiment, such as: perception, interference, attention and experimental bias. Materials for this experiment will be: 4 different test (1 written in black and 3 written in color), Testing Subjects (20 Males and 20 Females, different age groups), Procedure for this experiment will be to: Gather materials. Have the person read the first test, the one with the words written in black. Then have them read the second test, one with color words that don't match with the word. Give them the third test, the other one with color words, but this time tell them to tell you the color of the word, instead of reading the word. Give them the last test, the one that has the words written in color and the color corresponds with the word. After all four test time them and observe the people. The purpose is to see if people have more trouble analyzing colors instead of words. So far my hypothesis has been correct, most people have difficulty analyzing colors faster than words

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3058

Title: The Role of the Genetic Transfer of Mobile Genetic Elements in the Evolution of Microbial Populations

Student Name(s): A. Jajoo

Abstract:

Traditional understanding of phylogeny has its basis in inheritance. However, recently horizontal gene transfer (HGT), or the transfer of genes from a donor cell to a recipient cell by any mechanism other than traditional reproduction, has been shown to occur with significant frequency as well, especially within prokaryotic populations. The sequences of genes that are transferred are known as mobile genetic elements (MGEs). It is hypothesized that if microbial species engage in horizontal gene transfer, then they will have shared MGEs that can be tracked through microbial genomes. A group of 9,250 genomes were collapsed into 291 groups of 90% sequence similarity of the 16s ribosomal gene. These 291 groups were then compared to each other using Basic Local Alignment Search Tool (BLAST) algorithms and Perl and Linux coding to determine the amount of shared MGEs in each group. These bioinformatics techniques produced matched sequences of MGEs, which were then sorted and aligned to make a phylogenetic tree based on sequence similarity to show evolutionary relationships. This tree showed strongly supported relationships between genomes coming from several different clusters of organisms. Genomes from a cluster containing streptomyces, corynebacterium, arthrobacter, and mycobacterium were particularly pervasive, as they appeared in several different places in the phylogenetic tree. The diversity of relationships between organisms of different genome clusters shows significant levels of interaction and gene transfer between prokaryotic organisms. The development of a phylogenetic tree based on HGT rather than vertical inheritance shows substantial genetic interaction between prokaryotes.

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CB CS MI

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): A. Bernardi

Abstract:

The growing issue of superbugs-bacteria that can resist most antibiotics traditionally used to fight infection--has sparked a wave of research into new alternatives to traditional methods of treatment. One substance under investigation is honey. Honey has held antimicrobial abilities since ancient times, yet the exact mechanisms by which it does so are not very clear. The purpose of this experiment is to attempt to determine some of the properties of honey that contribute to its efficacy as an antibiotic agent. Measuring the various properties of honey required several different procedures. Firstly, to measure the concentration of hydrogen peroxide, a common antibiotic agent, in several different honeys a test where catalase (a highly specific enzyme that breaks down hydrogen peroxide into water and oxygen gas) was introduced to a sealed system of known concentrations of honey was observed for the creation of bubbles of oxygen gas from the decomposition reaction. The volume of gas could be used to calculate the amount, and therefore concentration of hydrogen peroxide in the tested honey. Additionally, an agar diffusion assay is being conducted to determine the actual bactericidal abilities of each honey. By introducing small paper disks saturated with various levels of honey solutions of varying concentration to top agar lawns of bacteria before incubation, small zones of inhibition should become apparent after incubation: each zone corresponds to how little of a concentration is needed to kill the bacteria. Naturally the larger the zone, the more effective the solution. Results and observations/conclusions are still pending.

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3060

Title: Biochemical Changes in Corneal Collagen Cross-linking: Nondestructive Analysis by Raman Spectroscopy

Student Name(s): K. Lee

Abstract:

Every year, millions of people receive laser refractive surgery (Lasik). Corneal ectasia, the progressive thinning of cornea is a major post-surgical complication; corneal collagen cross-linking prevents ectasia by enhancing corneal elasticity and stability. Our objective was to understand the mechanism of cross-linking by verifying the biochemical changes after inducing cross-links in collagen. Raman Spectroscopy, a light-scattering technique was used to characterize chemical bonds and intramolecular interactions in cross-link formation. Research involved three experimental groups: an unfixed corneal sample, an unfixed collagen thin-film, and a glutaraldehyde-fixed collagen thin-film. Purified collagen thin films were used as models for corneal collagen. Raman spectra from glutaraldehyde-fixed collagen films were compared to the Raman from the control-group collagen films. Raman signal comparison between non-cross-linked tissue and cross-linked collagen confirmed ether-type bond formation, interaction of amide NH and aldehyde groups, formation of secondary amines via Schiff base intermediate interactions, and pyridinium-type cross-links. Formation of pyridinium-type cross-links in the collagen thin films suggested that the human cornea may have unique functional mechanisms not found in non-corneal collagen samples. Quantification of the cross-links was an unresolved challenge; results from Raman alone were inadequate for complete optimization of the procedure, providing directions for future research.

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BI EE ME

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3061

Title: The Relationship of Major Vein Density to Leaf Size and Shape in the Plant Genus Pelargonium

Student Name(s): J. King

Abstract:

Leaf venation plays an important hydraulic role in determining maximum photosynthetic rates and a leaf's response to a changing environment. The hydraulic capacity of leaves is largely determined by complex vein architecture ordered into major and minor classes. Major veins are made up of primary and secondary orders that create the main venation structure of the leaf. An increase in major vein density can be correlated with higher tolerance to drought. This research investigated the relationship of major vein density (vein length per unit area) to leaf size and shape in the genus Pelargonium, a highly diverse plant lineage in South Africa. Major vein density was found by measuring the length of veins on leaf images from selected species which represented various shapes. The primary and secondary vein densities were statically analyzed and plotted by leaf shape, lobed or unlobed. Results showed that primary vein density decreased as leaf size increased at a similar rate regardless of shape, while secondary vein density decreased at a lower rate for highly lobed leaves versus unlobed leaves. Because secondary veins extend from primary veins to the margin, more lobed leaves have margins that are closer to primary veins than unlobed leaves. These findings suggested that lobed leaves should have higher tolerance to drought than unlobed leaves of the same size. This fundamental trait relationship of vein density to leaf size and shape can help explain the ecological distribution of leaves.

**Technical Disciplines Selected by the Student
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PS

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3062

Title: The Effect of Osmotic Pressure on Gram-Positive and Gram-Negative Bacteria

Student Name(s): V. Pillai

Abstract:

What is the effect of osmotic pressure on Gram-positive and Gram-negative bacteria? Osmotic pressure is the pressure applied by a type of solution to prevent the flow of water into a semi-permeable membrane. Osmotic pressure can also be known as a measure of tendency that is used in Osmosis. It is known as the diffusion of a solution through a semipermeable membrane. Two types of bacteria will be tested to see the effects of osmotic pressure on the bacteria's growth. Gram-positive bacteria cell walls contain a thick layer of peptidoglycan. Gram-negative cell walls contain a thin layer of peptidoglycan. This experiment tests the effect of osmotic pressure on these types of bacteria. The Gram-positive bacteria that were tested are known as *Micrococcus luteus*. The Gram-negative bacteria that were tested were known as *Escherichia coli*. Known concentrations of sucrose or NaCl were mixed in with the nutrient agar. Half of the petri dishes were inoculated with one type of bacteria and the other half was inoculated with the second type of bacteria. The experiment shows that as solute concentration increases, there will be higher osmotic concentration. Based on the experimental results, both types of bacteria were tolerant to a certain concentrations of hypertonic environment. *M. Luteus* was tolerant to salty concentrations, while *E.coli* was tolerant to lower sucrose concentrations.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

MI CB ME

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

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LS

Proj.
Num

3063

Title: Restricting the Growth of Lactamase-producing Bacterial Strains of Enterobacter aerogenes through Minimum Inhibitory Concentrations of Essential Oil Extracts

Student Name(s): S. Sathish

Abstract:

Nosocomial infections in hospital environments are a growing issue due to the development of antibiotic resistance in strains of Staphylococcus aureus and related species such as Enterobacter aerogenes. As such, many antibiotics, which are simple chemical constituents, are rendered ineffective. This research utilizes the naturally defensive properties of naturally-occurring oils and combines it with chemically simpler antibiotics in order to devise a synergistic, novel remedy for treatment of such infections. Genetically speaking, it is more difficult for bacteria to resist a combination of essential oils and antibiotics compared to antibiotics alone. This inhibiting combination was achieved through three phases: the simulation of the restrictive environment using mixtures of nutrient agar and varying concentrations (0.5%-2.5%) of essential oils (lavender and peppermint), the calculation of the ideal inhibitory concentrations of said oils, and the analysis of vancomycin performance in conjunction with the oils. Strains of E. aerogenes were grown at 37°C in nutrient agar containing each singular peppermint and lavender oil, as well as 1.5µg/ml vancomycin. Daily cell count data (for 1 week) suggests that the addition of either essential oil synergistically enhances the performance of vancomycin. Ideal inhibitory concentrations of peppermint and lavender oil alone were 0.5%-1.5% and 1.0%-2.0% respectively. Vancomycin reached maximum efficiency in plates containing 1.5% peppermint oil and 1.5% lavender oil, where radii of inhibition reached 3.61cm and 2.00cm respectively. The results are highly conclusive (through three trials) because no inhibition occurred in the control, which did not incorporate any concentration of essential oil and just Vancomycin.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME CB MI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3064

Title: Homeopathic Versus Pharmaceutical Antibiotics on E. coli

Student Name(s): n. lisewski

Abstract:

Antibiotics work by killing or inhibiting the growth of bacteria. These substances are used to treat people infected with bacteria, but due over prescribing of antibiotics bacteria have grown resistant to this treatment. Stronger antibiotics have been developed, but the stronger antibiotics upset the local flora essential to human metabolism. New safer alternatives need to be developed. Homeopathic medicine is a billion dollar industry focused on natural cures, but with little government regulation and scientific investigation its reliability is questionable. In this investigation two highly touted homeopathic antibiotics are being tested for their ability to prevent bacteria growth: allicin (compound responsible for garlic's scent and resilience against disease) and cinnamon oil. These two homeopathic antibiotics are being compared to a commonly used pharmaceutical antibiotic ampicillin, along with a control of water. This test was conducted by growing full k-12 Escherichia coli lawns on petri dishes. Then disks soaked with the substance were placed on the agar medium. These petri dishes were incubated for a day. After the incubation period, the zones of inhibition were measured in millimeters and compared. Cinnamon oil appears to be the most effective at eradicating E. coli with an average zone of inhibition measured of 37 millimeters, followed by ampicillin a measure of 25 millimeters. Garlic and the control blank disc had no zones of inhibition; proving to be completely ineffective at eradicating E. coli.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

MI CB

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title: Calories consumed during lunch by students from the Joel Barlow High School cafeteria compared to their GPA

Student Name(s): B. El-wardany

Abstract:

The lunch program at Joel Barlow High School has recently implemented changes to meals served in the cafeteria in order to promote healthy eating--namely the “under 200 calories” rule for non-entree food, in addition to more health-conscious meal options. As a member of the school community, I was interested in investigating possible correlations between what students consume during lunch and their performance in school, so that an informed case for or against these changes in the school food program can be made. For this preliminary study, calories that students intake during lunch were compared to their grade point average (GPA). Recent research has suggested a positive correlation between nutrition and academic performance. I, therefore, predicted that Barlow students who consume the FDA recommended calorie intake for 13-19 year olds for lunch will have higher GPA's than students who consume an amount outside of the FDA range. Data for this study were collected through an online survey, which was distributed to students of the school (grades 9-12) by the teachers. Students were aware that the surveys were optional and anonymous. As part of the survey, students were asked to check off what cafeteria food they eat on a typical school day lunch (entrees, beverages, sides, snacks, and condiments) or indicate that they bring their lunch from home, and report their GPA. My data shows no correlation between calories consumed during lunch to GPA, but I wish to investigate other factors associated with eating and grades.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):
 Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3067

Title: The use of Bacteriophage as an antibiotic for a bacterial infection in *Dugesia dorotocephala*

Student Name(s): S. Wimberley

Abstract:

The worry of antibiotic resistance over the past years has been rising because of the misuse of these products in treating bacterial infections. Antibiotics have been the go to treatment for anything from the common cold to a serious bacterial infection. Prescribing antibiotics for a cold or flu was a common practice, even though it was not effective because the common cold and influenza are caused by viruses. This misuse has caused an insurgence in antibiotic resistance. In antibiotic resistance antibiotics are useless against bacteria they were once capable of killing. In response to this epidemic the use of bacteriophages give a means of treating this problem. Bacteriophages, are viruses that target bacteria. The use of Bacteriophages to cure bacterial infections is a reasonable approach to deal with antibiotic resistance. By using the planarian flatworm *Dugesia dorotocephala* as a model organism to model open wounds I have subjected the planaria to varying concentrations of *Escherichia coli* starting at 10⁸ CFU/mL in LB broth after they have been cut at the abdomen. From observations it has been seen that the bacteria negatively affects the planaria at high concentrations, and can kill them. T2 Coliphage will be in varying concentrations starting at 10⁸ PFU/mL to see if the planaria are able to fully regenerate after undergoing both the bacterial infection and then the treatment of the bacteriophage.

Technical Disciplines Selected by the Student
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CB MI ME

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3068

Title: A Study of the Removal of Pollutants by Rain Gardens, a Low-Impact Development Drainage System

Student Name(s): S. Banker

Abstract:

When stormwater runs off into drainage systems from impervious surfaces, such as driveways, parking lots, and roofs, it can pick up pollutants and bring them into the drainage system. This project focused on determining if rain gardens, one type of low-impact development drainage system, can reduce the level of pollutants in the stormwater runoff. The hypothesis was that the rain gardens would remove significant amounts of total phosphorus, total kjeldahl nitrogen, and total suspended solids from the runoff water. Total kjeldahl nitrogen includes ammonia, organic and reduced nitrogen. The process to complete this project involved collecting samples from the rain gardens at inflow and outflow points to see if there was a significant difference in the amount of pollutants before and after. Samples were tested and conclusions were drawn from the data. To date, the rain gardens tested have shown significant reductions in total phosphorus, total kjeldahl nitrogen, total suspended solids, pH, nitrite, nitrate, carbonate hardness, general hardness, and phosphates. If the rain gardens continue to prove effective at removing pollutants, they will hold great promise for cleaning up our water resources so that we can keep our bodies of water, like Long Island Sound, beautiful for years to come.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

EV EM PS

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3069

Title: Elucidating the Ethylene Signal Pathway in Arabidopsis

Student Name(s): C. Kanlian

Abstract:

Ethylene is one of the best understood plant hormones and is most commonly known for its role in regulating the ripening process of climacteric fruits such as apples and tomatoes. A complex pathway of genes regulates its effect in Arabidopsis, a model plant for genetic study. This project aimed to elucidate the remaining portions and mechanisms of the ethylene signal pathway. To do this we used molecular genetic procedures, such as q-PCR, Western Blot, and Protein Blots, to analyze how mutant Arabidopsis lines responded to varying concentrations of ethylene treatment. Previous research has found that ethylene receptors, ETR1-5, are embedded in the ER membrane. In addition to mutations of these membrane receptors, we used mutant lines of EIN and CTR. Our results supported previous research in that known constitutive mutants always showed the triplet response, insensitive mutants never showed the triplet response, and the wild-type-like mutants showed response in the presence of ethylene. Knowledge of the ethylene signal pathway has and will allow agricultural development of artificial plant growth regulators and enhancers. This research has increased the marketability of off-season produce and distribution of fresh food to more people.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS CB BI

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4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3071

Title: The Effect of the Artificial Sweetener Neotame on Lifespan and Pharyngeal Pumping Rate in daf-2 Mutated *Caenorhabditis elegans*

Student Name(s): A. Murray

Abstract:

This project tested the effect of artificial sweetener on lifespan in the model system *C. elegans*. *C. elegans* contains a daf-2 signaling pathway, which has been conserved through evolution and is found in both the roundworm and mammals, making some observations made in *C. elegans* applicable to humans. When there was a mutation in this daf-2 pathway, worms were observed to have a lifespan up to twice as long as wild-type worms. However, this lengthening effect was decreased by up to 20% when the mutated worms were given a 2% glucose solution. There is also a relationship between pharyngeal pumping rate and lifespan in *C. elegans*. PPR acts as an early indicator of lifespan because of its correlation to muscle degeneration rates. Higher pharyngeal pumping rates indicate faster rates of muscle degeneration, while slower rates correspond to slower muscle degeneration. Aspartame plus acesulfame-potassium (AAK) is an artificial sweetener derived from aspartame. AAK was shown to increase the pharyngeal pumping rate in daf-2 mutated *C. elegans*. Because it increased pharyngeal pumping rate in daf-2 mutants, it also decreased lifespan in that sample. Like AAK, neotame is an artificial sweetener derived from aspartame. It is also metabolized the same way as AAK. It is a sweetener, like glucose. It was therefore hypothesized that neotame would have the same effect on lifespan and pharyngeal pumping rate as glucose and AAK. Preliminary results indicated that this was true, that neotame plates had a lower percent alive than glucose or water treated samples.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BI CB MI

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3072

Title: Development of a Prescient Warning Model for Cholera Utilizing an Epidemiological Identification of Risk Factors

Student Name(s): S. Xu

Abstract:

Cholera, a deadly disease, has been accountable for immeasurable financial and human loss historically and contemporarily, and causes thousands of deaths a year even today. Although scientists have been familiar with the biological aspects of the disease, only a questionable vaccine has been developed while new strains of cholera continue to evolve. In this study, data and statistical science, a promising new approach, was used to investigate the global social and political factors that would help us predict cholera outbreaks through the development of a model where high-risk countries for cholera and even other diseases can be identified and countermeasures taken accordingly. It was hypothesized that refugee populations and a high population density in a country would be strong indicators of high disease risk. To conduct the study, data was collected from sources such as the United Nations. A variety of potential risk factors were analyzed through data representation. These factors were analyzed using R programming through statistical correlations and graphical methods. The effect of the factors was then judged using R2 values. Results showed that several factors studied were correlated with cholera disease rates in varying degrees, and a predictive model was generated suggesting that population density is a weak indicator, while large refugee populations and instability are strong indicators of high-risk countries for cholera. Understanding and finding factors that indicate a high-risk country for infectious diseases such as cholera or Ebola is crucial for preventing massive loss of life and resources through providing policy recommendations and preventive strategies.

Technical Disciplines Selected by the Student
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ME MA EV

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3073

Title: Development of a Closed In Situ Cage System for Restocking of *Homarus americanus* in Long Island Sound

Student Name(s): S. Isidoro

Abstract:

The population of *Homarus americanus* in Long Island Sound in 1998 was estimated at 3.7 million, in 2010 the population decreased to 350,982. Conservation efforts, such as the CT V-notch program, attempted to manage the population through harvest regulations. This program did not address population restocking efforts and proved unsuccessful. To address the restocking aspect, juvenile lobsters must be raised and released. Laboratory based grow-out techniques are not reasonable due to the high labor and energy requirements. Therefore it is proposed that, a closed cage based grow-out system within LIS provides juvenile lobsters protection from predators and provides readily available nourishment through biofouling without extensive cost. This closed cage restock system is designed to further improve the viability of juvenile lobsters introduced to LIS. Lobsters were individually placed in tubes to develop. Each mesh tube is 11.94 cm in diameter and 18 cm long and is placed in a closed cage. These tubes facilitate biofouling by providing a surface to which sessile invertebrates can adhere to and provide a food source for the lobsters. To establish the efficiency, 50% of the tubes were pre-biofouled in LIS for two weeks prior to the introduction of lobsters. Data indicates an average growth rate of 1.91 mm throughout the study period. Additional acclimation data is observed through pigment change. Shell pigment transition indicates 87 % of lobsters have transitioned from blue/brown to purple/pink. This data confirms proper acclimation and potential grow-out methodology for restocking lobsters in LIS.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

EM AT AS

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2. Student independently performed all procedures as outlined in this abstract. Yes No

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3074

Title: The Stroop Effect

Student Name(s): T. Turner

Abstract:

I conducted the Stroop Effect experiment simply because it sparked an interest in me. In search for a project, this popped up and I decided to look further into it. The purpose of the experiment is to see if the manipulation of words can eliminate the Stroop Effect (Science Buddies). The task of the subjects was to read the ink color of a word and not the actual word itself. Following the procedures provided by the source; I instructed my subjects, had them read each strip of paper while being timed, recorded the data, and repeated it 2 more times for each subject. In collecting my data, I found that it was easier for my subjects to read the ink color in a smaller amount of time with the warped words versus the regular words. My hypothesis was correct and it shows that warping words can either eliminate or minimize the Stroop Effect. This investigation can possibly be applied in other aspects like helping children with dyslexia or even in forensics. It shows that things aren't always as they appear.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

BE

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3075

Title: Elevated Levels of Interleukin-8 In Non-Small Cell Lung Cancers Induce Cell Survival During Chemotherapy

Student Name(s): A. Pan

Abstract:

Non-small cell lung cancer (NSCLC) is a particular variant of lung cancer that equally affects smokers and non-smokers. Typical treatment of NSCLC involves the use of a class of drugs called tyrosine kinase inhibitors. While initial treatment is successful, drug resistance is inevitable in the majority of cases. Several studies have implicated elevated levels of Interleukin-8 to be linked to cancer. This project investigated how Interleukin-8 could be driving the development of drug-resistant cancer cells. A unique single cell capture was used to isolate and analyze the unique proteome of several thousand non-small cell lung cancer cells. The data was then analyzed using IsoPlexis and Genepix 6.0 software. The data gathered showed evidence that Interleukin-8 was linked to greater cell viability and health, as well as showed higher levels of Interleukin-8 in drug treated cell lines. We were also able to identify a special sub-population of cells termed “high-producers” which may be potentially serving as tumor drivers in the population. We concluded that that Interleukin-8 was very important in enabling the development of drug-resistant cancer cells, and the “high-producers” may play a very critical role in facilitating this development, although a future study will be needed to verify this hypothesis.

Technical Disciplines Selected by the Student
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CB EN BI

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3076

Title: The Effect of FGF2 on Hypoxia in the Mouse Brain: A Model for Human Perinatal Hypoxia`

Student Name(s): K. Halabi

Abstract:

Each year in America, 56,000 babies are born with very low birth weight. The lungs of these premature infants lack surfactant, a key component for lung development, which allows for proper oxygen exchange. Hypoxia in the brain results, causing decreased neuronal volume, ventriculomegaly, cognitive impairment, and developmental delays. This study sought to ameliorate the neural detriments that result from hypoxia in premature babies by stimulating interneuron growth in the brain. Mouse models of perinatal hypoxia were injected with fibroblast growth factor-2 (FGF2), a neural growth factor that was hypothesized to increase neurogenesis. Densities of parvalbumin-tagged interneurons were then counted in the dentate gyrus and cortices of the brain. These data were compared with densities of interneurons in hypoxic control mice without FGF2, and normoxic controls with and without FGF2. After primary and secondary cell staining, a StereoInvestigator microscope was used to count interneurons. It was determined that FGF2 did not significantly increase interneuron counts in hypoxic mouse brains. Further research towards regenerating neural cells could help thousands of premature infants who suffer from the effects of hypoxia.

**Technical Disciplines Selected by the Student
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CB ME

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3077

Title: Exploration into the Effects of Anti-PAR2 Antibody on the Expression of Proliferative Metabolic Pathways and Apoptosis of Mouse Breast Cancer Cells

Student Name(s): L. Novak

Abstract:

The purpose of this experiment was to employ cell culture research techniques and subsequent practices as a method of investigating or discovering medical alternatives and advanced remedies for cancer, with the intent of extrapolating the results of this experiment to different medical applications that could facilitate in the development of potentially effective treatment opportunities for cancer patients. I intended on investigating the effect of antibodies, specifically an anti-PAR2 mouse monoclonal antibody synthesized against an existing human sequence, on CUX-1, KRAS, and PI3K expression, the development of signaling and metabolic pathways as a result of these specific proliferative proteins, and overall cancer cell death. The concentrations of antibody I planned on using throughout my experiment are 0.5 μM , 1 μM , and 2 μM , with the anticipation that the antibodies would attach to a PAR2 cell surface signal receptor as an epitope and interrupt the proteolytic processing signals. I made use of a DNA fragmentation kit in addition to gel electrophoresis to accurately determine whether apoptotic cell death has occurred, as well as a hemocytometer to count the cells that died as a consequence of the antibody's effect upon these apoptotic pathways and DNA proteolysis. Additionally, growth rates for the cells' development were monitored. Following treatment, the data that was accumulated from the hemocytometer and gel electrophoresis kit suggested that the PAR2 antibody did induce apoptotic effects, as evidenced by the shorter banding of DNA fragments that appeared following gel electrophoresis.

Technical Disciplines Selected by the Student
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CB BI MI

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3078

Title: Neurochemical Signature of Cerebral Vasospasm in Patients with Subarachnoid Hemorrhage

Student Name(s): R. Patel

Abstract:

Cerebral vasospasm is a serious complication of vasoconstriction in subarachnoid hemorrhage (SAH) patients. There is a varied onset of the condition, and there is no known cure. The process of metabolomics profiling allows us to identify amino acids that have the potential of breaking down essential vasodilators. We propose that this amino acid profile, which is mechanistically linked to vasomotor tone via nitric oxide metabolism, represents a candidate chemical signature that may be used for early diagnosis and development of improved treatments of vasospasm. To begin the project, samples of cerebrospinal fluid (CSF) were drawn from patients during each stage of vasospasm. Two metabolomics approaches, LC-MS and GC-MS, were used to screen the chemical and level changes in the CSF before, during, and after vasospasm. A concentration change >1.5 fold and p value ≤ 0.01 were used to classify changes as significant. Five significant amino acids were identified. Two metabolites were identified by both LC-MS and GC-MS, while the other three were identified by only GC-MS. Four of these amino acids are linked to the nitric oxide (NO) pathway, which is essential for vasodilation. The level of metabolites post SAH was established with the control patients. This pathway has been studied for the first time in post-SAH patients. These discovered biomarkers can lead to the development of tests for the early detection of vasospasm. Further studies will establish the role of these biomarkers during clinical diagnostics and treatments of vasospasm in patients with SAH.

Technical Disciplines Selected by the Student
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ME BI CB

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3079

Title: Accumulation and Biomagnification of Microplastics in Marine Bivalves and Gastropods

Student Name(s): C. MacFaddin

Abstract:

The purpose of this experiment was to investigate the accumulation and biomagnification of microplastics in marine bivalves and gastropods in a controlled environment. It was hypothesized that when microplastics are consumed by the bivalves (mussels), density of the microplastics will increase in gastropod (snail) tissue at the next trophic level. Control and experimental mussel and snail tanks were established and 0.02 grams of plastic flakes (polyvinylpyrrolidone) added to the experimental mussel tank per day. Mussels and snails were fed algae and fish flakes in conjunction with the microplastics. Every four days, for sixteen days, two mussels from both the control tank and the experimental tank were analyzed for their plastic contents. Samples were ground, filtered via elutriation, and centrifuged to separate plastics. Prior to analysis, a portion of each experimental mussel was fed to the snails. Exposed snails underwent the same grinding, elutriation, and centrifugation as the mussels and analyzed for plastic content to determine biomagnification. Results indicate that the hypothesis was not supported. Although minute pieces of plastic were found in the experimental samples, the amount of plastics found were not statistically significant among the mussel population or between the mussel and snail populations. Future studies with larger populations and/or more sophisticated separation techniques may offer better insight into biomagnification of microplastics at the next trophic level.

**Technical Disciplines Selected by the Student
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EV AS CB

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3080

Title: Stabilization of CXCR4 for Crystallization by Tyrosine Sulfation of the N-Terminus

Student Name(s): M. Hovstadius

Abstract:

G-Protein Coupled Receptors (GPCRs) are of great interest to researchers because of their pharmaceutical potential. GPCRs are integral membrane proteins and their primary function is to transduce extracellular stimuli into intracellular signals. Chemokines are a family of cytokines that have the ability to induce chemotaxis in cells and their receptors are GPCRs. CXCR4, a chemokine receptor and GPCR, is unstable in the body and is incredibly challenging to crystallize. This project aims to stabilize CXCR4 by tyrosine sulfation, a post-translational modification that strengthens protein-protein interactions accomplished by tyrosylprotein sulfotransferases (TPST), in order to create a sample for x-ray crystallography. Prior research results indicated that mutating the tyrosines on the N-terminus of CXCR4 to mimic a sulfotyrosine doesn't increase the affinity of the ligand for CXCR4. This project attempted to co-express TPST and CXCR4 to ensure sulfation of the tyrosines on the N-terminus of CXCR4. This plasmid was created by ligation and creating a megaprimer. Both *E. coli* and *S. cerevisiae* were transformed with the plasmid. Once the sequences were verified, a bioassay would have been done to determine the amount of binding between CXCR4 and SDF-1, and thus the stability. Due to the difficulty in verifying the plasmid and growing the cell cultures, this data was not obtained. However, this lack of data raises questions about whether sulfation occurs on CXCR4 and if it could be done without TPST, as well as whether research done in CXCR3, a very similar GPCR, is accurate for other proteins of the same class.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BI ME CB

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3081

Title: The Effect of Gut Denitrification of *Dreissena polymorpha* on the Nitrate and Nitrite Availability in the Freshwater Column of Eichler's Cove, Newtown

Student Name(s): G. Storey

Abstract:

This experiment is a process of testing fresh water in a controlled tank environment, one tank contains 12 Corbiculidae freshwater clams, one tank contains 12 *Dreissena Polymorpha* (a controlled manipulation of overpopulation) in order to compare the level of nitrates and nitrites in the various water columns. Variables, such as, chlorine, hardness, pH, nitrites, and alkalinity were measured in order to insure consistence. These measurements determine if nutrient flow is disturbed by the gut denitrification cycle that results from the bivalve processes of the invasive *Dreissena polymorpha*, in comparison to native species (such as Corbiculidae) and if this species is doing as much harm as is reported by the environment. Nitrates and nitrites are natural pollutants that, when in balance with the environment, can be balanced in the water cycle. With over population of *Dreissena polymorpha*, this experimentation has concluded that nitrates and nitrites are overwhelming the system and are acting as pollutants harming the freshwater environment, specifically in Eichlers Cove, Newtown--where the mussels were taken from for experimentation. A control has been kept to compare to a freshwater system unaffected by the presence of bivalve denitrifiers, freshwater clams and mussels. The goal of this experiment is to determine what molecular components of the water column are being disturbed and to what effect does this change have on the holistic freshwater nutrient cycle. Future experimentation might be to inhibit the creation of excess nitrates and nitrites by *Dreissena polymorpha* and find a permanent solution.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EM EV BI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3082

Title: The Effect of Elevated Glucose Levels on the Maternal-Fetal Interface

Student Name(s): A. Garcia

Abstract:

Diabetes mellitus (DM) affects 20.9 million Americans, including 5.9% of all women in the U. S. and approximately 2.1% of women who have recently given birth. Risks associated with DM in pregnancy include: preeclampsia (PEC), and an increased incidence of Cesarean-Section. One hypothesis for the pathogenesis of PEC is a disruption of the healthy formation of the maternal-fetal interface with respect to the ueroplacental vasculature due to changes in the inflammatory and angiogenic factors produced by cells on either side of the interface. Previous research has shown that excess glucose impacts first trimester trophoblasts on the fetal side resulting in: increased inflammation, decreased migration of trophoblast cells into the maternal decidua leading to decreased modification of the spiral arteries, and increased production of anti-angiogenic factors. The goals of this work were to: determine the effect of glucose on basal chemokine, cytokine, and angiogenic factor secretions by human endometrial endothelial cells (HEECs) on the maternal side of the interface, and to determine the effect of glucose on HEECs response to bacterial LPS. ELISA (enzyme-linked immunosorbent assay) was used to measure several cell factors including: inflammatory chemokines/cytokines, pro-angiogenic factors, and anti-angiogenic factors. It was found that the only significant change was a decrease in IL-1 β production in response to elevated glucose. From this it was concluded that elevated glucose had little effect on the other inflammatory and angiogenic factors, but had a significant effect on the molecular pathway of IL-1 β in endometrial endothelial cells.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME CB BI

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3083

Title: Magic Magnets

Student Name(s): D. Sittambalam

Abstract:

Alternative methods to harvesting plants have been widely explored in order to augment their growth. This research stems from the fact that plants are the fundamental basis of our agricultural system. Our society relies heavily on plants for both nourishment and economic benefit. In this experiment, the objective was to determine whether plants would grow more when exposed to magnets. Enhanced growth of plants would provide larger supplies in the same period of time, which would be advantageous to the agricultural economy. To fulfill the above mentioned objective, approximately five radish seeds were placed in each of 6 pots with soil. The experimental group consisted of three pots, which contained magnets under the soil. The remaining three pots made up the control group and did not have any magnets in them. Measurements were taken using a ruler to measure the height of the plant stems at the time of sprouting and at each of the established intervals. After calculating the average final stem heights of the plants exposed to magnets and the plants not exposed to magnets, it was determined that magnets did impact the plants by causing them to grow taller by approximately 6.4% on average. These findings allowed us to complete our objectives.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS EV

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3084

Title: An Evaluation of Machine Learning Methods for Genetic Variant Error Detection

Student Name(s): Z. Effman

Abstract:

Genomic sequencing has empowered some of the greatest advances in biology and health sciences of the 21st century. However, the large quantities of data produced are significantly contaminated with error, making it difficult to sift out mutations from noise. Here we compared a wide range of algorithms tasked with separating real and artifactual genetic variants. We performed a grid search over the algorithms' hyperparameters to optimize the expected area under their predictors' ROC curves before evaluating the optimized algorithms against the current standard, the VQSR, using independent data sets to avoid overfitting. We found that our two ensemble-based methods, Random Forests and Adaboost, produced on average better predictors than the VQSR ($p = 2.58 \times 10^{-455}$, 2.50×10^{-390}). However, our evaluation criteria were not sophisticated enough for us conclude that either algorithm should replace the VQSR. In light of these results, we advise that further refinements of genetic analysis software should pursue ensemble-based methods to obtain the best predictions and computational efficiency, and we suggest that more nuanced evaluation metrics should be designed to identify the proper notion of performance.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CS CB MA

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3085

Title: Applying the Friendship Paradox To Trends in a High School Population

Student Name(s): J. Nadelmann

Abstract:

Current methods for predicting trends of social contagion, as well as other contagious outbreaks can be improved. On average, such “trends” spread through centrally located individuals earlier than those in the periphery of the social network. Given the intricacy of human social networks, it is very difficult to determine which people have the highest network centrality. This study aims to utilize the friendship paradox, a basic property of social networks, to predict which potential trends may spread through a high school population. The friendship paradox states that the friends of a random individual have more friends, and a higher centrality, than the random individual, on average. It is hypothesized that the nominated friends of random individuals will be familiar with more potential trends, such as viral videos, than randomly selected individuals within the network. For this study, 50 high school students were interviewed on what new videos and trends they thought would become popular within the high school, to determine which potential trends would be used for this study; from the interviews, 12 potential trends were selected. 59 random high school students assessed their familiarity with these trends, and then nominated 3 of their friends within the school. The same survey was then given to the group of nominated friends. The friends of the randomly selected individuals were significantly aware of more potential trends than the random individuals. This study demonstrated a novel method which could allow for early detection of anything that spreads throughout a network of people.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BE

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3086

Title: How Music Affects Concentration

Student Name(s): R. Grant

Abstract:

Many students prefer to listen to music while performing cognitive activities. My experiment was designed to test the effect of different genres of music on the concentration of ninth grade students at Fairchild Wheeler. I hypothesized that if different genres of music are played during tests, participants will score higher on the test during which they listened to classical music. I went about proving my hypothesis by administering several timed tests of the same difficulty, then comparing the test scores by grading based on accuracy and completion. The resulting test scores indicated that students were able to concentrate at the highest level while listening to classical music during reading and pop music during math. I theorized that this occurred because different parts of the brain responsible for each cognitive task were simulated by each genre. I also concluded that pop music impaired reading scores because the students were familiar with the lyrics, causing them to confuse the words of the song with the words in the test. My experiment and results are relevant because in today's world because there is such an emphasize on education. Although scientists have been researching the effects of music on many aspects of our lives, there is not adequate information proving direct correlation between a certain genre of music and high rates of concentration. The specific implications of this experiment would be to help students at Fairchild increase their scores on the mandated standardized timed tests taken multiple times throughout the year.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BE ME CB

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3087

Title: Natural Dye Treatments of *Gossypium hirsutum* using several Naturopathic sources in combination with the mordant of Aluminum Potassium Sulfate

Student Name(s): D. Grey

Abstract:

Organic dyeing techniques have been around since the Chinese in 2600 BC, and these practices have been steadily increasing in modern society. In my experiments, I focused on using regular grocery store ingredients, 2 or more for each color I was hoping to get, and using a common aqueous dyeing process. I specifically focused on the 6 regular colors: Red, Blue, Green, Yellow, Orange, and Purple. The problem with using natural ingredients for dyeing fabric is that these natural dyes have a complex chemical constitution. Unlike synthetic dyes, they are usually not a single entity but a mixture of closely related chemical compounds. This makes them particularly hard to bond them to your dyeing medium. I chose to use cotton. To counteract this, you use a Mordant. Mordant, literally means "to bite". The mordant is the chemical link that fixes the dye to a substrate by combining with the dye pigment to form an insoluble compound. There are several different types of Mordants, Alums, which can be used, however I chose to use the Aluminum Potassium Sulfate Mordant, as True "alums" are double salts of aluminum such as potassium aluminum sulfate. My results were not as expected, as the colors each ingredient was supposed to end up creating, in several instances was not successful and even if it was, the color came out either much lighter or muddied. But several ingredients created beautiful, correct, colors and my failures only prompted me to keep testing.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CB PS EV

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

Title: Unprecedented Glycerol-Free Biodiesel Production using Enzyme Catalysis

Student Name(s): M. Haddad

Abstract:

Biodiesel production from vegetable oil and ethanol (EtOH) has become a demonstrated alternative energy source. Enzymes catalyze triglycerides' conversion to biodiesel and glycerol waste. Designing a process that avoids the formation of glycerol byproduct by selective partial transesterification will incorporate the mono-substituted glycerol (MG) as biodiesel, avoiding waste. Addition of acetic acid (AcOH) to the enzymatic process will prevent the formation of glycerol and perform faster transesterification of the terminal alcohols, producing biodiesel containing mono-substituted glyceride (MG, biodiesel) instead of glycerol. This concept was tested in three experiments under dry conditions using EtOH, EtOAc and EtOH+AcOH as solvents. The reactions were incubated at 30oC for 24 hours then analyzed by thin layer chromatography (TLC) and gas chromatography (GC) to confirm absence of glycerol in the AcOH experiment. GC data identified MG-acetate in EtOAc and MG-alcohol in EtOH+AcOH biodiesel mixtures in the 20-30% area, indicating >85% selectivity. MG-alcohol was detected in <5% in the EtOH experiment. These results provide proof of concept for selective partial transesterification in the presence of AcOH as hypothesized. The MG-acetate in the EtOAc experiment was converted to the MG-alcohol in EtOAc experiment when tested in presence of water, providing chemical evidence for the structure of MG-acetate. These results provide proof of concept that enzymatic selective transesterification of vegetable oil with EtOH/AcOH forms biodiesel without glycerol. Secondly, it is a sustainable and environmentally friendly reaction; all components, including the catalyst, are from natural, renewable resources.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

AT ET CH

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3089

Title: Investigation of Bioremediation and Alkane-degrading Qualities of *Alcanivorax borkumensis*

Student Name(s): E. Ackerman

Abstract:

Pollution and marine water quality have become pressing issues in our modern environment, notably with the growth of industry and the usage of fossil fuels in current human civilization. Over the past century, there have been oil spills of varying magnitudes around the world that create dire environmental circumstances. *Alcanivorax borkumensis* are an aerobic hydrocarbonclastic marine halophile that reside in low populations in marine waters. They have been found to metabolize oils, and occur in high concentrations at oil spill sites. I have begun a study that evaluates how effective these bacteria are in bioremediating oils of varying densities, types, and composition, paying special attention to phosphorous and nitrogenous components. The oils used include canola oil, grape seed oil, Tris(hydroxymethyl)ethane, and Mag1 motor oil. Concentrations being used are 30 ppm, 100 ppm, 200 ppm, and 270 ppm. These concentrations were selected because they are reflective of concentrations of oil in waters in the vicinity of the Deepwater Horizon Oil Spill in the Gulf of Mexico. Data is still being collected at this time, so I cannot yet provide a complete report of results and analysis.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

MI EV CB

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3090

Title: Analyzing Cathode Placement in a Simple Single Vessel Microbial Fuel Cell: Potential Implications for Efficiency and Practical Applications

Student Name(s): E. LoPreiato

Abstract:

MFC (microbial fuel cell) technology needs to be further exploited to provide practical, cheap electrical power. This experiment looks at cathode electrode placement in a simple single vessel MFC to increase efficiency of power generation. Utilizing three configurations, on the proton exchange membrane (CPEM), mid-catholyte suspension (MCS), and partial air suspension (PAC), it was hypothesized that CPEM would generate the most power because its resistance to proton (H⁺) exchange would be the least. Measurements of voltage, current, dissolved oxygen, and pH were obtained twice daily for 14 days. Calculations of power, current, and power density were performed and the results were statistically compared. The hypothesis was not validated as it was discovered that PAC delivered higher and more consistent power output. This was assumed to be due to the ability of the PAC to induce more rapid evaporation of water, thereby allowing greater oxidation of H⁺ ions to liquid water. This results in increasing current flow by driving more H⁺ ions across the proton exchange membrane and subsequently more electrons across the electrical circuit. In addition, the evaporation of water is critical in allowing the removal of OH⁻ ions (from the dissociation of standing liquid water) to drive redox reactions further. This finding, along with yet undiscovered opportunities allows the potential for providing cheap electrical power to underdeveloped areas of the world, as well as relieving strain on the compromised power grids of developed areas.

Technical Disciplines Selected by the Student
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EN EM AT

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3091

Title: An Investigation of Drone Downdraft as a Viable Alternative for Insect Pollination of Essential Crops

Student Name(s): A. Kern

Abstract:

The purpose of this experiment was to investigate how drone downdraft can be used to pollinate essential crops usually pollinated by the honeybee. It was hypothesized that a drone oriented at a specific height, for a specific amount of time could produce enough downdraft to dislodge the sticky pollen of Brassica rapa. Resulting phenotypes analyzed and compared to a control would reveal frequency of pollination in terms of height and distance. A variety of Brassica Rapa genuses including rosette dwarf, yellow Greenleaf, and purple stem hairy were planted alongside non-purple stem hairless fast plants to test the distance capability of the drone as well as to determine the optimum height at which to fly the drone over the plants. A drone casing was built out of PVC piping to stabilize the drone in place over the plants in order to achieve a consistent drone height and wind speed above the plants. After flowering, experimental groups were placed underneath the downdraft of the drone for set time intervals to allow the pollen from the non-purple stem hairless plants to dislodge and pollinate the adjacent strains of Brassica rapa. After seedpods formed, seeds were dried and grown in petri dishes. Phenotypes were then compared and analyzed. Results indicated that the drone successfully caused the cross-pollination of the non-purple stem hairless fast plant and the other genuses. It was determined that the further plants were from the drone, the more effective the pollination was. The results on height of the drown were inconclusive.

**Technical Disciplines Selected by the Student
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PS AT CB

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3092

Title: Enhancement of Antibiotic Performance via the Addition of Silver Nanoparticles

Student Name(s): A. Lim

Abstract:

Antibiotics are the most common and effective way to treat bacterial infections, however bacterial species such as MRSA have developed an innate resistance to these medications as a result of over-usage, and organism adaptation and evolution. Silver is known to have a potent antibiotic effect when introduced as nanoparticles, retarding the growth of mold, spores, and other germs due to high specific surface area and high fraction of surface atoms. That effect is restrained, however, by the fact that silver is toxic as a powerful metabolic inhibitor, when introduced to the human body in sufficient quantities. If sufficiently diluted, colloidal silver is safe, and is used as an effective nutritional and dietary supplement. In this research, the ability of silver nanoparticles (AgNP) to synergistically enhance vancomycin and amoxicillin antibiotic inhibition of *E. coli*, *B. subtilis*, and *S. warneri* cultures was studied. For each organism, 3-day growth for each separate antibiotic, along with 500 ppm AgNP colloidal suspension (in di-water) added, was compared to a control group cultured in standard medium. Results demonstrate antibiotics and silver used in conjunction were the most effective at inhibiting bacterial growth in all species. *S. warneri* cultures demonstrated a 79% decrease of a $4.5E5CFU/mL$ culture when treated with silver/vancomycin, compared to 70% inhibition for antibiotic alone. $9.2E4CFU/ml$ *B. subtilis* cultures reported a 40% inhibition for silver/vancomycin, as opposed to the 25% decrease without silver. Finally, $2.3E5CFU/ml$ *E. coli* cultures were inhibited by 55% by silver/amoxicillin, compared to a 28% decrease for the in antibiotic alone.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME BI

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3093

Title: The Effect of Ocean Acidification on Nannochloropsis sp.

Student Name(s): C. Sherman-Watson

Abstract:

As industrialization increases and populations grow, a better understanding of the implications for increasing levels of ocean acidification has been recognized as a priority for oceanographic research. The majority of the research, however, has been focused on calcium containing molluscs, with little attention paid to microplankton such as Nannochloropsis sp. (Chlorophyta). In replicated treatments algal cultures were exposed to varying degrees of acid doses, from an acute exposure, to prolonged over the course of the study, to no acid at all. Results showed that in all treatments there was a substantial increase in algal density, with an average of 160 cells/ drop in group A, the group with the largest number of cells by the end of the experiment. In addition, the phytoplankton were able to neutralize the acidic conditions within a 48-hour window. It was predicted that Nannochloropsis sp. would be able to survive in the acidity, and this was delineated by the cultural population increasing in the solutions including acid. Studies on how this carbon issue affects marine cultures is done majorly based around shellfish, as they display visual influences of the pollution. These findings show that when considering the effects of ocean acidification on marine life, it is crucial to recognize the abundance of phytoplankton within the environment. They are most likely a contributing factor in oceanic pH, and are a factor in the buffering system.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV EM CH

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3095

Title: Examining The Efficiency Of Pleurotus Ostreatus As A Bio-Remediation Agent To Biodegrade Oil Based Pollution.

Student Name(s): J. Siveyer

Abstract:

Oil is fundamental to today's industrial stability. However, it is a toxic material that can damage or kill organisms, and recent oil spills have had a catastrophic impact on the environment. The purpose of my experiment is to examine the effectiveness of Pleurotus Ostreatus (Oyster Mushroom) in breaking down motor oil, to determine whether it would be a viable solution to biodegrading oil in the environment. First I grew Pleurotus Ostreatus from a kit. I then set up 3 tests, where each one had 6 samples; made up of 2g of Pleurotus Ostreatus and 10ml of motor oil. One used the mushroom caps, one the stem, and one the whole mushroom. About half were in petri dishes and others were in plastic containers. I made a control of each container with 10ml of oil. I measured the masses and did a visual inspection daily. The oil became noticeably cloudy and less viscous. The mass of the samples changed very little. After 6 days I created a 3% oil-xylenes solution for use in a gas-spectrometer to measure the change of oil. The gas-spectrometer results were: control oil: 591.4412ppm, caps: 32.996ppm stems: 20.5567ppm and the whole mushroom at 1.577ppm. These are decreases of 94.41%, 96.5%, and 99.73% respectively. These results show that mushrooms are very effective at breaking down oil. Mushrooms are shown to be a viable solution to oil spillages because they are quick and easy to grow and can effectively break down oil in a short period of time.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

PS EV BI

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

Title: Temperature-Independent, Portable, and Rapid Field Detection of Ebola via a Silk-Derived Lateral-Flow System

Student Name(s): O. Hallisey

Abstract:

Up to 90% of Ebola victims will die without early diagnosis and medical intervention, which can reduce fatalities by 50% and are critical to preventing future epidemics. Current detection methods are expensive, time-consuming and utilize complex instrumentation and chemicals that require uninterrupted refrigeration. Successfully maintaining the reagent's "cold-chain" from laboratory to point of use is highly problematic in regions with poor infrastructure, where Ebola is most common. This research sought to devise a rapid, simple and inexpensive Ebola detection platform that can be stored and transported without refrigeration. To begin, current Ebola ELISA reagents were embedded in silk fibroin, which possesses stabilizing properties, allowing storage of otherwise refrigerated reagents at room temperature. To confirm ELISA colorimetric detection of Ebola after prolonged, non-refrigerated storage of the kit's reagents, the Ebola ELISA was conducted in a 96-wellplate format (A450nm) at 0-7days from initial mixing and dilutions. Results indicate Ebola ELISA detection is viable in water dilutions only on the day of mixing. For silk-embedded reagents, successful detection was realized for up to one week of RT-storage. Silk-film embedded Ebola ELISA reagents were used to construct a four-channel, paper-based, microfluidic detection card, with colorimetric reagents positioned to create timed, visible detection of Ebola antigens. In this new device, that is stable and stored at room temperature, 30µl drops of water were used to dissolve silk-embedded reagents, initiating a timed-flow towards a center detection zone, where a positive (colored) result confirmed the presence of Ebola(+)-control antigens in 30 minutes, at a cost of \$25.

Technical Disciplines Selected by the Student
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- human subjects
- potentially hazardous biological agents
- vertebrate animals
- controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):
 Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3097

Title: The Correlation of Children's Phonological Awareness Development with Intelligence Quotient Throughout Reading Instruction

Student Name(s): J. He

Abstract:

Written and spoken language are essential for acquiring new information. While spoken language skills are innate, written language requires proficiency in spoken language and professional guidance to begin development, generally occurring from ages 3-5. As written language skills start development, spoken language also develops, affecting written language ability, and vice versa. One important aspect of spoken language, phonological awareness, is strongly related to a child's reading progression, and can indicate written language development. This study investigated the association of written language development with phonological awareness ability and the correlation of written and spoken language with human intelligence, specifically whether general intelligence can indicate phonological awareness ability during reading instruction. It is hypothesized that the development of written language skills will increase phonological awareness ability and correlate to a higher IQ. To investigate, previously gathered New Haven children ages 4-6 were given a series of standardized assessments measuring IQ and phonological awareness. Raw and standard scores were organized into tables and graphs. Medians and correlation values were used to analyze the data. Significantly more six-year-olds scored above the median on the Phonological Awareness subtests as opposed to four-and-five-year-olds, indicating spoken language development during reading instruction. Furthermore, those that scored above the median averaged a higher IQ than those that scored below. There were positive correlations between Phonological Awareness and IQ tests, with higher correlations evident for the older children. This indicates that general intelligence relates more to phonological awareness as written language develops.

Technical Disciplines Selected by the Student
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BE

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3098

Title: Self-Sustaining Piezoelectric Insole for Treatment of Diabetic Neuropathy

Student Name(s): G. Mesa

Abstract:

According to the Center for Disease Control almost 15 million Americans suffer from, “diabetic neuropathy” causing pain, numbness, and even amputation. Using biomedical engineering, a device was designed to harness the electrical energy from renewable piezoelectric materials to provide pain relief and nerve regeneration. A mathematical electrical distribution model was developed accounting for prescribed mA, patient weight, instep pattern and piezo electrical output. The result is a gel insole that can be fitted to foot planar pressure readings to activate piezoelectrics within. Embedded low frequency (2-5 Hz) Transcutaneous Electrical Nerve Stimulation [TENS] electrotherapy provides long lasting effects that could be which are regenerative in nature vs. high frequency treatment. Traditional low frequency is difficult to maintain but with embedded insole treatment the patient has mobility for sustained usage. Originally, attempts were made to implant a TENS regulator into the sole of a shoe, but that failed to meet durability testing. The device was then re-engineered with ceramic piezo discs. They were tested for durability, as the insole would be under fluctuating stress when in use. A low weight (4.53 kilo) durability test was conducted to work up to human weight bearing but results were inconclusive. The device was then tested by exerting over 700 kPa on several piezoelectrics nominated for candidacy, because they superseded the walking motion of the average 136 kilo man and the results were definitive. The final prototype was also assessed for efficacy vs. alternative treatment options as being self-powering, mobility enhancing and low cost.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME EE EN

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3101

Title: The Effects of Curcumin and Eucalyptus Oil on the Growth of Breast Cancer Cells

Student Name(s): E. Gombotz

Abstract:

In 2011, within the United States alone, 13,397,159 people had cancer. Cancer research centers all over the world continue to work in order to cure this abnormal growth of cells. The problem with this is that researchers work to find ways to cure cancer that has been diagnosed as opposed to find ways to decrease the amount of people diagnosed in the first place. Cultures all around the world have a variety of cultural norms, for example, in many countries in southeast Asia, the ingestion of curcumin which is found in curry, and the topical application of eucalyptus oil through henna dye, is extremely popular. Interestingly enough, the rates of cancer in India have been lower than most countries until a recent change in diet. By growing mouse mammary carcinoma cells in the lab with the addition of multiple amounts of curcumin and eucalyptus oil, the growth and proliferation of the cells can be closely monitored through the use of numerous processes and close watch. Although the growth process of the cells due to the nature of science set the treatment back, the addition of both products is expected to kill the cells from their normal growth. The rapid growth of the cancer cells depicts why it is so difficult to kill cancer and stop it from metastasizing. The study of cultural norms is extremely crucial to find ways to not just cure cancer in people who have it but to stop more people from getting it.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CB ME MI

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): S. Juluru

Abstract:

The purpose of this experiment was to determine what type of cleaner works the best against common household germs found on sink handles. My hypothesis was that Lysol would kill the most bacteria. I was interested to see which type of cleaner would work best; Lysol or GreenWorks. I took nine cotton swab samples of the same bathroom sink handle, wiped it on the agar in the dish, and put three drops of Lysol in three of the dishes. I repeated the same step with GreenWorks but in three other dishes. The control group did not have any cleaner put in it. I covered each dish with aluminum foil to mimic darkness and placed them in a warm area. After waiting six days, I opened the aluminum foil coverings. I discovered that the "kill zone" ring was larger in the dishes containing the Lysol as opposed to the GreenWorks and Control group. I can conclude that Lysol is most effective for killing harmful bacteria, but we cannot deem this experiment valid as I used the wrong type of dish to hold the bacteria, and I used aluminum foil as a substitute for a lid. This experiment can be used as insight for how to keep you're home healthy and clean, and it can be applied to all new germ killing products out there.

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3. This project was conducted at a Registered Research Institution. Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3104

Title: The Laws of Attraction

Student Name(s): M. Frame

Abstract:

The purpose of my project was to test if beauty could be quantified or if it was too subjective. My hypothesis for this experiment was that beauty was too subjective. Despite there being a formula, the results of mathematics would never completely correspond with those of people. The control in my experiment was every models' inability to enhance their beauty. The constants in my experiment were where I took the pictures and the measurements I used to determine the rate of beauty. The independent variable in my experiment was how beauty was measured. One way was by a rating scale of 1-10, (subjective), next was by measurements based on the golden ratio, (quantified). My dependent variable was how the results of the measurements compared to the results of the ratings from people. I measured my dependent variable by measuring the length and width of each face, then dividing the length by the width. Then I measured the length from the top of the head to the middle of the eye, the middle of the eye to the bottom of the nose, then from the bottom of the nose to the chin. I then added each of the measurements to get the score on a 1-10 scale. I then compared those to the ratings from people. The result of my experiment was that beauty is too subjective, thus proving my hypothesis correct. Improving on my experiment I'd test this idea on a larger, more diverse crowd to expand on the results.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BE ME MA

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): K. Hanrahan

Abstract:

In this experiment i tested to see does elevated temperature affect nitrate uptake in aquatic plants. In order to test this i set up a lab that involved Label three sets of data A1-A6. One set is placed in a hot water bath and the other in a room temperature environment, the third is the control. From this i then Fill each test tube with 50 ml of water. Following this i Put plants in first two labeled A1-A6. Finally, i Measured initial nitrate levels, after both one hour and two hours. From my data i found that as predicted in the hypothesis, larger amounts of nitrate do effect the plants ability to uptake the nitrate however the temperature does not effect the plants ability to uptake the nitrate. This is helpful in an environment like New England where the temperatures are constantly fluctuating. Having said that if we are able to identify if the uptake is being effected we can help to resolve this problem. This is also helpful in the science field because from this we are able to determine that

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2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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 Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3106

Title: The Differences in the Measurements and Numbers of Nuclear Pores and Nuclear Pore Complexes in Wildtype Stem Cell Lines and Huntington's Disease Stem Cell Lines

Student Name(s): K. Malani

Abstract:

Huntington's disease (HD) is a neurodegenerative genetic disorder caused by the mutant huntingtin protein (mhtt). Nuclear pores, which control the molecular traffic between the nucleus and cytoplasm, are an area of interest in HD. Previous studies established that differences in wildtype htt and mhtt cause difficulty in protein transport through nuclear pores because mhtt forms toxic aggregates in the nucleus. The aim of this study was to find whether there were differences between the lengths, areas, and numbers of nuclear pores in nuclear pore complexes (NPCs) of wildtype and HD stem cell lines. Depending on whether there were differences, another aim was to find whether nuclear pore function could be a target for HD treatment. I tested this question by reviewing a collection of 176 TEM photos of HD and wildtype stem cell lines in a single blinded manner, in which the wildtype stem cell line acted as the control. I enlarged the photos using zoom functions on a computer and scanned them to search for pores and NPCs. Once identified, I documented measurements of the NPCs and tabulated results in a table. Then, I determined statistical significance using an independent students' t-test. After these methods, I found that there was not a significant difference in the scores for HD (M=17.22900 SD=17.623111) and wildtype (M=31.31689, SD=20.295970) stem cell lines; $t(20) = -1.734$, $p = .098$. These results suggest that the type of stem cell line does not affect NPCs, and that further research should focus on mhtt versus wildtype htt instead.

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ME CB

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj. Num

3107

Title: The Effect of Triclosan on the Proliferation of Breast Cancer Cells

Student Name(s): S. Anaparthi

Abstract:

The Effect of Triclosan on the Proliferation of Breast Cancer Cells SaiRam Anaparthi
Triclosan is a compound that is used in soaps, toothpastes, deodorant sticks and shower gels. In a recent study, scientists found that the ingredient can be doing more harm than help. New cancer research shows that the exposure to high levels of triclosan can promote the proliferation of breast cancer cells. This project is important to me because Triclosan can be absorbed into the human blood stream, directly with contact, so if it can cause proliferation then Triclosan could serve as a dangerous product to use. I will be growing breast cancer cells using doses of triclosan to observe if they grow different from untreated cells. I will be using concentrations of 10micromoles/l, 15micromoles/l and 30 micromoles/l of Triclosan to expose to breast cancer cells. After testing with multiple trials, I will determine the proliferation by counting (with a Hemocytometer) the breast cancer cells. I have been growing breast cancer cells along with noncancerous cells to compare my results due to the product. Both types of cells are growing at a proper rate, and also tripsinized into 20 plates each. I'm using three cancer and noncancerous plates to test the three concentrations of Triclosan. I have expected to have cell proliferation in the breast cancer cell plates and no results in the noncancerous plates. Finally, I plan on presenting the results of my research at the Connecticut Science Fair at Quinnipiac University in March 2015.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CB

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3108

Title: The Effects of Different Environments on the Germination of Radish Seeds

Student Name(s): S. Spreca

Abstract:

Although vegetable gardening can be satisfying, many people want instant results without sacrificing the taste and healthiness of the vegetable. Thus, an experiment was conducted to test three different feeding methods with three different environmental temperatures. 10 seeds were put in each bag and hung for 15 days and data was collected every three days. At the end of this time period, it was observed that the seeds that were frozen grew the tallest (with the average being about 2.8 cm), while the ones watered with Gatorade grew the shortest (with the average being about 2.3 cm). Those that were frozen grew the tallest most likely because the seed coats (the testas) were worn down. Those that were watered with Gatorade grew the shortest most likely due to the salinity content of the Gatorade. There were also factors that disturbed the accuracy of these results. The results shown could determine, if the plants were grown to maturity, if one treatment yields the produce the healthiest, fastest, or, in general, better than other treatments.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS EV

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3109

Title: DNA Barcoding in "Health Bars"

Student Name(s): L. Morriss

Abstract:

The obesity epidemic is rapidly increasing in America as now over 68% percent of the American population is overweight. However, in recent years, a health wave has started to shock the population. "Health Bars", as they are commonly referred to, have become popular in the past 5 years. However, a typical bar can contain countless foods and supplements, thus making the ingredients unidentifiable on a visual level. Food mislabeling is a highly prevalent issue arising amid the world of processed food. Through my research and experimental process, I plan to test for ingredient mislabeling within these "health bars". I will utilize DNA barcoding to extract samples of DNA from grains, chocolate, and nuts in the various bars. Experimentation has been conducted and the results are being analyzed. These results will help determine whether or not corporations such as Kellogg, Kashi, and Quest Nutritions, are deceiving consumers.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BI ME MI

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3110

Title: Hybridized Manganese Dioxide & Gold-Iron Oxide Nanoparticle Inhibition of Tumor Growth via Radiosensitization and Tumor Microenvironment Control

Student Name(s): W. Yin

Abstract:

Controlled bombardment of cancer cells via ionizing radiation remains the leading form of cancer treatment. However, radiation treatment is often avoided because of its ineffectiveness and damage caused to neighboring, healthy tissue. Recent innovation in cancer treatment focuses on the use of paramagnetic Au-Fe₃O₄ nanoparticles that are biocompatible, and can be maneuvered to cancer sites. Once positioned, they display strong surface plasmon resonance, which leads to photothermal ablation, a natural and oxygen-free method of heat generation that is capable of quickly killing targeted and localized cancer cells. Separately, A-MnO₂ nanoparticles have been shown to regulate cancer tumor microenvironments through simultaneously limiting hypoxia and acidosis to enhance radiation response by preventing tumor aggressiveness. This research investigates novel synthesis of hybrid A-MnO₂-Au-Fe₃O₄ nanoparticles, so that both therapies can be realized concurrently, once the magnetically-responsive hybrid NPs are accurately positioned. 15nm A-MnO₂ nanoparticles were synthesized according to a modified Prasad method, while 2-14nm Au-Fe₃O₄ NPs were synthesized according to a modified Yu method, all of which were supported by SEM/EDS analyses. Hybrid A-MnO₂-Au-Fe₃O₄ were then formed by the combination of A-MnO₂:Au-Fe₃O₄ (1:3M) via 60°C sonication in 0.2% PVA. SEM/EDS analyses confirm the creation of PVA-coated hybrid nanoclusters (PVA-HNC; ~20nm), that remain magnetically responsive. In a simulated tumor environment, these PVA-HNC's would limit hypoxia, or slow tumor aggressiveness, as 45µM quenched 94% of 1.1mM H₂O₂ in 40min. Additionally, surface plasmon resonance of the PVA-HNC's was achieved. Irradiation of 100µM PVA-HNC demonstrated increased radiation signature versus a PVA-Fe₃O₄ colloidal suspension of equal scattering concentration.

**Technical Disciplines Selected by the Student
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EN ME CH

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3111

Title: The Effect of Zinc Oxide Nanoparticles on the Growth of Bacterial Infections

Student Name(s): S. Dave

Abstract:

Nanomedicine is a developing field that involves delivering nanoscale drugs to individual cells. Since nanoparticles are able to target distinct cells, the application of this field is ideal for treatment of bacterial infections. Research on various metal nanoparticles has shown that they have deodorizing and antibacterial properties. Escherichia coli and Bacillus subtilis were grown in culture, and the ZnO dispersion was applied in different dilutions. To measure the effect of the different dilutions on the growth of the bacteria, the zones of inhibition were calculated to observe the death or absence of bacteria. The results of the experiment are still inconclusive. However, it is predicted that the higher the dilution in the solution, the more anti-bacterial properties it will have.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CB MI

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4. Is this project a continuation? Yes No

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- Yes No

Title: The Effect of Brain-Derived Neurotrophic Factor on Retinoic Acid Differentiated SH-SY5Y Cells: A Model for Striatal-Enriched Protein Tyrosine Phosphatase in Parkinson's Disease

Student Name(s): A. Rajagopalan

Abstract:

Parkinson's disease (PD) is the second most common neurodegenerative disease, affecting 4-6 million people worldwide. Characterized by the degeneration of dopaminergic neurons in the substantia nigra, PD results in motor and cognitive deficits. Striatal-enriched protein tyrosine phosphatase (STEP) is a tyrosine phosphatase enriched in the dopaminergic neurons of the substantia nigra. Recent studies indicate that STEP levels are upregulated in PD, but its exact function in dopaminergic neurons is unknown. To study the role of STEP in dopaminergic neurons in an in vitro model, a neuroblastoma (SH-SY5Y) cell line was differentiated to dopaminergic cells using retinoic acid (RA) and the expression of STEP and its substrates was examined. The results show that RA differentiated SH-SY5Y cells express STEP and its substrates pERK and pPyk2. This establishes the feasibility of using RA differentiated SH-SY5Y to study the effects of dopaminergic toxins related to PD on STEP and to find potential PD therapeutic molecules that modulate STEP activity. Further, because brain-derived neurotrophic factor (BDNF) has shown to reverse the neuronal death exhibited in PD, this research seeks to establish whether BDNF inhibits STEP to achieve neuronal regrowth. To study this, STEP and STEP substrate levels were examined before and after BDNF treatment. The results reveal that BDNF affects STEP and STEP substrate levels, indicating a relationship between BDNF and STEP. This research therefore shows that RA differentiated SH-SY5Y cells can be used to further research on STEP in PD, and that BDNF potentially inhibits STEP and could be used in PD treatment.

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CB BI

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3114

Title: A Novel Antibody-Functionalized Graphene Transistor Lab-On-A-Chip for Selective Detection of Malaria Pathogens

Student Name(s): P. Hansel

Abstract:

Malaria is a mosquito-borne infectious disease caused by the Plasmodium blood parasite; more than 200 million people worldwide are affected by it, and more than 1 billion are at high risk for infection (WHO). Early detection of the disease is crucial to avoid complications like cerebral malaria or organ damage. Common methods today for detecting malaria in the blood include ELISA, which is relatively expensive; rapid diagnostic tests (RDTs), which suffer from low sensitivity and robustness; and blood microscopy, which is time-consuming and costly. We propose an electrical detection method based on antibody-functionalized graphene field-effect transistors (GFETs). Arrays of GFETs were fabricated to form a lab-on-a-chip capable of detecting minute concentrations of Plasmodium falciparum histidine-rich protein II (HRP II) antigen. Electrodes separated by 50 μm were first constructed on oxide-coated silicon wafers by negative photolithography and metal evaporation. Graphene monolayers were then transferred onto each electrode array by the bubbling transfer method. This formed arrays of back-gated GFETs. Each GFET was characterized by the researcher, producing current vs. gate voltage curves. The graphene channels were then functionalized with mouse anti-HRP II antibodies (IgG) using synthesized diazonium salts. A horizontal shift in the characteristic curves is observed upon exposure to HRP II antigen, as a result of conformational changes in the attached antibodies upon binding to antigen. Atomic force microscopy (AFM) was used to verify the attachment of antibodies and proteins to the graphene. This research sets the stage for future development and deployment of these tests in a clinical or field setting.

Technical Disciplines Selected by the Student
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EN ME BI

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s):

Abstract:

In the United States, cancer is the leading cause of death second to only heart disease. Every year more than 500,000 Americans die from malignant tumors while over 1 million Americans are diagnosed with them. Research within the field of cancer has grown exponentially over the years as scientists have been continuously searching for a cure. Current models used in cancer research are either incomplete or are too costly. This study aims to investigate whether *Dugesia dortocephala*, a species of planaria, a non-parasitic flatworm with unique regenerative properties, can prove to be a viable alternative to current models used in cancer research. This investigation was conducted on the basis of a link found between tumorigenesis and regeneration. Qualitative and quantitative observations of the planaria after exposure to two different concentrations (10ppm and 20ppm) of Cyclosporine A (CsA), a carcinogenic substance, will determine whether or not there is a link that may allow for planaria to be used as a substitute for current models used in cancer research. Data is still being gathered in order to resolve to a conclusion.

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3116

Title: An Investigation of Superparamagnetic Iron Oxide Nanoparticle Hyperthermia to Inhibit Growth of *Agrobacterium tumefaciens*

Student Name(s): A. Mellert

Abstract:

The purpose of this study was to investigate a hyperthermic treatment of plant pathogen *Agrobacterium tumefaciens* using superparamagnetic iron oxide nanoparticles. It was hypothesized that the superparamagnetic iron nanoparticles, when exposed to a magnetic field, will rotate and produce heat, resulting in reduced tumor size and inhibit growth. In the experiment, eight tomato plants were secured and planted two months prior to experimentation. While the tomato plants continued to grow, seven carrots sliced in two inch specimens were inoculated with the pathogen *Agrobacterium tumefaciens*. After inoculation and tumor growth, six carrots were injected with superparamagnetic iron oxide nanoparticles and under went the process of hyperthermia. By rotating each specimen 180 degrees around two adjacent magnets, the iron oxide cores of the nanoparticles rotated in place causing the nanoparticles to release heat, exposing the foreign tumor cells to extreme temperatures. This process was repeated in ten minute intervals each day for ten days. Then after substantial growth, the tomato plants were inoculated with the pathogen and the process of hyperthermia was repeated. Results were collected and analyzed for statistical relevance. It was concluded that the hypothesis was supported in that tumor size was inhibited (it stopped growing), but that the results were inconclusive in determining if the tumor was reduced in size. The latter was because degradation of the carrots and tomatoes made precise calculations a challenge.

Technical Disciplines Selected by the Student
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ME EN MI

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s):

Abstract:

The purpose of this experiment is to understand the relation of gender to the stroop effect which is a thinking process the brain goes through when it faces difficult scenarios. This experiment will take participants in the range of sixteen year old males and females to do tests demonstrating how their brain reacts with the stroop effect. In this project, the stroop effect test is whether to say the color word or color font. When taking the stroop effect tests, the frontal lobes of both the left and right hemispheres will not correspond with one another. The left hemisphere of the brain would want participants to read the color word while the right hemisphere would want the participant to respond by saying the ink color. For the most part, the females were able to be less flustered by the stroop effect tests. Recommendations to be made are to have as many participants in the age ranges as possible for accurate results and to clearly state what participants must do in each test.

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3118

Title: Development of Non-toxic Photostabilized Phycoerythrin for Application in Dye Sensitized Solar Cells

Student Name(s): E. Hong

Abstract:

Phycoerythrin is a red pigment extracted from the seaweed species *Chondrus crispus*. It fluoresces a bright red-orange with a wavelength of 324 nanometers. Phycoerythrin is used in fluorescence based detection and has the potential to be used as the sensitizer in dye sensitized solar cells (DSSC). DSSC's are cost efficient and absorb more sunlight per surface area than silicon-based solar cells. Due to phycoerythrin's low photostability, it quickly denatures, only lasting for a couple of days when in contact with light. Phycoerythrin that is currently sold in the market is preserved in sodium azide which is highly toxic. To minimize the toxicity and increase photostability, five solutions were employed with trehalose, myo-inositol, and guanidine hydrochloride to prevent denaturation. The untreated phycoerythrin control group degraded after 72 hours, when compared to the phycoerythrin in the solution of myo-inositol and guanidine hydrochloride maintained photostability beyond 30 days (720 hours). When incorporated to the DSSC, the phycoerythrin produced 0.5 volts for over an hour while the industry standard technique titanium based control cell produced 0.2 volts. The results indicate that phycoerythrin can be stabilized with non-toxic additives and be applied as the sensitizer for DSSC. With further research, phycoerythrin can be applied in food dye and ink or other materials that require a non-toxic natural red pigment.

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EN BI ET

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- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3119

Title: Assessing Changes in the Growth Rate of American Lobster (*H. americanus*) Under Varying Environmental Stressors As Modeled by Red Swamp Crayfish (*P. clarkii*)

Student Name(s): E. Kane

Abstract:

Long Island Sound (LIS) is an important ecosystem for many species, providing food, and habitat in Connecticut's waters and coastline. Long Island Sound has been detrimentally affected by many different human activities. In 1999, the LIS lobster population declined precipitously; climate change, pathogens and pesticides were all implicated. My research delved into the impacts of two stressors that affect lobster populations in LIS to determine which factor: an acidifying environment, or the presence of methoprene, is most detrimental to lobsters. I used juvenile Red Swamp crayfish (*Procambarus clarkii*) to model the environment's effect on the American lobster (*Homarus americanus*); they react metabolically and physiologically in similar ways to lobsters. Growth, in the form of changes in length and mass, was used as an indicator of metabolism. Four crayfish were used in each of the three tanks, a control and two experimental variables. Methoprene was diluted to one part per 2 billion in the methoprene treatment; the pH was lowered to 6 in the acidification treatment. Measurements of length and mass were taken every week for six weeks. Compared to the control, crayfish in the experimental variables had stunted length and mass growth. Methoprene most affected growth rate while an acidic environment stunted the growth to a lesser extent. My findings indicate that toxic pollutants such as methoprene, as well as acidification of the waters due to climate change can cause a significant decline in the growth of crayfish and are likely to have similar negative effects for lobster in LIS.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

EV EM AS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3120

Title: Isolation and Use of Antimicrobial Polypeptides Found in Grains to Inhibit the Growth of Gram-Positive and Gram-Negative Bacteria

Student Name(s): A. Wada

Abstract:

The purpose of this investigation was to isolate antimicrobial peptides produced by maize kernels, barley and rice to determine which most effectively inhibited the growth of gram-positive and gram-negative bacteria. It was hypothesized that the isolated, antimicrobial polypeptides from maize would produce significantly wider zones of inhibition when compared to the inhibitions zones produced by the antimicrobial polypeptides isolated from barley and rice. The experiment began by grinding the three grains to a powder and mixing the samples with 2x Laemmli Sample Buffer, in order to give the proteins an overall negative charge and allow them to separate based on size. The proteins were electrophoresed and identified based on molecular weight. The target proteins were then cut out of the gel in “chunks” and placed onto preseeded Escherichia Coli bacterial culture plates to test their effectiveness on gram negative bacteria and Clostridium sporogenes plates to test their effectiveness on gram positive bacteria. The success of the proteins was determined by the zones of bacterial growth inhibition created by the proteins. After observing the plates for seven days, there were some zones of inhibition, but these measurements were not statistically significant between the grain samples. In stating that the hypothesis was not supported, it should be noted that deamination of said proteins during isolation may have incapacitated their antimicrobial properties, thus skewing the results.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

PS BI MI

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3121

Title: Comparative Modeling of Signal Peptidase I (Spase I) from Mycobacterium tuberculosis Genome

Student Name(s): S. Jaladanki

Abstract:

Myobacterium tuberculosis is a strain of bacteria that has plagued the healthcare industry with its resistance to antibiotics. Tuberculosis (TB) mainly affects the respiratory system, but can spread and vary in severity. M. tuberculosis's resistance makes treatment for TB difficult. Bacterial proteins have specific functions that are carried out either inside the cellular envelope or the extracellular environment. In order for the protein to be transported into the cell, a bacterial protein secretion pathway is necessary. Many proteins are vital to the function of M. tuberculosis, but one such protein is the type I signal peptidase (SPase I). To release the mature protein from the cytoplasmic membrane, the N-terminal needs to be cleaved, which is what SPase I does. Spase I is being targeted because it is promising that by targeting the protein, drug development for TB may be advanced. However, SPase I does not yet have a definite protein structure. In this study, the amino acid sequence of SPase I will be analyzed and used to develop a three dimensional structural model of the protein. This modeled Spase I structure may be used as a reference for further development of protein structure, using techniques such as x-ray crystallography.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

CB MI CS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3122

Title: H2O: Is It Clean?

Student Name(s): J. Earl

Abstract:

Chlorine is currently the most commonly utilized chemical for water disinfection in the United States and has revolutionized water purification by largely reducing the prevalence of waterborne illness. However, health concerns linked to disinfection by-products (DBPs) have led to questions about the advisability of using chlorine to provide safe water for the population. In disinfection processes, gaseous chlorine or liquid sodium hypochlorite is added to water, causing a reaction in which hypochlorous acid is formed. Hypochlorous acid is known to form strong oxidizing agents in water and react with a wide variety of compounds, which is why it is such an effective disinfectant. This experiment tested for the four primary types of THMs in addition to HAA5 in samples collected from four common sources; well water, city water, bottled water, and tap water filtered by a Brita® water filter. This was done by utilizing the technique of gas chromatography, an analysis that measures the content of various components in a sample. The sample solution is injected into the instrument and enters a gas stream which transports the sample into a separation tube known as the column.” The detector then measures the quantity of the components that exit the column. It was hypothesized that tap water would contain the most DBPs while well water would contain the least DBPs because surface water is likely to contain large amounts of organic materials, resulting in the production of DBPs. Groundwater, however, does not commonly contain the organic material necessary to form DBPs.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH EM EV

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

Title: miRNA Analysis of Exosomes from Osteosarcoma Cells

Student Name(s): L. Channa

Abstract:

Cancer cells interact with and affect their microenvironment to facilitate tumorigenic growth and metastasis. Due to these interactions with local microenvironment, the cancer cells alter the surrounding normal cells. I plan to investigate how cancer cells affect their microenvironment. Therefore, the questions I look to solve are: What miRNA genes are expressed in exosomes from osteosarcoma cells and are there any patterns of miRNA expression that are predictive of phenotype? My hypothesis is that the population of miRNAs contained in the exosomes expressed by normal and cancer cells are different. My second hypothesis is that the patterns of miRNA expression contained in the exosomes are different between metastatic and nonmetastatic tumor cells and that the populations of miRNAs found in these exosomes are predictive of phenotype. In order to address my questions, I need to grow normal and osteosarcoma cells in a culture. Then, I will isolate the exosomes and miRNA with commercial kits. Subsequently, I will perform a miRNA characterization through qPCR to see which miRNAs were differentially regulated. These will show the miRNAs present. I will use statistical analysis to compare the populations of miRNAs in exosomes between normal cells and that of cancer cells. Using that data, I will be able to determine which miRNAs are critical for facilitating tumorigenic growth. By comparing the populations of miRNAs in exosomes from low metastatic tumors to that of high metastatic tumors, I will be able to determine which miRNAs are critical for metastatic growth. My results are currently pending.

Technical Disciplines Selected by the Student
 (Listed in order of relevance to the project) ME CB BI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- | | |
|---|---|
| <input type="checkbox"/> human subjects | <input checked="" type="checkbox"/> potentially hazardous biological agents |
| <input type="checkbox"/> vertebrate animals | <input type="checkbox"/> controlled substances |

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):
 Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): L. Low

Abstract:

Identification of an alternative, sustainable, and cost efficient source of energy remains an unsatisfied requirement in sustaining our environment. The demand for economic, alternative energy sources is increasing in parallel with the exponential increase in energy consumption. Enzymatic biofuel cells represent an alternative, however, research is needed to optimize this concept. Enzymatic bio-batteries utilize enzymes that breakdown sugars yielding protons and electrons, which circulate within the bio-battery and generate electricity. This experiment analyzes the effects of various combinations of glucose oxidizing enzymes, Glucose Oxidase (GOx) and Glucose Dehydrogenase (GDH) and oxygen reducing enzymes, Laccase (Lac) and Bilirubin oxidase (BOD) on electron production. A main purpose of this experiment is to optimize the efficiency of electron transfer using different combinations of these enzymes. This project consisted of designing bio-battery chambers for future applications and an experiment testing the voltage, conductance and resistance for the bio-anodic and bio-cathodic enzymes; GOx and Lac, GDH and Lac, GOx and BOD, and GDH and BOD. Results suggest that the combination of GOx and Lac produced the greatest current (peak ~13.2 mA) whereas GOx and BOD produced the least current (<0.8 mA). Interestingly, GDH and Lac produced the highest voltage (peak ~0.6 V) and current (peak ~12.0 mA) while the combination of GDH and BOD demonstrated the least decline in voltage (9.1%) and current (62.9%). This study demonstrates the feasibility of utilizing enzymatic reactions to generate electrical current. Ultimately enzymatic biofuel cells have the potential to be adapted for powering light sources or even medical devices.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3125

Title: The Effect of Differing Incubation Temperatures on the Expression of Hsp70 in *Anopheles gambiae* and Its Relevance to the Proliferation of Infectious Diseases

Student Name(s): M. Ambler

Abstract:

Heat shock proteins are evident in many living organisms in order to prevent other vital proteins from denaturing in response to an environmental stressor including temperature, pH, and lack of vital nutrition. In particular, organisms that don't have advanced thermoregulation systems rely heavily on the expressions of heat shock proteins (hsp) in order to survive changes in their environments. It has been shown that, in response to a hot blood meal, the mosquito (*Anopheles gambiae*) upregulates heat shock protein 70 (hsp70), showing an "eightfold increase" (Benoit 2012) in the expression of the protein. The expression can contribute to the proliferation of infectious diseases. Mosquitoes are vectors for pathogens such as West Nile Virus and Malaria. If they are able to survive higher temperatures, then perhaps this disease transmission cycle will increase. The extent to which incubation temperature has an effect on the expression of hsp70 during the adult stage. To test this, larvae of mosquitoes were raised to maturation in various incubation temperatures of 25, 30 and 35 degrees Celsius. Once matured to the adult stage, they were flash frozen in liquid nitrogen. Utilizing a Western Blot analysis, mosquito tissue was lysed to see the expression of hsp70. Analysis of results suggest that an increase of temperature will increase the expression of hsp70. Thus, an increase in temperature in specific areas due to climate change may be a factor in the proliferation of infectious diseases.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

ME CB CH

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3126

Title: Phytoplankton's Effect on Ocean Acidification

Student Name(s): S. Streimer

Abstract:

This experiment was designed to determine the effect of two species of phytoplankton, PLY429 and PLATP, have on water pH and alkalinity when immersed in an acidic environment similar to the ocean in the year 2100. I created an acidic environment, more tangible for research, using a CO2 bubbler distributed into many smaller bottles (.5L/1L) with two different starting pH values of 7.99 and 7.24. I tested my bottles for alkalinity and pH change two times a day periodically for the span of 20 days. My results showed that both species increased the pH, in both acidic environments as well as in both bottle sizes. Alkalinity throughout each bottle remained relatively constant. I found changes in pH varied during the course of the experiment. Data analyzed I concluded that an increased sunlight, increased the photosynthetic rates, therefore decreasing the CO2 in the water and increasing the pH. Qualitatively and quantitatively the PLATP had a more significant change, which I find is due to cell size and reproduction, which can be seen by the dense dark green cell color. Contrary to my hypothesis, the smaller celled phytoplankton had a higher reproduction rate which required more ATP fueled by glucose from photosynthesis. I believe my results can be extrapolated to a larger scale due to the correlation between both the smaller bottle size and the larger. My results can be used to find an ecological solution to the rapidly increasing global problem of ocean acidification.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV BI PS

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title: The Variation Between the Amount of Time Needed for the Germination of Green Bean Plants When Nurtured with Organic and Inorganic Nutrient Solution

Student Name(s): S. Kit

Abstract:

Hydroponics has been around for generations. Remarkably back in the Roman times it was first used by the Emperor Tiberius to grow crops during harsh winters. But now, in this day and age we can use hydroponics to sustain a steady production of crops throughout the year, without the massive workload and space traditional methods use up. What has been done differently, though, is the usage of a modern 3D-printer to assemble the hydroponic system using polylactic acid. This experiment tests if organic or inorganic fertilizers will more quickly produce a successful yield of plants using hydroponics. Plants were placed in the solution for two weeks, recording the time it took for the plants to germinate in the hydroponic solutions. Through this experiment, it will be possible to predict which solution, organic or inorganic, will provide a quicker germination time to the green bean plant while being nurtured in the solution. These facts will help the general public learn how to hasten germination time, and provide information to larger industries associated with plant production. As shown when the experiment was completed, the inorganic solution that was used provided a much quicker germination rate compared to the organic solution which had taken 11 days to germinate. Thereby, providing results that the inorganic method will allow a quicker rate of germination within the green bean plant.

Technical Disciplines Selected by the Student
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 Yes No

CSEF Official Abstract and Certification

Fair Category

Proj.
Num

LS

3128

Title: The Effect of Prevalent Environmental Pollutants on the Regeneration Rate of *N.vectensis*

Student Name(s): B. Tassavor

Abstract:

The Starlet Anemone (*Nematostella vectensis*) is a water-dwelling organism that resides in shallow salt waters near coastlines. The marine pollution (specifically nitrogen and phosphorus) from run offs such as fertilizers has a negative effect on the organism's daily functioning. Specifically, one major component of the *Nematostella*'s daily functioning affected is its ability to regenerate. The problem investigated in my experiment is: How the regeneration of the *Nematostella* is affected by run-off pollutants. I will accomplish this by placing an organism in 100 ml water with 20% salinity. The organism will also be stored in 18 degrees Celsius water. The organism will then be lacerated and its regeneration rate will be examined based on a diagram of regeneration stages. This sample will be the control. Three other samples will be examined with a similar salinity and identical water quantities except they will contain NH_4NO_3 . There will be a NH_4NO_3 concentration of $1 \mu\text{M}$ as a pollutant. To determine the impact of pollutants, like phosphorous, I will determine the regeneration rate. The difference in regeneration rates in the two experiments will indicate the effect of pollution on the organism. The experiment yielded lower regeneration rates throughout the regeneration from the moment of laceration to recovery in comparison to the control group. This result went just as expected. The organisms proved the dangers of marine pollution via fertilizer run offs. Also in the process, the organism proved its value as a model organism as it was proved to be an effective pollution indicator.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

AS CB

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5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3130

Title: Ultraviolet Germicidal Irradiation as a Feasible and Effective Consumer Technology

Student Name(s): T. Fallas

Abstract:

Ultraviolet Germicidal Irradiation is a relatively new technology that has seen high adoption in the medical and research fields. Certain ultraviolet wavelengths disrupt bacterial DNA chains destroying the organism's ability to reproduce. Because of the exponential nature of bacterial reproduction and because of the nature of infectious pathogens, this renders the bacteria irrelevant and safe. Ultraviolet Germicidal Irradiation has not seen widespread consumer adoption. It has been subtly integrated into consumer products or used by medical and research institutions. This research first verifies the effectiveness of an ultraviolet germicidal bulb at eradicating bacterial colonies then integrates the verified bulb into a 3D printed container that makes it usable for consumers. The end product is a sort of handheld wand that effectively sanitizes surfaces after 60 seconds of exposure. Literature and experimentation suggest that 60 seconds is the amount of time necessary to destroy even the most resilient forms of E. coli. It was these strains that were used for experimentation. The device is handheld and can be powered by a small battery. It provides a feasible method of integrating ultraviolet germicidal technology into a consumerist setting.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AT CB MI

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3131

Title: What Is the Best Way to Deliver Light to Plants?

Student Name(s): M. Jakubowski

Abstract:

In this experiment, different pulsating patterns of LED light are being used to determine how they affect the growth and development of *Phaseolus vulgaris*, or pinto bean seeds (common bean plant.) It is known that most plants naturally receive approximately twelve hours of sunlight per day, and light plays a large part in the development of plants because it is required for cellular functions such as photosynthesis. Organisms, including plants, follow the circadian rhythms, meaning that their behavioral patterns are developed based off of approximately twelve hours of lightness and twelve hours of darkness in a twenty-four hour day. If the light patterns are manipulated in the experiment, then how would it affect the growth of *P. vulgaris*? Would the *P. vulgaris* respond differently in terms of their growth and developmental patterns if they do not receive light in the normal pattern, and if so, would they grow at a faster pace? After asking these questions, a hypothesis was formed as an educational prediction of what a reasonable outcome may possibly be, and the experiment was underway in hopes of finding concrete answers.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3132

Title: Creation of different phospholipid aggregate morphologies for the use of drug delivery

Student Name(s): N. Reynolds

Abstract:

Chemotherapy can be very detrimental to one's body, the use of phospholipids as a drug delivery system could be used without such side effects of chemotherapy. This study aims to determine with different factors of construction what morphologies of phospholipids will be created, which can then be tested for use in the human body as means of drug delivery. The samples of phospholipids will be created with DPPG DPPC and DHPC, and with a certain R value (.5 and .1) which is the long chained lipids over the total charged lipid concentration. From each different sample of lipids a sample of a concentration of .1 and .05 will be created to be tested in the DLS (dynamic light scattering) machine. The DLS machine can determine the size of various particles by measuring the random changes in the intensity of light scattered within a solution. The different R values will be tested to see how it affects the morphologies, as well as the incubation time, and lipid charge concentration. Results for the changing of the R value will be ready for the science fair; I will not be done with the other two factors in time for the fair. With these results future scientists can have a way to make certain morphologies using my methods. The different morphologies can be tested for use in the human body as a drug delivery system.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BI CH

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3133

Title: Zostera marina's Effect on the Acidification of Long Island Sound

Student Name(s): N. Tomczak

Abstract:

The world faces an increasingly problematic situation. Rising levels of CO₂ in the atmosphere are absorbed by the oceans and the resulting carbonic acid is acidifying the waters. Some have suggested Zostera marina's (eelgrass) use in marine carbon conservation schemes but such strategies require additional research to establish the number of eelgrass plants required to offset specific quantities of CO₂. Over a period of five weeks I measured the concentration of CO₂ under controlled conditions to see how much CO₂ eelgrass is able to consume. We found that over the course of one year, a single plant can consume around 6.1 mg of CO₂. This small number suggest that Zostera marina in its present form would not likely be a highly effective carbon offset tool. For example, a plane produces 53 lbs of CO₂ per mile and for one flight from New York City to London, 3461 miles, a total of 1.36×10^{10} plants would be required for one year to offset the amount of CO₂ released. However, with genetic modification, Zostera marina could potentially be used to counter the rising levels of CO₂.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV PS CH

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LS

Proj.
Num

3134

Title: Neural Entrainment Occurs Early in Life: An EEG Study on Infants and Beat Perception

Student Name(s): S. Gandhi

Abstract:

Neural processing of music requires the coupling of the auditory and motor systems. When listening to melodies, the motor system entrains to the auditory perception of the underlying beat, causing the listener to move in synchrony with the rhythm. However, the way adults move to music can also influence how they perceive the underlying beat. This study examines the influence of movement on neural entrainment to meter in seven-month-old infants. It was hypothesized that infants bounced on every second beat will perceive accents on those beats and infants bounced on every third beat will perceive accents on those beats, despite the fact that both groups heard the same ambiguous rhythm. Each subject was bounced for two minutes while he or she listened to the ambiguous rhythmic stimulus. This stimulus could be grouped into sets of two beats or sets of three beats. They then sat on their parent's lap for two 9-minute blocks, listening to the same ambiguous stimulus while steady-state evoked potentials (SS-EPs) were measured using electroencephalography. SS-EPs were analyzed to determine if movement affected neural perception of the beat. It was concluded that neural oscillations in the auditory cortex encode infants' processing of the beat in rhythmic patterns. The results suggest that movement can bias how infants encode rhythms in the auditory cortex. Understanding how auditory-motor connections develop in infants can contribute to understanding musical and linguistic development in normal and at-risk infants.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

BE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

Proj.
Num

LST

3501

Title: How Does Turbidity Affect Tropical Fern Growth

Student Name(s): Y. Mehta, J. Werenski

Abstract:

We set out to determine how the turbidity of water can affect an aquatic plant's ability to grow. We wanted to test the turbidity of water because if we can find the optimal amount of sediment and use that information with real lakes. To test this, we were to put different amounts of sediment into 2 gallons of fresh water with a Tropical Fern in it and over the course of a week, see which plant has grown the most. The plant we decided to use to determine how turbidity affects plant growth is Tropical Fern. After performing our tests, our results showed when we use 1 tablespoon of sediment, the the Tropical Fern grew an estimated 7 mm. At 1 ½ a tablespoon of sediment, the plant grew 5 mm. At 2 tablespoons of sediment, the Tropical Fern grew 4 mm. Our control group grew about 3 mm. We can conclude from our test that 1 tablespoon sediment per every gallon optimizes plant growth. This information we pulled from our experiment can be used in real ponds and lakes. We can use the information we pulled from our experiment and judge how effective lake water is to grow aquatic plants. For instance, if lake water has only has 3 tablespoons of sediment, we can use the information we got from our tests to build a machine that can filter out excess sediment so the lake can optimise plant growth and so the ecosystem will not be as disturbed.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV EA PS

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

Proj.
Num

LST

3502

Title: Temperature Rising: Exhausted Efforts

Student Name(s): M. Brzostowska, G. Ciambriello

Abstract:

The purpose of this experiment was to determine how different types and levels of CO₂ in our atmosphere are contributing toward global warming. Our experiment tested which source of CO₂ (normal air, air from lungs, or car exhaust) will contribute the most to the warming of our atmosphere. Our hypothesis stated that: the car exhaust will have the greatest effect on temperature because car fumes contain the most carbon dioxide which will play a factor in trapping the earth's heat and contribute to gradual climate change. In order to do so we collected normal air, air from lungs, and air from a car exhaust in three separate jars, then heated up the temperature in each jar to 32°C and observed how each source of CO₂ affected the temperature over the duration of 2 hours. However, our hypothesis was proven incorrect. Trial 1 and Trial 2 proved that the air from the lungs was able to absorb and re-emit the most infrared radiation because it had the smallest decrease in temperature. In this case it was the biggest contributor to global warming. However, all of the sources of CO₂ had a gradual increase in temperature after 90 minutes. This shows that after a certain time period, the CO₂ molecules begin to re-emit the heat, contributing to an increase in the temperature of our mini earth. This ability to absorb and re-emit infrared energy is what makes CO₂ an effective heat-trapping gas, contributing to the gradual global warming of planet earth.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LST

Proj.
Num

3503

Title: The Effect of the Angle of Solar Radiation on Plant Growth

Student Name(s): P. Prama, P. Omotosho

Abstract:

Plant growth is highly regulated by light as it plays a significant role in photosynthesis, therefore choosing locations with ideal lighting can prove to be very critical in the health of your plants. However, during cold winters in areas, like New England, people tend to grow plants indoor due extreme temperature changes. The angle of the light from one season to the next can be just as difficult of a challenge. To observe the effect of light angle on plants, replicated planters of tulips were exposed to various controlled angles to test for any effect on plant height. Our experiment was for a four-week period and during those four weeks we collected and recorded the heights of the plants. The results of our experiment indicate that the angle of solar radiation influences the growth of tulips. Our results suggest that placing tulips at an estimated angle of 82° results in optimum growth (greater than the other treatments by 0.8 cm and 0.5 cm) would result in an optimum growth. Understanding the effect of light angle on plants could assist planters with determining the best suited angle for their plants.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS EV PS

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

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CSEF Official Abstract and Certification

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Proj.
Num

LST

3504

Title: Decreasing Crime Rates and Lowering CO2 Levels through the manipulation of Plant Growth

Student Name(s): A. Akarsu, K. Saryyev

Abstract:

Trees prove to be critical in sustaining a more healthy, efficient environment by reducing CO2 levels, and, according to a study done by Yale University, aiding the reduction of crime rates. In many cities in the United States, such as Milwaukee and Baltimore, as well as cities in Jamaica, San Salvador, and South Africa contain high crime rates. In addition to high crime rates, global warming and CO2 emission is rapidly increasing. Taller, faster growing trees/plants are needed in order to aid in the reduction of CO2 levels and reduction of crime rates. Air pressure affects plants' growth and sound waves are a type of wave that can change air pressure. The purpose of this experiment is to hypothesize a way to manipulate sound waves around plants in order to affect the plant's growth patterns. In order to test this idea, 3 of two sets of Wisconsin Fast Plants (6 total) (*Brassica Rapa*) were grown under identical conditions. The plants were kept to grow in room temperature at around 74F and received a constant fluorescent light for 24 hours a day. For 60 minutes everyday, one plant in each group was put next to Ney (sufi) music, the other plant in a mix of vulgar, violent music. The other group was held as a constant. Growths of each plant were measured everyday and the conclusion proved that the groups which listened to music (good and bad) displayed a slight increase in growth height over the period of time.

**Technical Disciplines Selected by the Student
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EV PS EM

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

LST

Proj.
Num

3505

Title: DNA Barcoding to Detect Mislabeling and Endangered Species in Turtle Meat

Student Name(s): M. DeVita, I. Caponiti

Abstract:

DNA barcoding has been used to detect wildlife trafficking and mislabeling in food products. However, it has never been used to detect the mislabeling or illegal trade of turtle meat. Endangered turtles include the leatherback sea turtle and the bog turtle. In addition, the common snapping turtle may also soon be listed among the endangered turtle species. This is significant to our study because many of the turtle meats from online suppliers are labeled “snapping turtle”. If this species becomes endangered, it will no longer be legal to sell that species of turtles, so it is important to determine its prevalence online. It is hypothesized that when turtle meat is purchased from online sources, a mislabeled turtle species and even an endangered turtle species will be discovered. In order to discover mislabeling, turtle meats will be collected from online sources and from shops in Chinatown, NYC. The DNA will be extracted and amplified using PCR. It will then be analyzed using gel electrophoresis to confirm the amplification. The samples will be sent out for sequencing and then analyzed using an online database. It is expected that at least 2 out of 5 of the turtle species tested will be mislabeled or endangered. The websites with the least amount of description regarding their products will most likely be mislabeled and possibly include an endangered species. Testing is complete and results are pending. In the future, research could be advanced by DNA barcoding other exotic meats that are also possibly endangered.

**Technical Disciplines Selected by the Student
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AS EV BI

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

Proj.
Num

LST

3506

Title: Fertilizer affect on Plant Growth

Student Name(s): N. Skrabacz, M. Roman III

Abstract:

It is very common for residents trying to maintain their lawn to often over fertilize with the belief that it guarantees green and healthy lawns. With that in mind, this study was done to evaluate the potential benefits of natural and synthetic fertilizer on growth of commonly gardened vegetables. In replicated trials these tomatoes were grown in controlled greenhouse conditions with the expected outcome that synthetic fertilizer would produce the most efficient growth because it was formulated for that very purpose. Results of this study indicate that despite the fertilizer being essential nutrients for the plants, over fertilization using either natural or synthetic fertilizers can inhibit plant growth and potentially be major environmental threats. Residual nutrients in the soil will inevitably become runoff leading to eutrophied coastal waters. If this issue goes unchecked and people continue to over fertilize their lawns, an issue especially prevalent in the summer, then anthropogenic impacts on the environment will drive irreversible damage. This study serves to show that needed nutrients do not guarantee growth, and should not be used that way.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS EV

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4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

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Proj.
Num

LST

3507

Title: Use of Saccharomyces Cerevisiae and Biosorption in the Purification of Industrially Polluted Waters

Student Name(s): E. Cicek, M. Acar, A. Edris

Abstract:

The Earth is running out of fresh water supplies due to global industrial pollution. Most of the current industrial systems are not environmentally friendly, usually dumping waste into lakes and fields. To clean those wastelands, this experiment uses saccharomyces cerevisiae, otherwise known as yeast, and its bio-sorption abilities. The wastewater would not only be cleaned but the leftover yeast could be used as a fertilizer and the leftover metal ions could be used in the production of other goods. The procedure starts with mixing 1 liter of distilled water with 20g of copper sulfate, nickel nitrate, and lead nitrate in a container. After the mixture is stirred for 30 seconds, the yeast is activated with glucose. The activated yeast is then poured into the ionic metal mixture which sits for 48 hours. Then, the yeast is filtered and removed. The remaining liquid is taken to a flame spectrophotometer to measure the ionic metal concentration that was not absorbed by the yeast and the data is recorded. Then the filtered yeast is placed into common household vinegar. The yeast cells release the ionic metals inside of them and the metals could be used in other production methods while the remaining yeast is used as a fertilizer. The data showed that 80% of the ionic metals were filtered by the yeast. The used yeast also makes a healthy fertilizer. The results prove that this filtration method is efficient and affordable which will allow major companies to keep a healthy and sanitary environment.

**Technical Disciplines Selected by the Student
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BI EV EM

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4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

Fair Category

Proj.
Num

LST

3508

Title: Target Identification: Frequency of the PV92 Alu Insertion within a Given Population

Student Name(s): J. MacFarlane, N. VanBelle, E. Ganshaw

Abstract:

The purpose of this investigation was to examine the frequency of the PV92 Alu insertion within a given population and to identify any correlation that might suggest PV92 is a target gene for other traits. It was hypothesized that through DNA isolation and testing, it would be possible to identify the PV92 Alu gene insertion within certain individuals and identify a correlation, if any, to other traits based on an accompanying health history survey. DNA was extracted from each participant using cheek swabs, isolated, and then underwent polymerase chain reaction (PCR). The PCR products were run through agar gels in an electrophoresis chamber, and compared against controls, including homozygous and heterozygous PV92 strands, to determine whether or not a DNA sample possessed the PV92 sequence of DNA. Once the PV92 Alu genotype in the samples was determined, the medical history surveys and the data were analyzed for a possible correlation. The data trends were examined and the participants were advised of the overall findings, but not of their own personal results. Data analysis indicated a general correlation, however, the trend found was not statistically significant. Evidence suggests that future investigation include a larger data set.

**Technical Disciplines Selected by the Student
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CB BI ME

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

Proj.
Num

LST

3509

Title: The Effects of Seed Priming

Student Name(s): S. Guijarro-Sines, M. Pierce

Abstract:

This study was conducted in order to determine possible benefits of seed priming for minimizing pollutant fertilizer runoff and improving agricultural efficiency in early plant growth. Common basil seeds were either not primed, hydroprimed, or soaked in fertilizer. Replicated seeds of each were grown and monitored for germination time and early growth. Though it was predicted that the fertilizer-primed seeds would do the best, the basil that was not primed grew the best. After 18 days of growth no fertilizer seeds grew (0%), 30% of the hydroprimed seeds grew and double that of the control seeds (60%). The fertilizer soaked seeds did not grow due to the possible residue left over on the seeds that created an acidic environment every time that the basil was watered. The hydroprimed seeds germinated before being planted which assisted in those seeds emerging first. They showed more promise in the earlier stages of growth but then after being exposed to regular growing conditions for 12 days, the sprouting slowed. In this case, priming the basil seeds with fertilizer did not have a positive effect but they have in other studies.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS EV CB

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

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Num

LST

3510

Title: The Designing and Application of the Single-Cell Immunoplex Device

Student Name(s): L. Vortmeyer, J. Lee

Abstract:

Various proteins are secreted on the cellular level, including cytokines, chemokines and growth factors, serving the gateway to a better understanding on basic cell knowledge and therapeutic topics such as cell signaling in the immunological system, stem cell research (Lu, et Al, 2013), and tumor microenvironment. A more effective alternative to ELISA and ELISPOT assays that detect these proteins, the Immunoplex Single-Cell Analysis device was our object of experimentation and development. The device is composed of two distinct parts: a subnanoliter microchamber array and an antibody barcode for secretion analysis. This amalgamation has to be stationary, or in other words, 'clamped down', in order to result in proper analysis. Faced with a need to create a distinct clamp that will epitomize many different parameters at once, we tested various aspects of the effectiveness of the final clamp that was 3D designed, printed and finally created. We received help from the Rong Fan Lab of the Yale Department of Biomedical Engineering to properly develop a clamp that encompassed those parameters. To confirm device effectiveness we partook in trials that put it to use. Upon observing activated CD4+ T-cells from healthy human controls on a single-cell level, high levels of heterogeneity and polyfunctionality was eminent. Various populations of TFH and T-helper cell subtypes were also observed using the Immunoplex device. Based on secretions from those populations, we were able to draw similarities between the origins of those populations and those of functional phenotypes such as TH1 and TH2.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EN ME CB

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

Proj.
Num

LST

3511

Title: The Behavioral Effect of Molting Patterns in Hermit Crabs

Student Name(s): J. Kral, G. Chirieleison-Yraita

Abstract:

Crabs' ecosystems are being disturbed in the Chesapeake Bay. Many trappers may not realize how harmful they are being when they catch more crabs than are being reproduced. If this happens, the crab population in the Chesapeake Bay will deteriorate. This project aimed to increase the knowledge of those in our communities on how the molting cycles of many crabs affects their behavior. To do this, we provided near-molting land hermit crabs with a controlled environment and observed their behavior in replicated experiments as they completed this process. After our data collection ended, we concluded that the crabs' behavioral patterns nearly nullified; they laid dormant and secluded for many days, ate nothing, and drank minimal amounts of water. These results supported our hypothesis that they would do nothing or would reduce their metabolic activity. This data is important because the molting patterns of a land hermit crab are comparable to those of the commonly trapped blue crab. If blue crabs are being trapped on a large scale during their molting seasons, they will be brought in at a higher rate than they are reproducing, and thus the population will be depleted. Thus, if those who could potentially be responsible for this population depletion know of the molting patterns of blue crabs and what to look for when these organisms may be molting, vulnerable blue crabs may be better protected. This education has potential of bettering both these crabs and the people eating them; population depletion would be unfavorable for both.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AS BE

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

LST

Proj.
Num

3512

Title: The Influence of Time Consistency and Processing Speed on Multimodal Perceptual Experience

Student Name(s): E. Silvert, Y. Zhang

Abstract:

The McGurk effect occurs when incongruent auditory (i.e. “ba”) and visual (i.e. “fa”) components of speech are presented together so that they are perceived as a fused percept (i.e. “va”). How does timing of the presentation of auditory and visual stimuli affect McGurk susceptibility? An understanding of this question will also be applied to individuals with schizophrenia who have shown abnormalities in perceptual processes. A pilot study was necessary to determine which offsets to use in the second phase of the study, which included use of electroencephalography (EEG). In the pilot study, healthy participants watched a video with the trials varying in two manners: the timing of the stimuli and the auditory-visual combinations. Behavioral data indicated which offsets were important to use for the EEG phase of the study and revealed that stimuli asynchrony needed to range from one second of auditory lead and one second of auditory lag (in relation to the fixed visual stimulus). The data also indicated that the stimuli should be presented in a fixed order. For the EEG phase, the video was reassembled to include 10 repeated trials of 19 timing offsets. Healthy and schizophrenic subjects reported their interpretation of each trial while their neurophysiological response was recorded. Lower activity in the posterior temporal cortex of the brain and a narrower window of McGurk susceptibility is expected in subjects with schizophrenia. Results should provide insight into audiovisual integration mechanisms and how schizophrenia affects integration. Findings could help diagnose and explain audiovisual abnormalities associated with schizophrenia.

Technical Disciplines Selected by the Student
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BE ME AT

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

Proj.
Num

LST

3513

Title: The Effect of Prescribed Burns on Soil Nutrients

Student Name(s): D. Rafuse, J. Coates

Abstract:

Prescribed burns have been used to both eliminate fuel for possible fire breakouts and to help remineralize the soil found in forests. One of the byproducts of the burns, especially in areas where burns don't happen frequently, is whether or not the fire remineralizes needed nutrients to initiate new growth. This study was done to examine the effect of prescribed burns on generation of primary growth of ground cover (wild flowers). After controlled burns of juvenile maple saplings, a typical deciduous canopy species, replicated treatments of plant growth were monitored for 30 days. It was found that the control group (synthetic fertilizer added) averaged more growth than the plants treated with ash from the burn. ANOVA statistics were run and it was found that $p=0.06$. This led to the conclusion that prescribed burns have a greater long term effect than short term, and are optimal on a large scale.

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PS EM EV

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Num

LST

3514

Title: The Effect of L-Ascorbic Acid on Protoreaster nodosus Regeneration

Student Name(s): M. Krah, A. Fiala

Abstract:

Collagen is a connective tissue that heals wounds. The Protoreaster nodosus, colloquially known as the “Chocolate Chip Starfish”, contains srap, (a regeneration-associated protease), which synthesizes collagen. This is similar to plasmin in the human, which also synthesizes collagen. The hypothesis is: If L-ascorbic acid is supplemented into a Protoreaster nodosus’ diet, then the rate of regeneration of the Protoreaster nodosus’ limb will increase because collagen, a protein which connects tissue, requires L-ascorbic acid in order to synthesize. In this experiment, four Protoreaster nodosuses were bought and placed in four separate tanks, each included a tank heater and a filter. The same filters, tanks, salt water, and sand were used for each tank. One limb was removed from each Protoreaster nodosus via scalpel. Then 250 mg of L-ascorbic acid, also known as vitamin C, were put into tanks B, C, and D by first being grounded into a powder, and poured into the water. Subject A was the control and received no vitamin C. Over a period of 18 days, with the limbs being measured every 3 days, Subjects B, C, and D showed signs of growth while the control did not. Subject B grew 0.01 centimeters, Subject C grew 0.02 centimeters, and Subject D grew 0.03 centimeters. The hypothesis was supported. This experiment can be further carried out by either altering the amount of vitamin C, or seeing if humans scrapes could heal faster since both the human and the Protoreaster nodosus contain the tissue collagen to synthesize wound healing.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BI CB AS

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4. Is this project a continuation? Yes No

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- Yes No

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Fair Category Proj. Num

Title:

Student Name(s): T. Brysgel, D. Lin

Abstract:

Biogas is defined as the product generated from methane gas that is released from manure that can then be turned into fuel used to generate renewable energy. The purpose of this experiment was to find out which type of animal manure generates the highest amount of methane gas, therefore making it the best suited for creating biogas. It was predicted that cow manure would release the most methane. The experiment was performed by placing 6 different types of animal manure inside of different bottles with balloons on top which trapped the released gas. The diameter of the balloons were measured once a day for 3 weeks. The larger the diameter of the balloon was, the more methane gas the feces released. For the first couple days all of the balloons were inflating at a continuous rate. However, eventually each balloon started to grow less and less on a daily basis, signifying that the feces had released most of its methane gas. By the end of the experiment, the balloon collecting the methane from the cow manure grew 5.75 cm, which was the largest growth out of all the balloons. The goat and horse manure balloons also grew 4.5 cm and 4.25 cm respectively. This experiment shows that cow manure is the best type of animal waste for creating biogas due to the high release of methane. With this information, scientists can invent and improve new methods for creating efficient biogas that may be used to someday power society.

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Num

LST

3516

Title: The Effect of Soil Alkalinity on the Lycopersicon Esculenta (plum tomato)

Student Name(s): A. Brennan, T. Close

Abstract:

The pH levels of soil are very important to the healthy growth of plant products. However; the use of lime to combat the soils raised acidity may be overused. The data collected in this study showed that the growth of plum tomatoes can be inhibited by high pH. It also suggests that having acidic conditions did not seem to inhibit growth. This would mean that the use of lime to raise the pH of soil or combat acid rain might actually inhibit the growth of plants instead of it helping them. The other serious problem with using liming agents is run off. In many farming communities people have their own well from which they get their drinking water. If liming is over done, the run off may get into the well water, and if human's blood rises above a pH of 7.8 it can be lethal. In today's society industrial pollution causes acid rain, and lime is advertised to combat this lowering of pH, especially in New England where there is a lot of industrialization and not a lot of lime in the bedrock naturally. This lime in other areas helps combat the acidic conditions caused by industrialization. However; lime should only be used if the pH drops below 5.4.

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EM PS EV

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Num

3517

Title: Using DNA Barcoding to Study Invasive Species on a Suburban Campus

Student Name(s): M. Henrie, K. Siciliano, L. Pura

Abstract:

Invasive species can be a threat to biodiversity and are important to study in many locations across the country. Invasive species are plants, animals, or other organisms that are introduced to an area outside of their original location. They can harm their new environment because they have no natural enemies to limit their reproduction. They therefore usually spread quickly and widely. This study seeks to determine the prevalence of invasive species on a suburban campus and whether the distance away from campus will produce a greater number of invasives. It is hypothesized that the greater the distance away from the main campus, the greater the number of invasive species. This is because the main campus is manicured while farther away from the campus there are more natural wilderness areas and wetlands. DNA was extracted from plant samples from 4 locations on campus. Multiple samples were tested from each location. After extraction, the DNA was amplified and the amplification was confirmed through gel electrophoresis. The samples were sent for sequencing and the results were analyzed using an online database. Invasive species were found at most locations, including those close to the campus buildings. One species that was barcoded was not found in the database, possibly indicating a novel sequence. Knowing the extent of the invasive species in communities can allow us to take action to eliminate them. The next step will be to discover ways to remove or limit the invasive species.

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4. Is this project a continuation? Yes No

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- Yes No

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Num

LST

3518

Title: Title: Recycling of dead leaves in and use them in paper production

Student Name(s): O. Aydin, Y. Demirkol, M. Coskun

Abstract:

Over the last centuries human actions have become extremely harmful for environment. One and half acres of forest is cut down every second. If the deforestation continues at this rate it will take less than 100 years to destroy all the rainforests on the earth. The main purpose behind this deforestation is to get resources for making paper. The United States has less than 5% of the world's population, but consumes more than 30% of world's paper. In order to create sustainable ecosystems we should find both more economic and convenient ways to produce paper-made products. The aim of this project is to lower the deforestation rate by using fall foliage and plants. In order to produce paper from the leaves and plants, materials were waited in a lime-water solution for 3 days. Then these leaves were squeezed into a dough. Wire netting was used to filter the fibers from the water. After a day, the absorption process has occurred and the dough was pressed flat. After drying the dough, it was cut and then made into paper. This process was repeated several times with different types of leaves and plants in order to determine the most cost-efficient and environmental-friendly ways. The determinants of strength of the leaf are fiber and cellulose. Trees and plants such as Betula Papyfria, Acer Saccharum and Miscanthus were used in this experiment. From the results of the experiment, it was concluded that Miscanthus is the best plant to produce paper from its leaves.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV PS EA

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

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Proj.
Num

LST

3519

Title: The Effect of Reduced pH on Submerged Aquatic Vegetation

Student Name(s): C. Murphy, C. Tanner

Abstract:

Our goal was to examine an aquatic plant's response to potential stressors in its environment (the stressor being low pH level). Heretofore, there has been much research concerning the effect of lowered pH levels on aquatic animal life and even coral, but there is a dearth of this same research centered around actual base-level plant populations. Thus, we simulated a plant-specific freshwater environment with decreased pH levels. We maintained eighteen sprigs of *Hygrophila difformis*, giving each set of three sprigs a pH level lower than the last set of three, starting at pH seven and ending at pH two. We found that the trial beginning at pH three had the best buffering capacity, recovering to a pH of about six and a half. As a result of our experiment, we now have a better understanding of a freshwater plant's response to an acidic environment and have projected ideas of how this knowledge may be utilized accordingly.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV EA

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CSEF Official Abstract and Certification

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LST

Proj.
Num

3520

Title: A Natural Way to Keep Insects Away by Using Essential Oil as an Organic Insect REpellent

Student Name(s): O. Tekin, T. Cangoz, A. Emhan

Abstract:

For many years, people used various forms of insecticides, insect repellents, and other products to keep insects away from our homes and environment; however, those products caused rapid decreases in insect populations. As everyone knows, there are thousands of insect species that have benefited us such as bees, spiders, and beetles; yet, we do not hesitate to kill them. Since 1970, insect numbers in cereal fields in Sussex have dropped by half (GCT 2004). We know that if bees vanish from Earth, human population would face a catastrophic end in only a couple years. Many other bugs have multiple benefits to humankind without showing it. Aside from loss of species, our own health is another factor in which we seek to overcome. We know that insecticides harm humans and our environment as much as they harm bugs. Our plants and crops get damaged from those chemical substances. Even breathing those substances leads to permanent damage in people's lungs. Our project is based on a way to find a new and ecologically beneficial way to produce insect repellents through various types of essential oils extracted from plants. If these essential oils, such as peppermint, tea tree, lavender, tobacco, garlic, citrus, are isolated from plants, they will repel insects because insects find the smells unpleasant and overwhelming. They are used as natural deterrents against insects. It is easier, cheaper, and better to grow plants to process them in order produce insect repellents, rather than using expensive, harmful chemical substances near our homes.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS EM BI

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CSEF Official Abstract and Certification

Fair Category

Proj.
Num

LST

3521

Title: The Effect of pH levels in Presoaking Liquids on Fruit Dehydration Duration

Student Name(s): B. Doughty, L. Abreu

Abstract:

Dehydrated fruit can last for extended periods of time without spoiling. Depending upon the fruit, it can take between 6-12 hours to dehydrate the fruit. If the acidity of the pre-soaking liquid was changed, then this may allow for dehydration duration to be shorter making production easier and quicker. In the process of testing five different types of fruit pre-soaked in five different liquids of varying pH levels, it was determined that the membrane integrity of the fruit likely plays a larger role in the process than pH of the pre-soak liquid. When comparing the percentage of weight loss for the three trials for each fruit pre-soaked in diluted lemon juice and distilled water, there was no difference ($p=0.9894$). When comparing cantaloupe and grape soaked in distilled water, there was a difference in dehydration rates ($p=0.0049$). This supports the idea that the acidity in the pre-soaking liquid did not have an affect but, that the fruits membrane can affect how long dehydration takes. Manufacturers and home cooks who dehydrate food can keep this in mind as they may have time restrictions on their production. The membrane integrity is a factor in the duration of dehydration whereas the acidity in the pre-soaking liquid is not.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CB EV PS

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CSEF Official Abstract and Certification

Fair Category

LST

Proj.
Num

3522

Title: Desalination by Portulaca oleracea: Maintaining and stabilizing overall growth and production of Omega-3 Fatty Acids

Student Name(s): C. Peisch, T. Kern

Abstract:

The purpose of this experiment was to investigate Portulaca oleracea's ability to desalinate water in a hydroponic system, including its ability to maintain and stabilize levels of Omega-3 fatty acids when grown in a high salinity environment. It was hypothesized that Portulaca oleracea (common name: Purslane) would desalinate water in a hydroponic system, as well as maintain and stabilize high levels of Omega-3 fatty acids in a high salinity environment. Experimentation involved 3 major steps. The first step involved growing and observing of Portulaca oleracea in an indoor environment under a UV artificial light. The same species of the Portulaca oleracea weed was prepared in four different containers. The Portulaca oleracea in each container was grown for about 3 months in order to be used for further desalination and omega-3 fatty acid tests. The second step included preparing the 5 hydroponic systems, each containing 0.0, 5.0, 10.0, 15.0, and 20.0 ppt (parts per thousand) of Instant Ocean artificial salt mix. Changing levels of salt concentrations were recorded daily for 2 weeks. The final phase of experimentation assessed and compared the 5 different levels of salt water concentration, as well as an analysis of Portulaca oleracea's omega-3 fatty acids. It was concluded that Portulaca oleracea desalinated salt water concentrations in a hydroponic system while maintaining stabilized high levels of Omega-3 fatty acids in a high salinity environment.

**Technical Disciplines Selected by the Student
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CSEF Official Abstract and Certification

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LST

Proj.
Num

3523

Title: The Effect of Thermal Stress on the Behavior of Coenobita clypeatus (hermit crabs)

Student Name(s): P. Ehwarieme, S. Hidalgo

Abstract:

For our project we wanted to experiment if thermal activity has an effect on a coenobita Clypeatus. For our hypothesis we said that colder temperatures would have more of an effect on the hermit crab because the coenobita Clypeatus usually lives in warmer temperatures. So in order to examine/test this experiment we would have to use 3 coenobita Clypeatus. Arrange 3 Tupperware containers with one covered with ice, another with heat pads, and one in it's regular temperatures. After we tested several trials we did in fact find out that our hypothesis was correct. Thermal Stress does affect the stress levels of an coenobita Clypeatus.

**Technical Disciplines Selected by the Student
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AS BE EV

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CSEF Official Abstract and Certification

Fair Category

Proj.
Num

LST

3524

Title: DNA Barcoding: Fish Finders

Student Name(s): L. Alderson-Smith, C. Thomas

Abstract:

Food mislabeling may lead to health problems for consumers. Researchers have detected the mislabeling of high-end fish such as sea bass and red snapper. However, research has not been conducted for the common fish stick. We plan to use DNA barcoding to test fish sticks for food mislabeling. We will test both commercially sold and school setting fish sticks. We expect that the fish species will vary in quality, with some fish sticks using very low grade fish rather than the higher quality fish they claim to contain. Results are underway, and thus far none of the fish samples that have been barcoded are mislabeled. Findings are still being analyzed. The findings will further the avenues of food mislabeling and enlighten consumers regarding the policies and procedures of certain food companies.

**Technical Disciplines Selected by the Student
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BI ME MI

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CSEF Official Abstract and Certification

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LST

Proj.
Num

3525

Title: The Effects of Acetylsalicylic Acid on *Pisum sativum* var. *saccharatum* (snow peas)

Student Name(s): A. Sanchez, D. Croft

Abstract:

Abstract Aspirin does affect germination and early stages of plant growth. The plant we used was *Pisum sativum* var. *saccharatum* (snow peas). The treatments included the control and, low and high dose aspirin in both liquidized and powdered forms. Data was collected every five days for over 15 days and were backed up statistically by p-values, which showed significant difference in the plant growth as the p-value was less than 0.05. Our hypothesis was that low-dose aspirin would produce the highest growth rate due to the immune response needed for living organisms. This started off to be supported in the early stages of this experiment, but was later proven false. The data collected showed that the control group with no aspirin had the best growth rates at the end of our experiments and low dose aspirin liquid had a positive boost only within the early stages of germination. Botanists and people concerned with the environment would care about this because if we find more efficient ways to plant, we can improve the way we grow and utilize plants. Or if someone has difficulty with plant germination, this may be useful. This may also increase photosynthesis rates because we can use plants that grow quicker as it also shows low dose liquid aspirin can help give the plants immune system a boost for germination.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

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CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4001

Title: The Hard Truth About Water Hardness: Which body of water is the healthiest (in Water Hardness)?

Student Name(s): J. Wang, G. Wang

Abstract:

Have you ever encountered that disgusting soap scum in your shower? Whether you believe it or not, it was caused by water hardness. Water hardness is important because it assess fish life and shows if the water is sufficient for human use. In our experiment, we decided to test the water hardness of water sources in the New Haven area, calcium carbonate, and tap water. Our problem is: Which body of water is the healthiest (in Water Hardness)? Our approach to investigating this problem was asking ourselves :How are we going to measure water hardness? We are going to test water hardness by titration. Some materials we used included calcium carbonate. Overall, we found that tap water had the healthiest level of water hardness. It contained 50 mg/L of Calcium Carbonate. Tap water was in the precise range for healthiness because 50mg/L is a healthy amount. In second place, Wintergreen Lake had 38.89, Mill River, with 172.22, Beaver Pond, with 366.67, Calcium Carbonate with 500, Quinnipiac River with 2666.67, Long Island Sound (New Haven) with 4455.56, and finally Long Island Sound (West Haven) with 4888.89. Our project contributes to the water environment because we found the amount of calcium carbonate of water sources in the New Haven area. Calcium carbonate can indicate whether the water is a healthy place for wildlife or not. We met all of our objectives because we found the water hardness for all of our sources.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH EV EA

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CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4002

Title: The Temperature Effects on Basketball

Student Name(s): D. Echavarria, S. Simmons

Abstract:

We decided to do this project because we wanted to discover why whenever we played basketball in different temperatures, the ball seemed to bounce at different rates. We believe that the ball bounced the highest in hot temperatures and bounced the lowest height in cold temperatures. To find the results to our question, we isolated a room by blocking all windows with trash bags to keep a stable temperature and be able to change the basketball to any desired temperature. Then, we took a measuring tape and attached it to the wall. After that, we would change the temperature of the ball to our desire. Finally, we dropped the ball from five feet at three different types of temperatures and recorded the height of which it bounced to. We also applied a temperature strip to allow us to make sure the temperature of the ball was the same as the room. We changed the ball to three different temperatures, one was at 120 degrees Fahrenheit, another was at 70 degrees, and the last one was at 30 degrees. As a result the ball bounced highest when it was at 120 degrees (the hottest point) and bounced lowest at 30 degrees (the coldest point). The process of this project was not what we expected. It was hard to get an exact measurement of the height the basketball bounced so if we were to continue this project we probably would have found a better way to find an precise measurement.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH MA

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4003

Title: Analysis of Safer Electroplating Metals and Electrolyte solutions with their Environmental Impact

Student Name(s): M. Shleifer, Z. Klein

Abstract:

The goal of our experiment was to use safer electrolyte solutions to electroplate different metals. We wanted to find out which solution made the metals gain the most weight which meant the electroplating process had occurred. After performing many tests to figure out how strong each individual solution needed to be, we then began to electroplate our metal variables. We discovered a number of different things: Some of the electrolyte solutions had little to no effect on our metal samples. Electrolyte solutions that are too strong only caused the metals to disintegrate (Effective: 0.1m to 0.05m.) Solutions such as copper sulfate and zinc sulfate worked remarkably well to coat some of the metals. We also found that although one electrolyte solution may work on one metal, it might not work on a different metal. Vinegar was the least effective. Our "Eco-plating" had mixed results. Three of the electrolyte solutions, copper sulfate, zinc sulfate, and lemon juice had positive results on at least two metals. We were excited to find a safer 'Eco-plating' method.

Technical Disciplines Selected by the Student
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EE AT EM

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CSEF Official Abstract and Certification

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PT

Proj.
Num

4006

Title: Meltdown

Student Name(s): J. Majewski, J. Williams, K. Clark

Abstract:

So you think temperature is the only thing that affects how fast things freeze or melt? Well, salt has been proven to lower the freezing/melting point of water. When salt and water mix a chemical reaction occurs. The experiment we chose was to demonstrate the melting properties of different salt compounds. We chose this topic because we live in New England and we wanted to know what would make the best ice melt during the long winter months. We used ice cubes, left them outside at 28 degrees and added different salt compounds to each. We checked the progress at 20 minutes and recorded our results. Trials were repeated three times. We concluded that the calcium chloride was the most efficient way to melt the ice.

**Technical Disciplines Selected by the Student
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Proj.
Num

4007

Title: Density Intensity; Is a Density a Quality?

Student Name(s): R. Antonios, J. Sorrentino

Abstract:

Many people say the greener the vegetable the healthier it is. What about Density? Do small characteristics like this determine the nutritional value of a fruit or vegetable. This project looks at the correlation between density and a fruit or vegetable's nutritional value. The fruit and vegetable's density were measured using a mechanical scale and graduated cylinder. The nutritional value was found using daily value from the FDA and the percentage each fruit and vegetable had of each vitamin. Each fruit and vegetables's vitamin percentages of the daily value were averaged to get the nutritional score. Our hypothesis was that there would be an insignificant correlation between the density and the nutritional value. The experimental results backed up our hypothesis by showing there was a insignificant correlation by giving us a low percentage. If the percentages were higher, density would have played a much more important role than it does. Other than showing the correlation between density and the nutritional score, it demonstrated which fruits and vegetables are more nutritious for you.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BI ME

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- Yes No

Title: Novel Methods for the Generation of Solar Steam, under Concentrated Solar Thermal Energy with a Fresnel Lens, using Graphene, Carbon-Foam, and Steel-Sponge Sponge

Student Name(s): M. Moghul, I. Moghul

Abstract:

Potable water is inaccessible to 769 million people. 96.5% of earth's water is trapped in oceans, salty, therefore inconsumable. The current drought problem in California, adjoining Pacific Ocean, can be solved by desalinating ocean-water. Most desalination processes (e.g. MED, MSF) require phase change. Steam is essential for such procedures. Steam is also used in the manufacture of > 80% of American products. Renewable, clean, inexpensive 'solar heat' is being explored to generate 'Solar Steam'. Our goal was to engineer a global solar-steam-generation-device which could, not only be applied to desalination plants in warm regions, but also to snow-abundant places like Connecticut. In order to explore thermal properties of popular carbon products, we questioned; whether mixing ocean-water/snow with graphene & carbon-foam could generate steam when exposed to concentrated solar thermal energy under Fresnel lens? If so, would addition of these 2 materials to a heating element (steel-sponge), enhance steam-generation? To answer this; two separate experiments were performed with Atlantic ocean-water, and backyard snow. 5 different combinations (experimental-groups) of graphene, carbon-foam and steel-sponge were tested with water/snow. Solar steam was generated most proficiently by the "steel-sponge+graphene" combination. Proficiency was analyzed in terms of 'time taken to produce steam' & 'rate of temperature rise'. This steam was further condensed in an experimental set-up using "steel sponge+graphene". This combination produced condensate from ocean-water with an efficiency of 60%, generating 15 ml water in 1 hour, and from snow with an efficiency of 32%, producing 8 ml water in 1 hour.

**Technical Disciplines Selected by the Student
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EN EM CH

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CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4009

Title: Surface Tension

Student Name(s): J. Kulaga, M. Fickes

Abstract:

Purpose: Surface tension is a property of water that allows it to resist external forces. We tested the influence of different substances on the surface tension of water. **Procedures:** We made rafts out of transparency film by cutting it into rectangles 12 cm x 6 cm. We then cut out a square at the end of the raft. Next we cut sponges 1.5cm X 1.5 cm and ran a toothpick through each sponge. We taped the toothpick to the back of the raft. We then took plastic water basins and filled them with room temperature water. We put the rafts into the water, and then we collected some household items including: liquid laundry detergent, liquid hand soap, table salt, etc. We used eye droppers to put a drop of each substance on the sponge on the raft. **Results:** Some of the rafts moved while others stayed still. Some of the substances, such as the liquid laundry detergent, made the raft move, which means that laundry detergent effects the surface tension by decreasing it. Some of the other substances, like the vegetable oil, didn't make the raft move, which means it had no effect on the surface tension of water. We put each substance on the sponge of the raft a few times to test the surface tension. **Conclusion:** We concluded that some of the substances effected the surface tension of water causing the raft to move, and others did not effect the surface tension causing the raft to stay still.

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PH

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Proj.
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4010

Title: Analysis of Nature's Digestive Enzymes and Effect of Inhibitors and Enhancers on Nutrition and Cell Absorption

Student Name(s): E. Lipsker, C. Kalmanson

Abstract:

ABSTRACT: The purpose of our experiment was to analyze the effect of various natural enzymes, found in our foods, on antioxidant levels and cell bioavailability. We further investigated possible enhancers to the rate of cell absorption, such as dietary metals and pickled variables. We predicted we would find beneficial enzymes in our diets that aid digestion, and also find ways to increase cell bioavailability. Our results were very positive:

- All samples tested had antioxidant value, but fruits, especially citrus, fermented, and pickled samples had very high levels of antioxidant.
- Added calcium actually slowed cell absorption.
- Zinc and iron enhanced the rate of bioavailability, by as much as 954 mg./min. (oats) to 859 mg./min. (pineapple).
- Fermented and pickled variables slowed bioavailability.

So dine wisely and include "Energizing Enzymes."

Technical Disciplines Selected by the Student
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CH ME AT

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PT

Proj.
Num

4011

Title: Fore!

Student Name(s): B. Bellinger, L. Doyle

Abstract:

The purpose of this project was to determine if there is a difference in the distance traveled by an expensive golf ball vs. an inexpensive golf ball. We were curious to know if a golfer would benefit from a more expensive golf ball or not. We understand that the manufacturer sets the price and does not take into account the distance a ball will travel. The participants hit the expensive golf ball and the less expensive golf ball for a total of five times each. After hitting the ball, we measured the distances and calculated the average. In conclusion, the average of the cheap balls was almost the same as the average of the expensive balls. The results supported our hypothesis. We learned that buying the expensive golf balls might be a waste of money because we seemed to hit both types of balls the same average distance.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

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Num

4012

Title: What It Takes to Clear the Loop

Student Name(s): M. Campisi, I. Ricardo

Abstract:

In this project the question presented was, "How high does the drop of a roller coaster have to be to give the cart enough velocity to loop the loop." After doing research we came up with the hypothesis, if the starting point of the roller coaster is higher than two times the height of the loop, then the cart will clear the loop. To test this we built a model roller coaster and used a marble to simulate a cart going down the track. Our procedure for conducting the experiment consisted of us building the height of the loop at 50 centimeters and the height of the starting point at 91 centimeters. Each time we put the marble through the pipe roller coaster we added 7.6 centimeters to the starting height of the model roller coaster. Our results showed different than our hypothesis predicted, but it was not far off. The result showed that the starting point heights of 91 centimeters through 113.8 centimeters the marble was not able to clear the loop. On the starting point height of 121.4 centimeters the marble made it through the loop $\frac{1}{3}$ times and with the next height it made it $\frac{2}{3}$ times. The independent variable was the height of the loop, the dependent variable was the velocity of the marble and the success rate of clearing the loop, and the constants was the height of the loop and the marble.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

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CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): E. DeSandre, R. Asido

Abstract:

A couple years back I went to Niagara Falls and the people who were talking about the falls stated that the fall produces a lot of Hydroelectric power. So when the PBL was introduced hydroelectric energy popped into our minds. So we then discussed the 2 reason why we're doing this experiment and they were we wanted to know how it works and to see how different flows of water would affect how much energy is produced. Our procedure is how to conduct the experiment build experiment fill the bucket with the pvc pipes with 5 gallons of water then twist nozzle to $\frac{1}{4}$ and let the experiment finish and record data do step 2 again then twist the nozzle to $\frac{1}{2}$ do step 2 again then twist the nozzle to $\frac{3}{4}$ do step 2 then twist the nozzle fully then make sure you recorded the data and tested each level 3 times then you are done Our conclusions consisted of with an increase in the flow of water then the energy will increase along with it. As you can see in our results the energy increased every time we increased the flow of water. Making our hypothesis correct. This is because every time you open the nozzle a little bit more the flow of water increases in not just speed but in pressure too. This makes the water hit the spoons with more pressure each time, which will spin the wheel faster, which will give you more power.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4015

Title: Ramps, Textures, and Cars, Oh My!

Student Name(s): S. Falcetti, K. Wadman

Abstract:

How does the texture of a surface affects the speed of a toy car down a ramp? So to find the answer to this question, we raced a toy car down a ramp with four surface textures including artificial grass, wood, sandpaper, and tile on a ramp. Then we timed each trial using a stopwatch. We conducted three trials for each surface texture. The results came out as we predicted; artificial grass making the car move the slowest and and the wood making the car move the fastest. In conclusion, We found that the flatter surfaces, like the wood and sandpaper, that had less friction, moved faster, and the surfaces with rougher surfaces, like the artificial grass and the tile with more friction, moved slower. The data supports our claim: more friction = slower the time. With further testing and research, we have defended this claim.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH ET

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4016

Title: What is the Best Ice Insulator

Student Name(s): H. Greenleaf, B. Kline

Abstract:

For this experiment, we tested to see what insulator was the most effective in keeping ice cold. We got the idea for this experiment when we noticed that there are coolers made of different materials, they all claimed to keep the contents the coldest. This made us wonder which material actually did work the best. We hypothesized that, "If we wrap an ice cube in different materials, then the Styrofoam will be the most effective insulator because the Styrofoam traps the cold air in and keeps the hot air out." We gathered four different materials, wrapped an ice cube in each one of the materials and left them there for an hour. After the hour was done, we measured how much ice had melted. From this experiment, we found that Styrofoam was the most effective material in keeping ice cold. Our results made sense because Styrofoam is used a lot for insulation. There are coolers that you can buy for ice and Styrofoam cups that hot drinks are served in at Dunkin' Donuts.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EM EV

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4017

Title: The Sensing Cane

Student Name(s): K. Yuan, C. Betancur

Abstract:

There are limited options of accessibility for people with impaired vision. Some use a white cane, or a guide dog, which is not an option for everyone. Canes can still result in bumping into objects. The objective of this project was to innovate the current white cane to make a sensing cane to help those who are visually impaired be more aware of their surroundings, and reduce the occurrence of bumping into objects. This innovation took the form of an ultrasonic range sensor added to a normal white cane, allowing the cane user to be able to sense objects further than the cane can reach. To accomplish this, an Arduino Uno, an ultrasonic range sensor, passive beeper, and a white cane were used. The sensor and beeper were engineered to the bottom of the walking cane and were wired to alert the user of approaching objects by beeping. After completing the prototype, several trials of testing were conducted. The student researchers were able to navigate their way around a room full of objects and the prototype was deemed successful. To improve this prototype, however, the components of the system need to be more compact, and located at the top of the cane with only the sensor at the bottom. The beeper would be louder as well. The sensing cane is a great innovation of the white cane, and will help those with impaired vision who struggle with the other methods of assistance.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AT CS EN

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4018

Title: Raining Rust, Causing Corrosion

Student Name(s): A. Knight, K. Omelchenko

Abstract:

Abstract By: Audrey Knight and Kateryna Omelchenko For our experiment “Raining Rust, Causing Corrosion,” we investigated whether salt water and acidic liquid increase the rate of corrosion of steel compared to tap water. We hypothesized that salt water and low pH water would have a higher rate of corrosion of steel than tap water. To test the rate of oxidation, we measured the change in temperature of the liquid in which the steel wool is immersed in, specifically testing three different water conditions over a timespan of ten minutes in an insulated test tube environment. Tap water, which is pH 7, was the control for the experiment. We used seawater from the New Haven harbor to represent the salt-water condition. Acid rain condition was made by adding distilled white vinegar to tap water until it reached pH 4.3. We conducted three trials for each liquid and calculated the average change of temperature in ten minutes for each type of water. Our results showed that the highest average temperature change of the oxidation reaction occurred in seawater condition. The second highest average temperature change was observed in the acidic pH water and the lowest average temperature change was observed in the tap water. These results supported our hypothesis that salt water and low pH water increase the rate of corrosion of steel. Also, we learned that oxidation of steel occurs faster in seawater than in acid rain conditions.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4019

Title: Analysis of the Extraction of Proteins from Under Utilized Resources and Their Nutrient and Bioavailability Values

Student Name(s): B. Koenigsberg, B. Piekarski

Abstract:

Protein is vital to the function of our bodies. Unfortunately, millions of people around the world suffer from protein malnutrition. So we decided to find underutilized foods and their wastes that can easily be grown and thus benefit millions. We used protein indicator to determine the quantity of protein in several variables. We then extracted the protein from food and wastes with high levels of protein. Next we tested the variables for nutrient value and cell bioavailability. We discovered the best protein sources that are easily grown include:

- Most Protein Rich Wastes: Potato, Acorn Squash; Nuts/ Seeds: Sunflower, Hazelnut; Beans/ Vegetables: Red Beans; Grains/ Grasses: Soybean, Lentil, Alfalfa
- Nutrient Rich: Wastes: Potato, Acorn Squash; Beans/ Vegetables: Chickpea; Nuts/ Seeds: Sunflower; Grains/ Grasses: Soybean, Alfalfa
- High Cell Bioavailability Wastes: Potato Waste; Nuts/ Seeds: Hazelnut; Beans/ Vegetables: Red Beans; Grains/ Grasses: Lentil, Soybean

Many of these variables are not only a good protein source, but they are also easy to grow in any environment. We have discovered the "Protein Power"!

**Technical Disciplines Selected by the Student
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AT CH EV

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4020

Title: Peer Pressure and Robots

Student Name(s): R. Sottile, A. Thombre

Abstract:

Studies have indicated that an audience can inhibit a person completing a task. This begs the question of whether robots will inhibit a human as much as another human would. The objective of this project was to determine if the presence of an advanced humanoid robot, NAO would hinder the ability of a person to perform a task; in this case, completing a mathematics, reading comprehension and pattern recognition test. It was hypothesized that if NAO is in the vicinity of the subject then the subject would perform worse compared a subject completing the task alone. To test this hypothesis, 21 students from Amity Middle School Bethany were gathered to take the assessment. A third of the students took the test alone. Another third took the same assessment in a room with another person. The final third took the test with NAO. NAO said some basic statements and questions every minute or so as did the other person in the room. From there, the scores were analyzed in relation to the trial they were under and whether or not NAO caused them to perform better, worse, or the same. The results indicate that NAO had a positive effect on the testers who averaged at a score of about 86%. The testers who were alone averaged at approximately 75% and the testers who were in the company of another human averaged at about 66%. This disproves our hypothesis, and instead indicates that robots socially facilitate humans.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AT CS BE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4021

Title: Keep Out! An Animal-Proof Garden Enclosure

Student Name(s): A. Lencyk, D. Allman

Abstract:

Abstract Our goal is to create an animal-proof garden enclosure for Greenwich Catholic School (GCS). Animals enjoy eating the fruits and vegetables at the GCS garden. In order to keep them out we have designed an animal-proof garden enclosure that is sure to work. We decided to research and price out weather-proof materials for the GCS garden. First, we researched and brainstormed the best materials to use for the garden enclosure. Next, we measured out the GCS garden. We went to Home Depot and spoke to an employee who gave us advice about the best materials to use. We then priced out the suggested materials for the garden. We measured out the GCS garden and found out that the dimensions are 32x56 feet. The best and cheapest materials for the garden enclosure includes pressure treated wood, rust proof screws, chicken wire, and galvanized wire mesh. The 8 foot posts and galvanized wire mesh will keep larger animals out such as deer, raccoons, rabbits, and skunks. The chicken wire will also extend below the ground 1 foot to keep out animals that dig. The chicken wire is for the smaller animals such as mice, moles, and voles. After much time and effort we have measured, priced out, and resolved GCS's animal problem. We determined that our animal-proof garden enclosure will undeniably keep those pesky animals out!

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EN EM

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4023

Title: Wind Power: How the Shape of the Blade Affects the Amount of Power Being Produced.

Student Name(s): I. Schwarz, Q. Callanta

Abstract:

Wind Turbines provide power for many people around the world. One key factor to the amount of power being produced that we found in our experiment is the shape of the blade on the Wind Turbine. The shape determines how fast or slow the turbine spins; causing more or less power to be produced which we could measure by the brightness of the red light in the turbine. In our experiment we tested out different blade shapes to find out which blade was the most efficient. We wanted to do this experiment to see if the standard long trapezoid shaped blade really was the best choice to produce the most power. To complete this experiment we kept every condition constant except for the blade shape. This allowed us to keep the experiment as precise as possible. We measured the power produced by the turbine by the brightness of the red light and recorded our observations. Our results concluded that the petal shaped blade was the blade that produced the most power. The petal blade catches the most air and spins the turbine the fastest, making it the best choice for a real-life, power-producing wind turbine.

**Technical Disciplines Selected by the Student
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AT EE EV

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4025

Title: Generating Electricity using Wind Gust from Vehicles on highways to Power highway Lighting and feed the Power Grid

Student Name(s): A. Cecunjanin, A. Mohammed

Abstract:

Abstract Introduction: The objective of our experiment is to utilize wind gusts from the vehicles on a highway as a source of energy to generate electricity using a wind gust turbine. This wind gust turbine will be used to light the highways and/or feed the grid. In this experiment, however, we will not be conducting this on a highway for safety reasons. On the other hand, we conducted the experiment using a small scale model on our deck and interpolated the results for a real full scale wind gust turbine on a highway. This experiment is done with renewable and common sources. **Procedure:** Step One: Construct the wind gust turbine using an induction generator, shaft, blades, and mount on a base. Step Two: Place the wind gust turbine on the deck and place a high powered fan in front of the wind gust turbine. The shaft will rotate generating electricity. Step Three: Record the number of volts generated in your lab notebook using a Multimeter. **Results:** By using the floor fan on a deck at high speed we measured voltage between 3.0 to 3.4 volts. **Conclusion:** We have seen that good amount of electricity is generated just using a floor fan. On a typical highway the wind gust varies from 50 to 60 MPH. In conclusion, if we built our original wind gust turbine and place it on the highway behind the guiderail, we will be able to generate over 1,500 Watts of electricity using a 12 Volt DC generator.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE EN EM

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4026

Title: Structure Vs. Nature: The Effect of Landslides on Different House Structures

Student Name(s): M. Langston, A. Lo Presti

Abstract:

This experiment was focused on the natural disaster: landslides. We wanted to design a series of tests to determine which of the three house structures (pyramid, stilt or regular) would withstand a simulated landslide for the longest duration. To create the landslide, we used a large tank and filled it two-thirds with a mixture of gravel and sand; then we used a hose to simulate the rain which causes a landslide. Previous to the start of the trials, we did a control experiment to see how long it would take for the sand to be displaced. This was so there was a time limit on the house movement. The time ended up being 20.7 seconds. Before adding the water, we placed each house on the sloped sand. Our results were interesting. The pyramid withheld for an average of 16 seconds, the stilt 20.4 sec., and the basic for only 7 seconds. Please take note that the timing began when the hose was turned on and ended when we noticed movement in the structure. In conclusion, the stilt house was the most efficient and would be the best choice when up against this particular natural disaster. This may have been attributed to the fact it had the least amount of surface area. If we were to do this type of experiment again, we think it would be interesting to test different types of stilts to see which would withstand the best.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV EN EM

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4027

Title: Does Shape Affect Speed?

Student Name(s): J. Griffin, O. Sherwood

Abstract:

The purpose of our experiment was to learn and test Newton's three laws of physics. Since we acquired the basics of Newton's three laws of motion in science class, we decided to surpass our current knowledge on this subject to apply in our experiment. In addition to that, my partner enjoys Football and I am fond of Soccer. First, we gathered our materials to build our slingshot and picked our jobs; such as timing, recording, and releasing the balls. In order to set up the slingshot, we took two resistance bands and tied them together with a sturdy knot. The stake that was out 22 feet marked the stopping point of the balls destination. When the first person pulled the resistance bands back they let go and at that instance the other person starts the timer. When the balls pass the stake 22 feet away the person who is timing stops the time. In our conclusion of our experiment our data showed that the soccer ball traveled at a faster rate as an average. Our hypothesis was not supported since we anticipated that the football would go faster, however the soccer ball traveled at a faster rate. We learned from our experiment that the shape of the soccer ball and football affected their air resistance. Although we predicted that the football would go faster, we did not consider that the slingshot would shoot the football in an awkward matter. Therefore, some parts of this experiment were not valid.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH EN ET

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- Yes No

CSEF Official Abstract and Certification

Fair Category

Proj.
Num

PT

4028

Title: Does Your Shirt Have Your Back?: A Study of Clothing Features that Protect Against UV Light

Student Name(s): A. Clark, B. Clark

Abstract:

The effects of long-term ultraviolet (UV) exposure on humans include early skin aging, wrinkles, loss of skin elasticity, dark patches, and pre-cancerous skin changes. We know that wearing sunscreen, hats, and sunglasses helps protect against UV light, but we wanted to learn more about how well our clothes protected us. This project examined how the material, color, and thickness of 29 different garments affected the degree to which they block UVA and UVB rays. We used a portable UV meter to measure the protection that these garments provide against UV light emitted from a fluorescent UV light bulb (i.e., black light). The UV meter provides UV Irradiance readings, which describe the amount of UV light that hits a surface. The lower the UV irradiance reading, the more protection that a shirt offers from UV light. We shone UV light through all 29 shirts and recorded the UV irradiance readings from the UV meter. Of all the materials we tested, cotton shirts provided the best UV protection, with an average UV Irradiance reading of 7. We also found that dark shirts most reliably had low UV irradiance readings. In relation to shirt thickness, our tests were inconclusive, since shirts of all thicknesses achieved low and high readings. Overall, our tests suggest that dark cotton shirts provide the best UV protection. Further experimentation could include new variables to study, such as the age of a shirt and the number of times that it has been washed.

Technical Disciplines Selected by the Student
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EN AT ME

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4029

Title: Incorporating the Flutter Effect in Flags to Produce Energy

Student Name(s): T. Livesay, F. Liu

Abstract:

According to Humdinger Wind Energy, a progressive clean energy corporation, the wind belt is a great source of electricity that is better than wind turbines, and is very cheap. It uses the flutter effect, which is when something flutters and vibrates in the wind, to produce electricity. This is a new clean way to produce energy that was researched only a few years ago. The objective of this project was to delve deeper into the topic of windbelts, the flutter effect, and piezoelectric energy generation to investigate the feasibility of incorporating this technology into common day flags to generate electricity. To accomplish this, a prototype of an energy generating flag system was designed and engineered. This prototype consisted of a piezo vibration sensor embedded in a flag via various support configurations, which were designed and constructed. The prototype was then tested with use of a high powered fan, and the results were measured using a multimeter. Multiple test trials revealed that the flag system was successful in creating voltage. Further, analyzing the data suggests that stabilizing the end of the piezo to allow the other end to vibrate more, and moving it toward the center of the flag are factors that led to the production of more voltage from this system embedded in the flag. This project indicates that the piezoelectric and flutter effects have the potential to be incorporated into flags throughout the world to generate electricity. This is an extremely eco-friendly and clean method to create electricity.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AT EE ET

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4030

Title: To Melt or Not To Melt: Using Natural Materials As Insulators

Student Name(s): J. Breski, C. Chaplinsky

Abstract:

The purpose of our experiment was to figure out what types of natural insulating materials are better than others. We used sand, rock, leaves, mulch and air (control) as our insulators. We also used a procedure that would allow everyone to easily be able to repeat the experiment, and most importantly do the experiment correctly. At the beginning of the experiment, we did a pretest to see what the ice cream's temperature would be to give us an idea when it would melt. In our experiment, we realized that the sand, rocks and mulch kept the ice cream colder for a significantly less amount of time than the leaves. We also realized that there was a spike in the temperature of the ice cream for the sand, rocks, mulch and control after about the 2 ½ hour mark of our testing. The leaves had that same spike in temperature 2 ½ hours later than that at about the 5 hour mark which proves that the leaves kept the ice cream colder longer proving that it was the better insulator out of the three other materials and the control. From this experiment, we drew a conclusion that when you try to insulate ice cream with different natural materials, leaves would be the best insulators because they are less dense and have more air space to keep the ice cream cold. All of this data that we collected throughout this experiment contributes to our hypothesis being correct and our experiment valid.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EN ET EV

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4031

Title: RADIATION STOPPER

Student Name(s): M. Vásconez Gilces, I. Acevedo

Abstract:

Radiation is a particle that contains molecules. Radiation can be come in different forms such as waves or particles. Radiation is bad for the organs in a humans body it also damages the human's cells. Radiation can cause cancer too. Radiation also can come from different things such as phones, tablets, or things that have to do with technology. But however this type of radiation is not intense that as other things, unless you use it constantly everyday then it will become intense. You can even die in the moment you are using these listed items and much more. Many people die from radiation or they get cancer from it. The suggested time of using the listed items would be 30 minutes or less or else you get the bad consequences. There is a type of radiation that is really hazardous which is called natural background radiation. This type of radiation is hazardous to the public as well so radiation is all over the place so hardly anybody is safe from background radiation. This type of radiation is also artificial and natural. Radiation is bad for your eyes as well because you can get a lazy which means one eye drifts off when you stare at somebody or something. The electric flux through an area is simplified as the electric field duplicated by the area of the surface projected in a plane perpendicular to the field. Gauss's Law is a general law applying to any closed surface.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4033

Title: BabyBot: Creating a Robot to Soothe a Crying Infant

Student Name(s): N. Sudhir, R. Du, A. Fischman

Abstract:

According to the National Sleep Foundation, the average adult needs seven to nine hours of sleep every night. For most new parents, this is almost impossible. The objective of this project was to create a robot that could soothe a crying baby back to sleep if they woke up at night, so that the parents need not wake up. Robotic prototypes were designed, constructed, programmed, and tested to play a recording of a lullaby when a pre-recorded tape of a baby crying exceeded a set decibel threshold. The two prototype designs used a teddy bear as the robotic shell. One contained an arduino board and its microcomputer along with sound sensors and an alarm system, and the other used Lego Mindstorms NXT brick and sound system. The prototypes were then tested using a recording of a crying baby which was played to determine if each of the robots registered the crying according to the set decibel threshold and played the music in response. The NXT based prototype was successful in registering the recording of the crying baby and played music three times before sounding an alarm. The arduino based prototype was successful in registering the crying and sending an alert in response. The results of this project indicate that with further development, the robots could be utilized in a baby's nursery to help pacify them when crying and alert parents when needed.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AT CS EE

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PT

Proj.
Num

4034

Title: The Designing and Testing of a Self Constructed Aircraft

Student Name(s): M. Stamm, P. Nguyen, A. Carlson

Abstract:

In this project our group designed, built, and tested a remote controlled aircraft. We first listed the characteristics that we designed the plane around: the ability to fly slowly and consistently with an electric motor. In the design process we researched typical ratios between wing span and fuselage length, along with wing area compared to horizontal stabilizer/elevator area. After the plane was constructed, we did our first test of our engineering project in our school's gym, taking out the variable of wind. We ran into many errors that required immediate attention before the next test: 1. We threw the plane instead of a regular take-off. 2. The propeller had too steep of a pitch, making it not function at lower speeds, so we switched it out with a less steep-pitched one. 3. The plane failed to glide far, calling for a wing 1.5 times the length and width. 4. The location was too small. We did our second test in the Newington High School gym, which is twice the size of the first gym, creating a larger take off space. 5. The plane was too heavy, so we used a lighter battery. The next time we tested our aircraft, we did four take-offs per wing and discovered the plane took off faster and was easier to fly with the improvements. If we redid this project, the landing gear would be redesigned to be perfectly symmetrical because our taxiing and take-offs varied due to the uneven steering.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH EE ET

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5001

Title: BOBS System

Student Name(s): J. Warren

Abstract:

The invention I made can help save lives. The problem is that there is a reoccurring issue of people forgetting children in their vehicles, which sometimes result in the injury or death of their child. I have created a manual child safety device out of household materials then tested it using two test subjects. I placed the device into one car and recorded the results. The results were that test subject 1, who had the device installed in his car, remembered the child consistently, but test subject 2, who did not have the device installed in his car, forgot the child twice out of the five days of testing. In each situation, a doll was used to represent the actual child. The conclusion is that my hypothesis was proven to be correct. A manual safety system, such as BOBS, can prevent accidental injury and/or death to a child forgotten in a car.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

EN ME AT

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5002

Title: How much air is needed to allow a weighted structure to rise?

Student Name(s): S. Pittman

Abstract:

The goal for this experiment was to find a way for a weighted structure to lift and move. The research that I found was mainly tests and different methods to accomplish a similar goal that I had. I took these methods and twisted them up to make them different and my own. The weighted structure that I built had a couple of computer fans along with motors attached to a foam board. The foam board had holes cut in it to give the air coming from the fans, exposure. Attached to the bottom of the foam sheet is a plastic bag which inflates and causes the structure to rise. There was multiple times when data was taken and after analyzing the data I found problem which made my structure fail to rise. Some problems or limitations I faced was the weight and that the fans were not producing enough air. To solve these problems, I made the base lighter by trimming it and removing the extra pieces attached to the bottom, and I used a method called a "series of wires" which allowed the batteries to produce more power so the fans could spin faster. These changes allowed my model to work and accomplish my goals.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5003

Title: Do Wheels Increase Distance On a Trebuchet?

Student Name(s): A. Warmus

Abstract:

A trebuchet is a machine used in medieval siege warfare for hurling large projectiles. It was revolutionary in ancient times. Greek philosopher Archimedes observed that wheels made a trebuchet launch projectiles farther. Archimedes could not figure out why wheels would make a trebuchet launch projectiles farther because the catapult's arm swung too fast. I am using modern technology to test this and see why wheels make a trebuchet throw farther. My hypothesis is that if I put wheels on a trebuchet, then the projectile will be thrown farther because the counterweight will drop in a straighter line, increasing energy transferred to the projectile. I hope to increase my understanding of physics. I constructed a trebuchet out of pvc pipe by using instructions from multiple sources. I used a trebuchet algorithm program to determine the optimal lengths of parts of the trebuchet. I made the trebuchet very large so that it would fire a projectile accurately and consistently. To test my hypothesis, I fired the trebuchet ten times with wheels and without wheels. I marked where the projectiles landed with chalk and recorded the results. The launches with wheels fired the projectile farther. I used video technology to analyze the differences between the launches frame by frame. I proved my hypothesis correct. Wheels did make a trebuchet throw farther because the counterweight dropped in a straighter line and the wheels allowed the trebuchet to move forward with the projectile. A trebuchet with wheels is more efficient than a trebuchet without wheels.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH EE

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5004

Title: The Effect of Boiling of the pH and nitrite Levels of Water

Student Name(s): A. Cho

Abstract:

The purpose of this lab is to discover if boiling affects the pH and nitrite levels of water, and if the source of water makes a difference. Overall, the results both supported and didn't support the hypothesis. During the experiment, the boiling didn't change the water's pH level at all throughout the experiment. Also, it was observed that if the nitrite level was zero before boiling, then it stayed zero after the boiling. However, if the nitrite level was above zero, then the boiling decreased the nitrite level to zero. The results are valid and reliable because in the fifty-five tests, they consistently showed the same results. In the future, some topics for further studies is how the nitrogen cycle works and what makes this cycle happen.

Procedure: 1. Measure and pour 5 mL of rainwater into test tube. 2. Test water with thermometer; make sure the temperature is 21°C. 3. Test water's pH and nitrite level using the pH and nitrite test solution and record. 4. Repeat steps 2-4 four more times. 5. Put the water into small pan and heat it to 100°C (measure temperature with thermometer). 6. When water cools down to 21°C, measure and pour 5 mL of rain water into test tube. 7. Test water's pH and nitrite level and record. 8. Repeat steps 7&8 four more times. 9. Repeat steps 2-9 with stream and pond water.* *Wash instruments after use

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH EV

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5005

Title: Parachutes: Does size matter?

Student Name(s): J. Vidal

Abstract:

How does a parachute work? Does the size of a parachute affect your fall? This is a common problem. Let's say you are going sky diving and you need to get a parachute. But, you have no idea what type or what size parachute you need. My project will solve the confusion so you don't have to worry about buying a bad parachute. See how my research can help you. Hope you enjoy my project!

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

EA

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): A. Glowacki

Abstract:

All my life I've been interested in the difference between batteries and their life. So, I decided to do an experiment on batteries. By testing which brand of battery lasted the longest. I automatically thought that Duracell would be the most powerful based on all the advertising for it. In my experiment, I tested five different battery brands. I conducted my experiment three times to make sure of my results. The Duracell batteries did end up lasting the longest by far. I found out that the biggest reason of why the huge difference between the brands was actually because some were a totally different kind of battery. Some were alkaline batteries, and some were non alkaline batteries. The Alkaline batteries lasted significantly longer than the non Alkaline batteries. I also compared the cost of each battery brand to how long it lasted. Sunbean ended up being the best battery brand when it comes to cost compared to how long it lost energy. As a follow up experiment, I conducted the procedure again only this time using LED flashlights instead of the basic brand flashlights. They ended up lasting much much longer. The LED flashlights lasted days where as the standard ones only lasted a couple hours.

**Technical Disciplines Selected by the Student
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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5007

Title: Changing Water Content in Soil to Generate Electricity in Form of an Earth Battery

Student Name(s): R. Pai

Abstract:

The purpose of this experiment was to see if an increase of moisture in soil would have an affect on the output of an earth battery. My hypothesis was that if I increased the amount of moisture in the soil, then the electricity generated would increase because the soil was wet. When the soil has wet, the electrode will corrode faster, therefore increasing the electron flow in the soil, which increases will the amount of voltage produced. Earth batteries generate electricity through a transfer of electrons from one terminal to another. To make the earth battery, I took the two plastic cups and filled them both up with soil. I then put an anode and cathode in each of the containers and connected an anode from one of my containers to a cathode in the other container. To change the moisture, I added 3 tablespoons of water every day because the electrodes needed at least a day to corrode. My results show that my dry soil generated .2 DC volts but then changed drastically to 2.76 volts when I got to 10 tablespoons. When I went to 13 tablespoons, the electricity generated stayed at 2.76 volts. My hypothesis was verified for the most part because the electricity generated did increase but then the water content made no difference after a certain point. In the future, I would like to make a larger scaled earth battery to see if it made a difference in the electricity generated.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

EE EV EM

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5008

Title: Crossing The Gap... But With What?

Student Name(s): E. Novicio

Abstract:

Bridges are found all over the globe giving people and products an easy mode of transportation over rivers, ravines, seas, and more. They can be made of concrete, metal, or even plain wood! But which material is the best to use? This project looks at the questions, "How does the material of a bridge affect its weight bearing capacity?" and, "How do the materials plastic straws and wooden Popsicle sticks compare against each other when used in making bridges?" The hypothesis is that the material will greatly affect the bridges' weight bearing capacity and that a wooden Popsicle stick bridge would hold more weight than a plastic straw bridge. For the experiment, two Warren truss Popsicle stick bridges and two Warren truss plastic straw bridges were made. The bridges (tested one by one) were then placed between two points and a bucket was suspended from the middle of each bridge by string. The bucket was gradually filled with water until the bridges couldn't support any more weight. After that, the weight of the bucket with water was recorded. The results showed that the wooden Popsicle stick bridges were able to hold an impressively larger load than the plastic straw bridges. These results showed that my hypothesis was correct and that the Popsicle stick bridge could hold the most weight. It was much unexpected to see the difference of the max loads between the two types of bridges.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE EN AT

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

Title: Impact of Turbine Blades on Power Output

Student Name(s): V. Subramanian

Abstract:

Abstract Purpose –Find out how number and size of turbine blades affects power output of a geothermal wet steam energy plant. **Procedure:** Place layer of aluminum foil over pan. Cut hole the size of the coffee can into foil layer. Cut same hole into pie plate, then place it upside down over pan. Pour water into hole. Make two six blade turbines with small and big blades, then two eight blade turbines with small and big blades. Bend wire into L shape, then create third smaller side on the shorter side. Duct tape wire to side of coffee can, so shortest end is hanging above top of can. Push cork onto short end of wire, then push pin into bottom of cork. On other end of pin, push on turbine (blades shouldn't have been separated when created). Place can on top of foil-covered pan, and pan on stovetop. Punch small hole near rim of can. Heat to 110° F and let steam rise from hole; blades will turn. **Drawn Data:** Small number of small blades works best for an H.A.W.T. steam-powered turbine. **Reasoning:** A large number of blades captures more air particles, but air resistance forms, reducing rotation numbers. High number of blades produces more rotations, but puts too much stress on steam-powered system. **Conclusion:** A small number of small blades is best turbine combination for steam-powered turbines. However, if denser gas was applied, large blades could be used without air resistance or too much strain, improving energy efficiency.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project) EN EE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- | | |
|---|--|
| <input type="checkbox"/> human subjects | <input type="checkbox"/> potentially hazardous biological agents |
| <input type="checkbox"/> vertebrate animals | <input type="checkbox"/> controlled substances |

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):
 Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5010

Title: Which is Better for the Garden? Aspirin or Super Thrive

Student Name(s): M. Tomas

Abstract:

The goal of this experiment was to determine if seeds planted in soil supplemented with Super Thrive (a commercial plant supplement) would yield more and hardier plants than seeds supplemented with aspirin. Thirty sunflower seeds were planted, ten in each experimental group and ten in the control group. The control group was watered with tap water. One experimental group was watered with tap water mixed with aspirin (487.5 mg per gallon). The other experimental group was watered with tap water mixed with Super Thrive (1/4 teaspoon per gallon). The plants were watered twice a week for 34 days, and data were recorded every five to eight days. The experimental group exposed to aspirin had the lowest germination rate, 50%, followed by the group exposed to Super Thrive, 65%. The average heights of the plants that were watered with aspirin, 15.5cm, were lower than the averages of those exposed to Super Thrive, 20.07cm. The hypotheses that Super Thrive would produce taller plants, and have a higher germination rate than the aspirin were supported. Even though aspirin has been successfully used by gardeners to supplement plant growth, it does not work as well as Super Thrive. The salicylic acid in aspirin (also the main ingredient in Super Thrive) is believed to promote plant growth, however other ingredients in aspirin could have conflicting effects on the plants. Perhaps pure salicylic acid would have produced more dramatic results.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS CH

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

Proj.
Num

P7

5011

Title: Let There Be Light!

Student Name(s): G. Hyland

Abstract:

Science improves our daily lives. The light bulb changed the way we live at the turn of the century, but how did different materials and environments affect the development of the light bulb? This project looks at which thickness of lead (2mm, .7mm or .5mm) creates the brightest, most sustainable light when charged with 6 D batteries. Each lead thickness was compared beneath two different size jars of varying oxygenated air in three different environments (cold 32° Fahrenheit, room temperature 70° Fahrenheit and a hot environment at 80°-plus Fahrenheit) to determine optimal lead thickness, amount of air and ideal environmental conditions to create the brightest, most sustainable light. My hypothesis was that the lowest thickness of the lead would burn brightest and last longest in the warmest environment as there is less oxygen in warm air to burn versus burning out faster if there were more oxygen to feed from in cooler environments. Observing the data, the .7mm filament produced the longest lasting light in each environments. The hypothesis that the .5mm would produce the brightest and longest lasting light was rejected when compared to the .7mm and 2mm leads. Interestingly, the .5mm produced the brightest light, but burned out quickly due to thinness. The 2mm had longevity, but burned dim, and sometimes did not produce any light at all. Consistent throughout the experiment, regardless of temperature, was that the richer the oxygen the faster the filament would burn, which impacted the ability to achieve that lead's full brightness.

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PH CH

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CSEF Official Abstract and Certification

Fair Category

Proj.
Num

P7

5012

Title: Dye sensitized solar cell

Student Name(s): J. Fischer

Abstract:

Abstract Solar cells takes natural energy and turns it into electricity. My project was Dye Sensitized Solar Cells and how different dyes (berries) collected more energy. This could be very helpful because the dye that collected the most energy, would be more helpful. Also the dye that collected the most energy also lasted the longest. The general procedure for how to make a dye sensitized cell has some easier parts and then some harder, such as how to make and roll on the titanium dioxide paste. an easier part is how to make the dye using the different types of berries. However sometimes making the dy can also be hard, such as when making the lemon dye. To make the lemon dye you must make sure that is does not contain too much acid. To make sure of this you must use water and the lemons peel to make the dye. Doing this project shows the berries that contain the most energy and that last the longest. In doing my project I realized that my hypothesis was incorrect, since I suspected that the lemon dye will have the most dye and will last the longest when in fact it was the raspberry that had the most energy and lasted the longest.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE AT

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CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5013

Title: Build a Raft powered by surface tension

Student Name(s): R. Senanu

Abstract:

Have you ever wondered how a detergent can clean your dishes. Well on this science project you will see that there are multiple ways of building something on surface tension and similar ways that are all linked to the surface tension of water. I believed that oil is the fastest way to make a raft move and to prove my theories I conducted multiple tests and oil came out first and laundry soap came in second.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

ET CB EN

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CSEF Official Abstract and Certification

Fair Category

Proj.
Num

P7

5014

Title: Can the Weight of a Car be Accurately Weighed by Using an Air Pressure Gauge and a Ruler?

Student Name(s): A. Purcell

Abstract:

The student wanted to determine if the weight of a vehicle can be calculated be within +/- 5% of the manufacturer's gross vehicle weight. Each tire had the square inches of the tire touching the floor (foot print), multiplied by the PSI of each tire. The total of all 4 tires should total the gross vehicle weight. The student learned that there are several issues that can be encountered when trying to run this experiment: 1.The accuracy to the tire gauge used. 2. The accuracy of measuring the foot prints of each tire. 3.The structure and wear of the tires.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

EN AT MA

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5015

Title: Low cost, Low technology solar water distillation system

Student Name(s): I. Benson-Clarke

Abstract:

There are many areas of the world that do not have regular access to clean water. I wanted to find a cost effective way to provide clean water for anyone who needs it. After extensive research I decided to do an experiment building on work that was done at MIT. The purpose of this experiment was to find a more inexpensive alternative to MIT's research in which they used nanotubes for solar distillation. My hypothesis was that drilling holes in plaster of Paris would be a low cost and low technology way to achieve solar distillation. I drilled holes at half inch increments in plaster of Paris placed with water in aluminum trays to judge against the control groups. These control groups were water in an aluminum tray and a solid block of plaster of Paris with water in the other aluminum tray. I found that quarter inch spacing, 1/16 holes worked the best as an inexpensive alternative with a 13% increase in solar distillation over the control groups. This experiment would help to supply fresh water whenever it is needed.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EN EM EV

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5016

Title: The Effect of Water Depth and Beach Surface on the Onshore Height of a Tsunami

Student Name(s): H. Kirkman

Abstract:

The purpose of this experiment was to determine whether or not the depth of the water and whether or not gravel and sand as beach substrate affect the onshore height of a tsunami. The hypothesis was that the tsunamis' heights would be highest with the deepest level of water and with sand as the beach substrate. A wave table was constructed using a plastic bin, water, sand, gravel, and a board. A weight was dropped on the board from the top of the bin, which directed the water towards the beach. The beach substrate was gravel and was later changed to sand to test the difference in tsunami heights. The water level was tested at 5,000 mL (4 cm deep), 6,500 mL (5 cm deep), and 8,000 mL (6 cm deep) for both sand and gravel as the beach substrate. The average heights of the tsunamis with gravel as the beach substrate were 5.83 cm at 4 cm deep, 7.5 cm at 5 cm deep, and 8 cm at 6 cm deep. The average heights of the tsunamis with sand as the beach substrate were 6.5 cm at 4 cm deep, 8.33 cm at 5 cm deep, and 8.83 cm at 6 cm deep. The hypothesis was correct. Sand as a beach substrate and the deepest level of water caused wave heights to increase. It is concluded that different depths of water and different beach substrate affect the size of a tsunami.

**Technical Disciplines Selected by the Student
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EV EA

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- Yes No

CSEF Official Abstract and Certification

Fair Category

Proj.
Num

P7

5017

Title: Foam Dissolving Methods

Student Name(s): E. Stedman

Abstract:

Packing peanuts, a problem that takes up a lot of space. The purpose of this experiment is to try to reduce the volume of the styrofoam. I wanted to see if a peanut would dissolve faster in water, white vinegar, or pure acetone. I thought that if a peanut was placed into each liquid, then the peanut placed into acetone would dissolve the fastest. I decided to try to do this by placing 3 peanuts (each) in 1 jar filled with water, 1 filled with pure acetone, and another with white vinegar at the same time. My hypothesis was correct, after 5 seconds and on no changes occurred to the 3 peanuts in the water or the white vinegar, however the 3 peanuts in the acetone dissolved in 3 seconds. This experiment demonstrates that styrofoam dissolves in acetone the best and that it's volume reduces greatly due to the air escaping from the peanut.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): M. Figueroa

Abstract:

Families in our area struggle with high heating bills every winter. Many homes use wood as a heat source and wood can cost a lot. I wanted to know which wood would give off the most heat for the longest amount of time. After researching, I decided the best way to test this is to place wood in a pie pan and use a lighter or match to ignite the wood. Once the wood is lit I started timing. When there was a good flame I used the IR Thermometer to measure the heat output. I repeated the same steps with pine and oak wood. I made sure I had the same amount of wood, and I lit the wood and used the IR thermometer the same way each time. Cedar burned over twice as long as the other wood tested: 11:22.20 minutes and had a heat output of 468 degrees Celcius. This could easily help people with if they have wood powered stoves and fireplaces or even heat generators they could know wich wood burns longest, hottest, and has the most heat output to save money.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5019

Title: Baking with Fantastic Flours

Student Name(s): A. Ho

Abstract:

There are many different types of flour, but which one should you choose that gives high quality results? In my project, I tested three different types of flour in baking cakes to see if there is a change in density. I did this by baking mini vanilla cakes with All Purpose Flour (as instructed on the recipe) but then manipulating the flour for Corn Flour and Soy Flour. The purpose for this experiment is to help those with an allergy to wheat decide what type of flour they should use (Corn Flour or Soy Flour) when baking and how similar or different it is to the original flour used in the recipe (All Purpose Flour). Celiac Disease which is an allergy to wheat and gluten is a nation wide problem that we face today. The amount of cases over the past several years have increased and scientists think it is connect to people eating genetically modified foods. I discovered that the cakes made with Corn Flour was the most dense while the All Purpose Flour and Soy Flour was pretty much tied. By doing this science project, I realized that Soy Flour is the closest in density to the original and that if you like cakes that are more dense then you should use Corn Flour. I met my objective which was testing if there was a change in density when you manipulate the type of flour. Overall, I enjoyed doing this project!

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH ME PS

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CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5020

Title: Self-Inflating Balloons

Student Name(s): J. Rodrigues

Abstract:

My experiment is testing the amount of gas produced when different household acids are combined with baking soda. For my experiment I decided to use lemon juice with a pH of 4 compared to the pH of distilled white vinegar which is 5. My hypothesis was that lemon juice would produce more CO₂ gas because it is more acidic. When I experimented with lemon juice it averaged 86.67 ml of CO₂ gas compared to distilled white vinegar which reached an average of 85 ml of CO₂ gas when it reacted with the baking soda in the balloon.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH CH CH

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CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5021

Title: Rust A Bunch

Student Name(s): A. Ramos

Abstract:

I was outside one day and it was raining, I realized that the railing to the stairs started to rust. After some research I figured out that rust only occurs when a metal is moisten then exposed to oxygen after dried. My project is based on two different methods and I use four different liquids to test which one will make a piece of metal rust the quickest. All I had to do was get a tray that goes in the oven, aluminum foil, four same sized containers, ammonia, bleach, vinegar, water, same sized nails, cupcake pads, a sharpie, and spray bottles. Put the aluminum foil on the tray and over put cupcake pads with nails on it. then you label it and spray each nail with the liquids. Now you put the four nail in the containers with the different liquids and then you observe what happen for the time you did the project. I found out that the nail in the bleach container rust the most and the nail that was sprayed by vinegar rust the most. My hypothesis was wrong sadly. The bleach won because it has hydrogen peroxide which breaks down metal and vinegar has acid that melted the nail.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH EV

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CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): R. Sarkisian

Abstract:

I chose this topic because magnets intrigue me. I think that magnets are very interesting, so I decided to see what would happen if I paired them up with different materials. I chose copper and plastic in the form of a pipe and then I thought would be cool to see what would happen if I dropped a magnet through each pipe. What I discovered was that the magnet slowed down when traveling through the copper pipe and it was at full speed when traveling through the plastic one. This led me to believe that copper must have some magnetic qualities and plastic has none. I researched why a magnet slows down when it passes through a copper pipe versus why the magnet has no effect when going through a plastic tube. I discovered that the rate at which the magnet traveled through the copper pipe was not due to magnetism but because of eddy currents.

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Proj.
Num

5023

Title: Which Variables Affect The Flight Path Of A Rocket?

Student Name(s): B. Toth

Abstract:

How do different design variables affect the altitude a 2-liter bottle rocket reaches when launched? Sixteen 2-liter bottle rockets of varying design were built. Each design was tested for 5 flights. Specific variables were changed and tested to see which one went the highest, the straightest, and the straightest for its height. After analysis, data showed that rockets NC3, FTC, FN9, FLB, FA11 were the most ideal for a combination of height and straightness of flight. These rockets had the following characteristics: NC-3 - Tennis Ball Nosecone, FT-C - Three Proportional Clipped Delta Wings, FN-9 - Nine Delta Wings Bottom, FL-B - Three Delta Wings Bottom, FA-11 - Fins at 11°. The ideal rocket (BD) design included a tennis ball nosecone, three clipped delta wings on the bottom at 11°. Although this rocket combined the traits from the highest and straightest flights, the BD design did not perform as expected.

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PH EE AT

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P7

Proj.
Num

5024

Title: Measuring Acceleration

Student Name(s): M. Wiig

Abstract:

I was told that if two objects are dropped at the same time they should accelerate at the same rate and hit the floor at the same time. To test this, I made two ramps from wood and rolled two different balls down the ramp. I used a super ball (lighter) and a small bocce ball (heavier). My hypothesis was that gravity would have the same effect on each ball and they would take the same amount of time to roll down the ramp. Each ball was released thirty times from five different points on the ramp. The times for each position and each ball were averaged. Because the balls started with no speed, I calculated the acceleration by multiplying the distance by 2 and dividing that number by the time squared. Please come see my presentation at the science fair so you can see the results and what I found out.

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PH

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P7

Proj.
Num

5025

Title: Can You Taste the Difference Between Tap and Spring Water?

Student Name(s): A. Wozdusiewicz

Abstract:

We all know that there is a difference between tap and spring water, one is filtered and one is not. but the question is , can you taste the difference? The hypothesis was if the participant drinks tap water and spring water during a blind taste test, then they will not be able to tell the difference. My experiment consisted of 20 test subjects. I had poured about 4 ounces into a plastic cup of both types of water and did not let them see which one is which. After I tested all of the subjects, I analyzed my data and noticed that 16 subjects answered correctly, 3 subjects didn't know the answer, and the last one answered incorrectly. My hypothesis was proved incorrectly because the majority of my test subjects got the answer right.

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EV

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CSEF Official Abstract and Certification

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P7

Proj.
Num

5026

Title: The Power of Wind

Student Name(s): S. Guiry

Abstract:

Wind turbines were tested in this experiment to see if different blade designs (angle and shape) would vary the amount of power produced when faced with wind. Rectangular, triangular, and air foil shaped blades were each tested at a 15, 45, and 75 degree angle. This information could be needed in the world for electricity problems and to find the best way to generate power with turbines for low costs of money. For the hypothesis, it was stated that if different blade designs were used, then the amount of power produced (in mw) would vary. A mini wind turbine was built and put in front of a fan, testing each blade at each angle. The generator's wires were connected to a computer for graphs and tables to be assembled automatically. The blade that generated the most power was the air foil shape, followed by the rectangular blade, and the triangular blade produced the least amount of power. The results and data for this experiment were accurate, but not as accurate as it could be. One possible mistake or error made could be that the blades might have been loosely secured in the hub and wobbled a bit during testing. Another could be that the blades were not perfectly cut and the fan was not perfectly lined up with the center of the hub. If this experiment is done again, these problems and mistakes would be fixed as best as possible for any future testing.

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Proj.
Num

5028

Title: Will It Corrode?

Student Name(s): L. McDonald

Abstract:

In my experiment, I tested out which metal was the strongest; aluminum, copper, or steel. The purpose of this experiment was to learn about corrosion, but to know, if I were to build anything, which metal would be best. To test this, one of each of the metals into water, salt water, and ammonia and wait five days for the results. Steel corroded the fastest which surprised me, aluminium corroded, but not a extraordinary amount, and copper held up the most.

**Technical Disciplines Selected by the Student
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EV CH

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P7

Proj.
Num

5029

Title: Sound Barriers: How does the type of material affect the amount of sound that carries through a surface?

Student Name(s): A. Ahilan

Abstract:

The purpose of this experiment was to compare the effectiveness of common sound proofing materials. To conduct this experiment, I chose 6 different sound barriers: cork, egg carton foam, newspaper, terry cloth, denim, and Styrofoam. With these materials, I built six separate test boxes. Then, while generating, a constant sound within each box, I measured the sound from outside of the container using a sound meter. I repeated each trial 5 times and recorded the results. I repeated the procedure at four different frequencies. The effectiveness of the materials as sound barriers was not uniform across the different frequencies. Cork was the best high frequency sound barrier while at lower frequencies egg carton foam was the best. This experiment has implications for soundproofing, because the effectiveness of a sound barrier is not only determined by the material but also the frequency.

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EE PH

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Fair Category

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Proj.
Num

5030

Title: Opening a Garage Door Using Raspberry Pi

Student Name(s): S. Johnson

Abstract:

The engineering goal of this experiment was to successfully make a garage door opener that was Raspberry Pi based and controlled through a smartphone. In order to accomplish the goal, a Raspberry Pi Model B+, relay switch, and smartphone to access the final product, as well as many other connectors were used. The Raspberry Pi Model B+ has 40 GPIO pins, some which were used in this project. In order to accomplish this goal, a service called WebIOpi was downloaded onto the Raspberry Pi after configuring Wi-Fi onto the micro SD card, the Raspberry Pi's storage space. This is because WebIOpi allows a web interface that is password protected control the GPIO pins on the Raspberry Pi. After the installation, GPIO pin #7 was connected to relay 1, GPIO #13 to relay 2, pin 14 to relay ground, and pin 2 to relay VCC, or power. A cable was run to both garage motors with assistance from an expert. Now, when a pin is activated through WebIOpi, the pin triggers the surge of energy to the relay switch which clicks on, letting power pass through the cable and into the garage door motor, opening the door. The garage door was opened from a smartphone through a web browser. However, the website is not very user friendly and can be hard to navigate, and the website does not yet display the status of the garage door, as this requires Python programming. This would be an area for future improvement.

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CS EE AT

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CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5031

Title: How to Build a Hovercraft

Student Name(s): A. Kliczewski

Abstract:

The purpose of this project was to design and build a working hovercraft. Prior knowledge was that hovercrafts can travel on land and water, air makes hovercrafts move up and around, and people think hovercrafts are the future of transportation. Some of the materials needed to build the hovercraft were a leaf blower, two bungee cords, foam pipe insulation, a flex-a-spout pipe, and many more tools. The main elements in building the hovercraft were the board, the shower curtain, and the leaf blower. These can be put together to form a hovercraft by cutting a hole in the board wrap the bottom of the board in a shower curtain and staple it to the top of the board, stick the leaf blower in the hole and turn the leaf blower on. The results of this experiment were that the hovercraft worked, it hovered one inch off the ground. The hovercraft was built with readily available materials, and in a safe environment. The strengths of the hovercraft was that it hovered with 130 pounds on top of it and was not difficult to build. The weaknesses were the weights on the hovercraft had to be centered, the hovercraft would go crazy with no weight on it, and the hovercraft had to be used on a flat surface. As the hovercraft was being built a foam cushion was added to the edge to prevent the plastic from ripping, and added tape to prevent leaks. The end result was that the hovercraft hovered.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE ET

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Proj.
Num

5032

Title: Wind Energy

Student Name(s): D. Okoney

Abstract:

This topic is to show how blade pitch affects the amount of voltage output a wind turbine can produce. Does blade pitch on wind turbines affect the output of a wind turbine using the same wind speeds? Will gear ratios, different blade types, and horizontal/vertical configurations affect the output as well? To conduct the experiment, a wind power renewable energy science kit was utilized. Although the kit provided guidelines to perform various experiments and tests, modifications were made to the standard approach using various blade pitches, blade types, horizontal configurations, and gear ratios. The objective was to determine which method created peak performance producing the highest output which could then be used in designing an actual wind turbine. Observations were that blade pitch produced peak performance towards the mid setting of the degree angle. The horizontal configurations produced less output than the vertical setup. The lighter plastic sheet blades did not produce the same type of output as the thick molded plastic blades. The standard kit gear ratio provided the maximum gear speed compared to the modified version due to its higher ratio. In conclusion, the blade pitch was the most impactful of all variables tested. The blade pitch configurations were able to produce the most voltage output. In terms of practical applications, the suggestion would be to build a VAWT (vertical axis wind turbine) at a mid setting degree blade pitch with molded blades. This will produce a maximum voltage output, resulting in a promising renewable energy resource.

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ET EE EV

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Proj.
Num

5033

Title: Changing the pH of Soil to Generate Electricity in the Form of a Microbial Fuel Cell

Student Name(s): N. Narayan

Abstract:

The purpose of this experiment was to see how the pH of soil affected how much electricity it was able to generate. My hypothesis was that if I used neutral soil in my MFC, then more electricity would be generated because neutral soil has more bacteria than acidic or alkaline soil. To test this, I made a microbial fuel cell, which generates electricity when bacteria transfers electrons to the anode. To build my microbial fuel cell, I started with pouring two cups of the soil being used in that trial into the plastic container. The anode and all of its wires went on top of that soil. Next, two more cups of the same soil were poured into the container. The cathode was placed on top along with a little bit of soil. My results show that the neutral soil (with a pH of 7) generated 0.8 DC volts. The acidic soil, with a pH of 5, generated 0.15 volts of electricity. The alkaline soil, with a pH of 9, generated 0.5 volts of electricity. My hypothesis was correct because the neutral soil generated the most electricity compared to acidic and alkaline soils. My research showed that nutrient availability in soil affects how much bacteria soil contains; neutral soil has more nutrients, and therefore it is theorized that it has more bacteria. In the future, I would like to test whether neutral soil really does have more bacteria than acidic and alkaline soil.

Technical Disciplines Selected by the Student
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EE EV EM

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P7

Proj.
Num

5034

Title: Wood Toughness

Student Name(s): A. Andrade

Abstract:

My project was on wood toughness. The way that I determined the wood toughness was by durability. I determined durability by how many chips, dents, cracks and pieces each piece of wood had. The different wood types that I used were Oak Wood, Maple Wood and Walnut Wood. For my experiment I soaked each piece of wood in a bucket of water for five minutes. Next I let each piece of wood sit for ten minutes. The reason I soaked the wood was so the wood could soften so when I smashed it I could identify and compute the damage done to each piece of wood more easily. I smashed the Oak Wood on a concrete ground five times. Then I recorded my data. Then I smashed the Maple Wood and Walnut wood five times as well then I recorded my data again. Then I did another trial and I repeated my steps. After I completed my second trial I compared the first trial with the second trial. After comparing the data I found out that Walnut wood was the toughest (most durable) wood and Maple Wood was the least durable.

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EN PH

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P7

Proj.
Num

5035

Title: Keepin' Warm

Student Name(s): M. Suarez

Abstract:

The purpose of my experiment was to determine whether fiberglass, cellulose or extruded polystyrene was the best thermal insulator. I became interested in this project because I often hear my parents talk about the expense of heating and cooling our home. This experiment will show me which insulation material will work the best, thus reducing energy costs. My hypothesis is that fiberglass will insulate the best. This experiment was conducted by placing 3/4 of an inch of insulation material in the space between a coffee can and an inserted glass of water at 138 degrees. A lid is placed on top and the can is put in the refrigerator for 30 minutes. The water temperature is taken and recorded. A total of three trials were taken and then averaged. This process was repeated for the other two materials being tested, as well as one with no insulation. The results showed that my hypothesis was correct. Fiberglass lost the least amount of heat when placed in the refrigerator. However, based on my research on the R-values (resistance to heat flow) of the material tested, I concluded that both my hypothesis and experiment were incorrect. The methods used in my experiment to place the insulation around the glass of hot water, may have allowed heat to flow through the cellulose and polystyrene.

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ET EN

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P7

Proj.
Num

5036

Title: THE AMOUNT OF CRITICAL MASS NEEDED TO MAKE A SUSTAINABLE CHAIN REACTION

Student Name(s): M. Locke

Abstract:

The purpose of this experiment was to see how many mousetraps and Ping-Pong balls it would take to make a sustainable chain reaction. It was predicted that it would take at least 64 mousetraps and 129 Ping-Pong balls to provide enough critical mass to make a sustainable chain reaction. A sustainable chain reaction was defined as a reaction where 85% or more of the traps were sprung. With fewer than 16 traps, the 85% mark was not met. With 16 traps or more, every trial resulted in at least 85% of the traps being sprung. The hypothesis was proven to be incorrect. It took 16 mousetraps and 33 Ping-Pong balls to provide enough critical mass for a sustainable chain reaction. In all three trials of 16 traps, all traps were sprung. This experiment used up to 242 traps. Mousetraps were set with 2 Ping-Pong balls placed on top of each trap. After setting up the traps, one Ping-Pong ball was dropped in the hole in the net above the traps, thus starting the reaction. This experiment could be made better if the mousetraps didn't have to be modified in 4 different places. One unforeseen difficulty was that the traps would break after repeated use. Improvements to this experiment would be to target where the ball dropped more precisely, to mechanize the timing of the reaction, and to have all mousetraps with the same sensitivity. Another improvement would be to have more trials. This experiment demonstrates dynamics of nuclear fission.

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PH AT

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Proj.
Num

5037

Title: Using Different PLant Xylems to Filter Phosphates

Student Name(s): A. Joseph

Abstract:

The purpose of this project was to see how the plant xylems from different trees affected the amount of phosphates present when water is filtered through them. The hypothesis that if 5 ml of water is filtered through plant xylem filters, then at least 0.5 ppt (Parts per thousand) of phosphates will be filtered out in at least one of the plant xylems because depending on the size of the pores in the xylem, at least one may be able to filter out bigger molecules, was proven wrong. The white pine, maiden hair, and oak trees were used for their xylem. The plant xylems were stripped of their bark and put into tubes, 5 ml tap water was filtered through them, and then the water was tested according to an API Phosphate Testing Kit. 5 ml of unfiltered water were also tested as a constant. It had 0.25 ppt of phosphates. The oak and maiden hair plant xylem increased the number of phosphates. The oak by 1.83 ppt and the maiden hair by 1.42 ppt. The white pine xylem filtered out 0.07 ppt. Future studies might include researching why the oak and maiden hair plant xylems increased the amount of phosphates, and doing a test to see what happens when bacteria is filtered through plant xylem. The use for this experiment would be to solve the problem of nutrient pollution, which occurs when too many minerals, such as phosphates are present in lakes and ponds.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV PS

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5038

Title: Frozen

Student Name(s): D. Christie

Abstract:

In this experiment I was investigating how the freezing point is affected by the type of solution. This problem intrigued me because here in Connecticut, we have been getting a lot of snow and the roads needed to be treated. This problem is important because it can help us understand why salt is put down on roads and why other solutions aren't. It can also help us understand why we use salt as a preservative and how we use salt solutions to make things, like ice cream. In the process to find an answer to my question I made four different solutions: sugar, salt, baking powder, and baking soda. I put them in the freezer and checked on them periodically until they were frozen. I recorded the temperatures of the water solutions every time I checked on them. It turned out that the sugar, baking powder, and baking soda solutions all froze at around the same temperature (22-26°F), but the salt solution was still a liquid at that temperature. This shows why salt was chosen to treat roads over the other solutions, since it has a lower freezing point. I found out some pretty interesting facts from doing this project. For example, I learned that salt is put down when it snows since it needs to -21°C (-5.80°F) to freeze, which rarely happens. Also, I learned that sugar, baking powder, and baking soda water solutions all freeze at the same time when given the same circumstances.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH EV EN

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

Proj.
Num

P7

5039

Title: Wrap the Apple Save the Apple

Student Name(s): R. Langan

Abstract:

Have you ever took a bite of an apple and decided to save it for later, then when you took it out to eat more you found out it didn't look as tasty anymore. It probably looked brown or shriveled and not like a new apple you would want to eat. You might have wondered, how could I save this apple so it won't be brown and disgusting? It is believed that plastic wrap will keep apples fresh for a long amount of time. During this experiment I wrapped four apples in plastic wrap, aluminum foil, newspaper, and in a plastic sealable bag. I also left one with no wrapping. The apples were left in the refrigerator for five days. Each day the apples were taken out to see how fresh they were. It was concluded that plastic wrap kept the apples freshest for the longest. The apple wrapped in newspaper did not stay fresh at all. The apples in the plastic sealable bag and in aluminum foil stayed somewhat fresh. So the next time you have an apple and would like to save it for later, you know what to do!

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH AT

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- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5040

Title: Effectiveness of Fertilizer Application Techniques in Reducing Fertilizer Runoff and Pollution

Student Name(s): J. Luz

Abstract:

Fertilizer runoff is a concern because of land and water pollution. The fertilizer that runs-off the land goes into nearby bodies of water, affecting drinking water with growth of algae. Fish begin to die due to plants that are growing rapidly, taking over the oxygen. The goal of my experiment is to find out how much runoff and pollution is coming from certain fertilizer application techniques. To test such techniques, a stream table was filled up with soil halfway and a filter of a porous cloth was placed at the end of the dirt. Salt was substituted for the replacement of fertilizer because the salt dissolves like fertilizer and it's not a dangerous chemical. I tested a total of 7 techniques: 1) broadcasting 2) stirring 3) stream 4) row of small deep holes 5) bigger and deeper holes 6) semi-deep holes 7) deep holes with a cover up. One quart of water in a watering can was poured on to the soil with the applied salt. The water was drained and the level of salt in the the water was measured. Five trials were done per application technique. With a salinity level of 6.8 ppm, deep holes with a cover up is the fertilizer that causes the least amount of fertilizer. Not only do the deep holes with the cover up have the least amount of runoff, it is most consistent in the results. Deep holes with a cover up should be preferred as the best application technique.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV EM CH

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5041

Title: Free Energy

Student Name(s): E. Wicko

Abstract:

In my project I am exploring the properties, functions, and quantum mechanical aspects involving magnets. To express these properties I created a circular dish-like device that allows me to spin a magnetic arm around magnets positioned on the outer rim of the device. I discovered that when alike magnetic fields on the arm and on the base collide the magnetic arm shoots to the nearest attracting pole. The magnetic arm does this due to many quantum mechanical wonders in the magnet. The spinning of the electrons around the atom create a magnetic field, but only if the atom has electrons that have aligning polarities. Then the atoms must align forming crystals, adding to the overall magnetism. In addition those crystals must align to form domains, then finally the domains must align to form a permanent magnet. Magnets are amazing and very usefull wonders.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ET EE PH

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5042

Title: UAV for Science

Student Name(s): J. Queenan

Abstract:

The purpose of this project was to design and build a working and Flying Unmanned Aerial Vehicle (UAV) or in this case a quad copter. The criteria and constraints were that the quad copter had to fly, be safe, be built at home, stay within 400 feet of the pilot, and be kept within the eyesight of the pilot. I built this quad copter using a fiber glass frame to hold everything, a set of four Castle Electronic Speed Controllers which had to be soldered, a DJI™ Naza m lite flight controller, four Turnigy™ motors, 4 propellers, a Turnigy 4s lithium polymer (LiPo) battery, a power breakout cable, and the controller of this UAV is the Turnigy 9x Transceiver. All of this was held together with Velcro™, small thin zip ties, Hex bolts, and the nuts included with the frame. I flew and test flew the quad copter many times. The results were the first time it flew it crashed into a tree. The second time it flew, one of the motors was going faster than the others so I re-calibrated the controller. The third time was a success, I was able to maneuver in multiple directions. The purpose of the project was complete. The UAV can be tweaked more so it can reach its top performance.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE AT CS

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- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5043

Title: Just the Facts

Student Name(s): K. Legnard

Abstract:

The objective of my engineering project was to design, build and program an app to help kids learn their math facts. In every grade, students have to take math fact tests and some students really struggle to learn their math facts in fun way. I have always seen numbers and facts in different ways and wanted to try to show other kids what I see in my head when I solve basic facts. Before actually developing the app, I had to research SWIFT programming language which is used in the Apple Developer (IOS) software program called XCode. I tested my code in the XCode playground to see if my designs, ideas and coding would work. After experimenting in the playground with different codes and functions, I began building my prototype and outlining what I wanted the app to actually be able to do. Along the way I programmed it, ran the app on the IOS simulator, debugged, revised and repeated the steps. I am still currently working on a couple of different versions of this app. One app is for controlled basic fact practice while the other is designed to build early number sense and counting skills using visual images. I plan on continuing to develop math apps for basic fact practice to make math fun. Hopefully you will see my apps in the app store very soon!

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

MA EE AT

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- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5044

Title: What is the most effective treatment for melting ice?

Student Name(s): S. Peglow

Abstract:

The purpose of this science project was to observe what the most effective de-icing substance is. I proceeded to do this project by first filling small plastic containers with one cup of water. Second, place containers in freezer and wait till frozen. When frozen take out however many containers needed from freezer. Then, measure out one tablespoon of de-icing substance. Next, pour the tablespoon of de-icing substance on the ice and start the timer. Every couple minutes write down what is happening to the ice. When the time is up measure (tablespoons) how much water was melted. Lastly, repeat process with other de-icing substances and alternatives. By testing and observing the de-icing substances I have learned that calcium chloride was the most effective, magnesium chloride was the second most effective, sodium chloride, magnesium chloride hexa-hydrate was the third most effective, sodium chloride, potassium chloride, magnesium chloride hexa-hydrate was the fourth most effective, and sodium chloride was the least effective. Out of the alternatives kosher salt was the most effective and pickle pulp was the least effective. I also observed that sodium chloride had the least cost per pound of \$0.22 and magnesium chloride had the highest cost per pound of \$1.25. According to the background I found that when you spread any one of the de-icing substances on ice, they start to melt the ice and form a liquid or slush. Also, that the substances dissolve in the melted ice and form a brine solution.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH EV

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5046

Title: The Effect of Different Temperatures on the Strength of a Magnet

Student Name(s): R. McDermott

Abstract:

This experiment was conducted to determine how different temperatures affected the pull of a magnet. Different temperatures will not only affect the pull of a magnet, but also make the strength of the magnet stronger and weaker. The strength of the magnet was measured by a single paperclip next to a tape measure. The magnet would slowly inch up the tape measure by millimeters, until the paperclip moved to cling onto the magnet. Only the millimeter where the paperclip clung on was recorded. The temperature that had the highest pull on the magnet was the freezer test, with an average pull of 19.4 mm, then the room temperature test, with an average pull of 15.8 mm. The boiling water test had an average pull of 13.4, which was the lowest pull. The cold magnet is more dense than the room temperature and hot magnet. Therefore, the pull of the cold magnet is higher than the room temperature and hot magnet.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH EE AT

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj. Num

5048

Title: Let's Beet Slippery Roads

Student Name(s): V. Quish

Abstract:

The purpose of this project was to see if I could find a way to make the roads safer when ice and snow cover them. To accomplish this, I observed how rock salt, rock salt with beet juice, and beet juice by itself reacted with a block of ice. Then, I observed how long it took each block of ice to melt and how long they remained melted.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

BI EV

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5049

Title: Self-Inflating Balloons

Student Name(s): T. Mhatre

Abstract:

The idea of “Self-Inflating Balloons” caught my eye because I used to find inflating balloons a bit of a challenge, and often wondered if there was a better way of doing this. I learned that mixing a larger quantity of acid with a smaller quantity of base creates CO₂. So I started the experiment to understand how I can get the best inflated balloons using different combinations of acid and base quantities. For the base (DV) I used baking soda and for the acids (IV) I used vinegar, liquid laundry detergent, and lemon juice. My hypothesis was that one cup of lemon juice and one spoon of baking soda would create more CO₂ than vinegar or detergent with baking soda. To test my hypothesis, I poured one cup of lemon juice (IV) inside a large soda bottle. Then, I poured one spoon of baking soda (DV) inside a small balloon separately. Then I inserted the mouth of the balloon on the mouth of the soda bottle so the baking soda falls on the lemon juice. To keep this experiment as precise as possible I waited for 30 seconds and then measured the balloon in centimeters. I completed 3 trials of this process and did the same process for other 2 IVs. According to the data collected, vinegar and baking soda created more CO₂ than laundry detergent or lemon juice with baking soda. This is because vinegar is more acidic than detergent or lemon juice and it is a “weak base.”

Technical Disciplines Selected by the Student
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CH

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5050

Title: I'M DYE-ING TO FIND OUT WHAT DYES ARE USED IN MY FAVORITE CANDIES: A CANDY CHROMATOGRAPHY EXPERIMENT

Student Name(s): E. Smith

Abstract:

Candy Chromatography is when water travels up a strip of paper using capillary action while in a salt solution. If I used this method to test what colored dyes were used on/in candies, then I thought that the dyes would be different in same colored candies. I wanted to test my favorite candies, so I decided to test Sour Patch Kids, Skittles, Dots, M&Ms. I used food coloring for my control group. First, I had to extract the dyes of the candies by putting the candy in the dye for 3 minutes, then transfer the extracted dye onto the strips of chromatography paper. I now had to hang the strips over the salt solution for the water to travel up the strip and bring the dye with it. Next, I calculated how far the dye traveled from where the dye had started. Then, I took the distance traveled by the dye and divided it by the distance the salt solution had traveled. The idea was to compare these numbers to find out the retention factors (Rf values). My hypothesis was proved to be mostly right- 2/3 of the candies' dyes were different. Only the brown M&Ms and Skittles used the same dye (there weren't any brown Dots candies). The yellow and red dyes used in M&Ms, Skittles, and Dots were different. This project helped me to determine if the Mars Candy company uses the same dyes in their candies. Now I know that they don't, but I still love candy!

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

ME

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

Proj.
Num

P7

5051

Title: Which Bridge Design Is Best

Student Name(s): G. Congdon

Abstract:

The design of a bridge is essential to its ability to bear weight. In my project, I tested two bridge designs' ability to bear weight: the Howe Truss Bridge and the Warren Truss Bridge. I predicted that the Warren Truss Bridge's design with its diagonal beams that spread weight throughout the bridge would hold more weight than the Howe Truss design. The Howe had a combination of diagonal beams at a tighter angle and straight beams, which might make it rigid and collapse under pressure. After constructing the bridges out of popsicle sticks, I gradually added weight until the bridges broke. I then weighed the mass that broke each bridge, and divided that by the weight of the bridge mass. This resulted in the weight bearing capacity: the Howe Truss held 180 times its own weight, and the Warren Truss held 95 times its own weight. This disproved my hypothesis. Though the Howe Truss was a half ounce heavier, the weight bearing capacity was almost doubled. This showed that heavier and more complex designs are much more effective in holding weight.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE PH

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5052

Title: Does the Number of Fins on a Rocket Affect How Long It Stays In the Air?

Student Name(s): N. Erdtmann

Abstract:

March 10, 2015 Abstract Does the Number of Fins on a Rocket Effect How Long it Stays in the Air? The purpose of this experiment is to understand if the number of fins on a rocket affects the amount of time it spends in the air when launched. It is predicted that a rocket with 3 fins will spend the most time in the air. It is predicted that a rocket with 5 fins will spend the least time in the air. 3 rockets were constructed with each having a different amount of fins, one with three, one with four, and one with five. The rockets were launched and timed till the parachute blew out of the rocket. The rocket was retrieved and sent up again. There was three trials per rocket. The times were very close together, hundredths of a second apart. The hypothesis was true, the rocket with three fins spent the most time in the air and the rocket with 5 fins spent the least time in the air. The hypothesis was correct, but there was no significant difference in times because the engine burned the same amount of time on every trial and the hundredths of a second difference is just eye perspective error. This experiment can be improved by launching the rockets in a controlled environment, instead of testing the effect of the fins test the differences of engines, test the altitude the rocket reaches with fins, or test the differences of wind speeds.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH ET EE

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5053

Title: Which Wheat Flour Has the Most Gluten?

Student Name(s): A. Tuttle

Abstract:

Gluten has become a well-known word and topic for discussion when it comes to food. Gluten is a protein. It is found in wheat flours, but which ones contain the most? In this experiment, three different kinds of wheat flours are used to determine which ones have higher and lesser amounts of gluten. Some types of flour are considered to be “hard” (for example, whole wheat), while other kinds of flour are considered to be “soft” (for example, pastry). What makes flour either “hard” or “soft” depends on the amount of protein, or gluten, in it. The types of flour used in this experiment were whole wheat, pastry, and all-purpose. Each type of flour (independent variable) was mixed with water, kneaded, and rinsed—each one receiving the same amounts of water, as well as time and treatment during the kneading process (controlled variables)—to reveal a ball of gluten (dependent variable) in the end. The gluten balls were measured by both diameter and weight. Three trials in all were performed. It was expected that the whole wheat flour would produce the largest balls of gluten, while the pastry flour would produce the smallest. The experiment was a success, and the results consistently showed the whole wheat flour to have the most gluten, the pastry flour to have the least, and the all-purpose flour to be in between the two.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BI

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5054

Title: Development of an Explosive Trace Detection Device to Avoid Threats of Terrorism

Student Name(s): B. Kerr

Abstract:

The possibility of terrorists' use of explosives is a threat to the security of our country. In order to detect these explosives government agencies currently use large, heavy, and expensive machines that are difficult to handle especially in the field. In order to solve this problem, I attempted to develop an inexpensive and reliable method of detecting explosive residue. The Griess reagent contains chemicals that when mixed with sodium nitrite, a compound similar to those used in explosives, produces a color change. In my experiments I tested if the Griess reagent could be used as an effective explosive residue detection method. I tested this by swabbing the residue of sodium nitrite from multiple surfaces which might be used in the production of explosives and then exposing the swab to the Griess reagent. The results showed that residue could be detected in a concentration dependent way. I then engineered a detection kit as a prototype and tested its function, and it was able to detect nitrite residue reliably. This could be a new system of detection that is faster, lighter, and more inexpensive than the present methods. It could be useful for law enforcement agencies in the field to prevent terrorism threats.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AT CH EE

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5055

Title: Duct Tape Durability

Student Name(s): T. Smith

Abstract:

Is duct tape really an effective sealant for ducts? The purpose of my experiment is to test the durability of different types of duct tapes under real life attic conditions. Tape strength was tested in phases one through three. A milk-crate/lumber set-up was used. Weight was added by placing bricks into a bucket suspended from the duct tape, which was connected to two pieces of sheet metal. Attic temperature conditions were simulated by using a hairdryer and by placing the tape in a freezer. Additional phases of testing led to set-up redesign to address stability issues and to allow for exploration of adhesion on plastic surfaces. While Duck Tape is designed for sealing ducts, my testing results show that it is not as durable as other tapes. Data collected suggests that Gorilla Tape and ChemTape are the best performing tapes. Duct tape today is used for many purposes under many conditions. Further testing would allow people to be informed of the most durable duct tape based on the conditions and materials they plan to use it on.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EN EE AT

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5056

Title: Electromagnetic Energy and Innovative Applications

Student Name(s): S. Liu

Abstract:

The purpose of this project is to gain an understanding about electromagnetism, and how electric energy can be transformed into magnetic energy. Magnetic energy can be created across an iron based metal when electric voltage is applied through copper wires wrapped around the iron metal. The iron metal used here is a standard iron nail. Electrical voltage creates a polar effect within the electrons of the iron nail, which causes a positive (+) and negative (-) magnetic field. The level of magnetic energy is dependent on a few variables. In this project, the variables under investigation are 1) voltage level and 2) number of copper wires coiled around an iron nail. In general, this experiment demonstrates that the greater the voltage and the greater the number of coils, the greater the magnetic strength. Additionally, electromagnetic energy is powerful energy that can be used in varying innovative technologies. Electromagnetic energy can be found in simple applications, such as an ordinary household doorbell, to highly sophisticated applications, ranging from MRI (Magnetic Resonance Imaging) technology to high speed magnetic rail transport. This project discusses and explains how electromagnetic energy is applied in these innovative applications.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ET EE

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 vertebrate animals controlled substances

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5057

Title: What's in this water?

Student Name(s): B. Hoth

Abstract:

Every summer my family puts up a pool and fills it with well water. After adding chlorine to the pool water, it turns brown. Adding Metal Out to the pool water helps clear the water. This made me wonder how much metal is in well water. I wanted to test well water (A), distilled water (B), filtered water (C), bottled water (D), and two other sources of water (E, F). I tested each sample of water using strips from a PurTest® Iron Hardness Plus Kit. It tested for chlorine, copper, nitrate, nitrite, alkalinity, pH, hardness, and iron. I found out that well water has the highest amount of iron and copper as I expected. It also has the highest alkalinity, pH and hardness. Originally chlorine, nitrate, nitrite, alkalinity, pH, and hardness were not going to be tested but they were included in the PurTest® Iron Hardness Plus Kit. Chlorine is added to reduce microorganism in the water. Copper is in water because of the pipes that the water goes through. Hardness comes from mineral and metals like iron and low amounts of copper present in the rocks and soil. Nitrates and nitrites are also in water because of the rocks and soil. Water should be more alkaline and the pH should be about neutral or 7 so that the pipes do not corrode. This experiment showed well water has the highest amount of metals which could be removed by a metal filtering unit and a water softener.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME CH EV

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4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5058

Title: The Voltage Changes from Different Wavelength Radiations on a Solar Panel

Student Name(s): S. Jain

Abstract:

Electricity is greatly wasted in households due to numerous causes, thus factoring into the average \$102 monthly electricity bill a household pays. Even with lessons on conserving energy, changes are nominal. This experiment's purpose was to use different radiations to produce sufficient amounts of energy on a 6V Solar Panel. Currently, solar panels placed on houses, are so expensive that it takes more than 20 years for them to pay back for themselves. I hypothesized that from five different radiation types, primary blue would produce the most energy due to shorter wavelengths which causes more energy production. Even though UV has a shorter wavelength, solar panels can't absorb it efficiently. This experiment was conducted in a dark environment with no initial radiation. It implemented a box lined with reflective tinfoil, where bulbs of all five colors would be placed separately. After warming the light bulbs, voltage readings from solar panels were taken using a multimeter and then analyzed. Data supported that the red light produced the most energy, 4.18V, a greater amount than the other bulbs. This proved my hypothesis incorrect. This shows any color can be absorbed by a solar panel, as all colors experimented with produced sufficient energy. This experiment is valid as most of the constants were regulated. One inconsistency might have been that some radiation left from the previous trial in the environment. The results from my experiment can be implemented to explore how different elements in a solar panel can affect the energy being absorbed.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ET PH EE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5059

Title: Relinquishing Rust

Student Name(s): K. DeRosa

Abstract:

I sail during the summer and I have noticed that clips, booms, and other metal parts of sailboats rusted while other boats with the same parts remained rust free. This caused me to question why and also how to manage the progression of rust. I learned that different types of metals are less likely to rust, such as stainless steel while others like iron are more susceptible to rusting. My experiment used four corroded generic nails placed in 4 tbsp. of different liquids: Windex, Diet Coke, soapy water, and salt water. Each was submerged for 12 hours a day over the course of four days. Each day I recorded observational result. I used spa test strips to measure the alkalinity, pH, and bromine of the liquids. I researched the ingredients of the liquids to determine the most common compounds (ammonia, citric acid, sodium chloride, glycol ether, surfactant, and potassium benzoate) and then recorded the data. I found the liquids with the highest amounts of citric acid and ammonia had the greatest effect on the nails. I found that Diet Coke had the greatest effect on removing the rust from the nail. However, the caramel dye inside the Diet Coke caused the nail to tarnish, rather than rust. Windex removed the most rust, but caused pitting. Salt water increased the presence of rust, but smoothed the edges. Soapy water created more rust and caused the nail to adhere to the bottom of the glass.

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CH

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3. This project was conducted at a Registered Research Institution. Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

Proj.
Num

P7

5060

Title: Ice Matters

Student Name(s): C. Olson

Abstract:

For my science project, I wanted to figure out what substance could melt ice the fastest and why. I hypothesized that salt would melt ice the fastest. After some research, I figured out some neat things about these substances. I found out when testing a separate block of ice with no substances on it, the temperature could trick you into thinking the substances would melt all the ice by itself. For the procedure I bowls filled with ice, paper, timer, thermometer, sand, sugar, salt, freezer, 1/2 table spoon. I froze the ice for the same amount of time in 4 bowls. I used one cup of water in each bowl. I wrote down the temperature of the room during each attempt. I put sand in one bowl, salt in another, and sugar in the third bowl, and nothing in the last one. I made sure I put an even amount of substances in each bowl, using 1/2 table spoon. After one hour, I took a measuring cup and measure the water of the melted ice in each bowl. The bowl with the most water was the best way to measure how much ice had melted. I wrote my findings and repeated this two more times. At the end of my experiment, I found out that salt melts the ice the fastest. Because water freezes between 0°C and 32°F, salt brings that temperature lower which makes the ice melt. Sugar also does the same thing, but not as well.

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EV CH PH

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CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5061

Title: Bubble Blowing

Student Name(s): N. Scotto

Abstract:

I chose this topic for my project because it was not only interesting, but fun to complete! At first, I thought that if honey was added to the bubble solution, then the bubble will last longer than bubble solution alone. To perform this experiment, all I needed was a bottle of plain bubble solution and household ingredients like vinegar, honey, orange juice, etc. I blew 6 bubbles for each solution. Each bubble was timed (by another person) and the times were recorded and averaged for each ingredient. The hydrogen peroxide bubbles ended up having the longest lasting bubbles. My hypothesis was proven wrong. In my observations, I noticed that the thicker liquids had shorter times. I figured out that it was because the thicker it was, the heavier it made the bubble. The heavier the bubble was, the faster it would sink to the ground and pop.

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CH

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CSEF Official Abstract and Certification

Fair Category

P7

Proj.
Num

5062

Title: Paper Chromatography: The Science of Color Separation

Student Name(s): D. Farr

Abstract:

Remember in kindergarten when you played with a prism and shone light through one side and a rainbow was produced on the other side? All colors, with the exception of the primary colors (red, yellow, and blue) are combinations of the primary colors. This experiment will show how certain types of dyes or inks can be separated into their component colors by using paper chromatography. Paper chromatography is an analytical chemistry technique used for separating dissolved chemical substances. If a solvent is introduced to a paper with a dye or ink placed on it then the solvent will move up the paper via capillary action and separate the dye/ink into its component colors. This experiment tested different combinations of three liquid solvents as the mobile phase, three papers as the stationary phase and three everyday household dyes/inks as the samples. The same two primary colors and two secondary colors were analyzed for each of the dyes/inks tested. The results showed that the dyes/inks travelled and separated differently depending on the absorbency of the stationary phase. Also, some dyes/inks separated in different orders depending on the type of mobile phases used due to differences in the physical characteristics of the mobile phases such as pH, chemical composition and the sample's solubility in the solvent. Finally, the concentration of the samples affected how well the samples separated. In conclusion, it was determined that it is possible to separate everyday dyes/inks into their component colors using paper chromatography.

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CH

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CSEF Official Abstract and Certification

Fair Category

Proj.
Num

P7

5063

Title: How Accurate are your local weather apps?

Student Name(s): T. Messina

Abstract:

Purpose: I investigated weather applications and questioned their reliability. **Procedure:** This experiment involved recording predicted and actual temperatures during a 30 day period. I checked three weather apps at 8pm and recorded the next day's predicted temperature in the chart. At 12pm the next day, I recorded the actual temperature for that day followed by the historical average daily temperature for each of the dates. Then I calculated the temperature deviations between the predictions and the actuals and between the historical temperatures and the actuals. **Results:** To properly report the results, I defined the terms as follows: "normal" > or = to 7 degrees of deviation from the historical average high temperature on a given day; "extreme weather" or = to 3 degrees from the actual high temperature; "inaccurate predicted deviation" < or = to 4 degrees from the actual high temperature. Not considering temperature extremes, the accuracy of TWC was 73%, and NBC and CBS 70%. During normal temperature, TWC was 88% accurate, NBC was 76%, and CBS was 82%. During extreme weather, NBC was 62% accurate, and TWC and CBS were 54% accurate. **Conclusion:** The hypothesis for this experiment proved correct. The temperature became less accurate as the weather got extreme. When inconsistency was present, the predictions decreased in accuracy for all three applications. They dropped from 76-88% accuracy during normal weather, to a 54-62% accuracy during extreme weather.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV EA MA

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): R. Ramthun

Abstract:

This project was developed to analyze the ability of four filters in reducing water turbidity, and two flocculants ability to settle suspended matter in the water. The main questions this project was developed to answer were: Which flocculent settles the most suspended matter in a water sample? Which flocculent results in higher light penetration at different points in the water sample it settled? Which filter reduces the most settled suspended matter in a water sample, and, finally, which flocculent creates higher light penetration in the resulting sample? To test the problem, four samples of water with different ratios of cups of dirt to water were mixed (1:20, 1:30, 1:40, 1:50), run through four filters (Ceramic/Cork filter, the Xylem filter, a cloth filter, and a gravel filter), and were settled by two flocculants. (The Moringa oleifera pod, and Aluminum potassium sulfate.) The water samples were run through their own filters and flocculated, then the samples were tested using the Imhoff Cone settling procedure and the Colorimeter procedure for measuring light penetration. In testing, the xylem filter proved completely ineffective. The gravel filter removed almost all of the visible suspended solids. The ceramic and cloth filters worked relatively well, however, the cloth only removed the largest particles. For the majority, the performance of the filters didn't change, regardless of the soil to water ratio. Overall, the Moringa oleifera settled more suspended solids, but the Alum and Moringa colorimeter tests were comparable.

**Technical Disciplines Selected by the Student
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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5503

Title: Evaporation Rate of an Ice Cube in Liquids With Varying Densities

Student Name(s): M. Ticotsky

Abstract:

This project investigates how the density of various liquids affects the evaporation rate of an ice cube. It was hypothesized that the lower the density, the faster the rate of evaporation. Four different liquids were chosen to be tested--carbonated ginger ale, plain caffeinated coffee, raspberry lemonade, and salt water. For three consecutive trials, each liquid was warmed to 65 degrees Fahrenheit and poured into each cup. At this point, one ice cube was placed in each cup, and one drop of food coloring was added. The evaporation rate was timed and recorded when the ice cube was fully melted. The findings confirmed my hypothesis – coffee, being the least dense liquid, evaporated the ice cube the fastest, and the salt water evaporated the ice cube the slowest. The salt water was most dense, and caused the cube to float on the surface, surrounded by its own water for an extensive period of time. This investigation is very intriguing, as the more we learn about the density of our waters today, the better understanding we will have on its effect on the environment. Specifically, how it may correlate to the current trend of glaciers and icebergs breaking away from their natural habitat and evaporating at a fast rate. This research displays how vital it is to explore various solutions in order to preserve our natural wonders.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH EV EA

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 vertebrate animals controlled substances

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category
P8

Proj. Num
5504

Title: Green Energy Ferris Wheel

Student Name(s): I. Salazar

Abstract:

According to Bill Gill, a general manager of North American Midway Entertainment says, “At full capacity, the soughton fair operates on five generators, each of which consumes 6 to 7 gallons of diesel an hour.” But what if the fairs are able to use green energy to operate the attractions? For example what if a ferris wheel used solar power to operate and power other attractions nearby? It could provide enough energy to power itself and maybe a few carts around or lights too. This will save money and provide a cleaner source of energy for those operating and enjoying such fairs. The goal of this project was to incorporate green energy sources into carnivals attractions to reduce the reliance on diesel to operate fairs. If successful these green energy designs will allow for a greener and more safer environment for carnivals/fairs. In order to do this, a model of a ferris wheel was be constructed and, mini flexible solar panels were positioned on the wheel according to the design. The design will included positioning the panels so that they received maximum sun exposure. An multi meter was then used to measure and analyze the amount of energy captured. The results indicated that through out the day there is more sun exposure captured. Examples: Morning was 9.42 volts, Noon was 11.04 volts, and evening was 12.36 volts. In conclusion the wheel increases energy towards the end of the day.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AT EE ET

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5506

Title: Effect of Blade Angle and Wind Angle on Rotation Speed of a Home-Built Wind Turbine

Student Name(s): M. Chen

Abstract:

Wind energy is a promising source for renewable energy. The harvest of wind energy is normally done with wind turbines. It is therefore important to examine how air flow interacts with turbine operation. Among possible factors, blade angle was chosen as a factor in this experiment. The test also examined the effect of the angle in which wind hit the rotation plane because wind can change directions freely. For this experiment, factors were examined on a home-built wind turbine. The experiment setup included a fan as a wind source so that there was a controlled airflow, and the number of rotations per minute was recorded. It was reasoned that the faster the turbine spins, the more energy the turbine produces. It was observed that small - but greater than zero - blade angle resulted in the high rotation speed. The turbine slowed down significantly when the wind was not aimed straight on but at an angle. It is concluded that, for wind farms located in areas where wind changes direction often, it may be beneficial to make the rotor orientation adjustable.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ET EE AT

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

Title: Music Metrics and Fractals: Analyzing Different Genres of Digitized to Identify Input Metrics for Programming Fractal Representations of the Music with Mathematica

Student Name(s): G. Buckridge

Abstract:

The goal of this experiment was to create a program to generate and manipulate a fractal that would distinctively and visually represent a song, based upon its specific metrics. 144 songs of different genres with distinct sounds were selected to compare. Three artists per genre and three songs per artist were selected for detailed analysis to identify input metrics for the fractal generator program. MIDI files were gathered from public domain and converted into mp3 files using GarageBand for further audio analysis as needed. Mp3s were downloaded into Audacity to look at waveforms. MIDI files were converted to text files with Wolfram's Mathematica and Midi2text. Note occurrence, volume, note duration, dynamics, and pitch were then analyzed. These metrics were imported into Excel for further study of note counts and examination for significant values related to known mathematical relationships. Variables were selected to manipulate a Koch Snowflake in Mathematica and Scratch. Mathematica and Scratch tutorials were studied, commands were researched, and projects in the databases explored and modified. A demonstration for the construction of the Koch Snowflake was downloaded in Mathematica. Programming modifications were successfully completed to add the necessary variables and options to generate different fractals based on the selected music metrics. The Mathematica program generated distinct visual fractal patterns for each type of music. A similar fractal generator was also created in Scratch. Working in Scratch helped to clarify how the fractal is generated in Mathematica and the programming concept of a recursive procedure.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

MA CS AT

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- | | |
|---|--|
| <input type="checkbox"/> human subjects | <input type="checkbox"/> potentially hazardous biological agents |
| <input type="checkbox"/> vertebrate animals | <input type="checkbox"/> controlled substances |

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5508

Title: What effect does cloud coverage have on solar panel output

Student Name(s): G. Young

Abstract:

Using solar panels is a great way to produce clean and environmentally friendly energy. My goal was to determine what percentage of the power is still being produced during varying amounts of cloud cover. To do this I attached a voltmeter to the solar panel to determine the volts produced. then I covered the panel with a box to prevent any ambient light from altering the results. I then added a light to act as a sun that would have a constant amount of energy unlike the sun. to represent cloud coverage I cut cardboard into strips that were one eighth the length of the solar panel. These each represents 1 okta. I then conducted my tests and collected my research. My findings surprised me. There a much more dramatic decrease in the amount of energy produced than I had expected. In conclusion my hypothesis is correct but my results were still not what I expected.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5509

Title: The Effect of using foam to create a more sophisticated highway barrier on lessening the spike of g-forces during an impact.

Student Name(s): D. Colgate

Abstract:

The hypothesis is that if foam is used to create a more sophisticated highway barrier, then the spike of G-forces will lessen during an impact. This hypothesis was based on the fact that foam has a way of transferring energy from the impact to other parts of connected area. First, to test the accelerometer, I used a 1:24 scale diecast car to simulate an impact 90⁰ to the wall. This proved that the accelerometer chip could read accurately and quickly. Using my knowledge of highway barriers and SAFER barriers, I designed a barrier using foam and metal, along with two others, one with double-sheeted foam and one just concrete. I then built a 1:12 scale car, attached my accelerometer chip, then propelled the car at each of the barriers twice. From observation, the one block of concrete moved a little bit from the impact, but when fastened more securely (by adding additional weight so movement would be more limited), the concrete only barrier didn't seem as effective. The cement block without fastening actually did the best out of all 6 trials with all the barriers, at only 1.35 G-forces, and a 1.425 average overall, better than the foam barriers. My conclusion from this, based on the data is this: if you can have someplace for the energy to transfer upon impact away from the vehicle, then that will be the most effective barrier.

**Technical Disciplines Selected by the Student
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EE AT PH

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5510

Title: hovercraft

Student Name(s): s. khan

Abstract:

My project is about a hovercraft to see if flat is better than a dome shaped hovercraft before I made a hover craft I tried to make a steam engine, but I did not have the right materials to make it work. so my dad told me to go to the basement and see what I come up with. so I saw a lot of broken computers, some wires, and a 12 volt adapter. I brought them up stairs and along with a cooler lid, it was Styrofoam so it was light. It was also domed shaped. a hovercraft needs a cushion of air so I took one of the bigger fans and cut a hole in the lid and hot glued it in. I did the same for the smaller fan but instead I faced it up so it cold give the hover craft some thrust. I connected every thing by wires and then to the 12volt adapter. I did the same for the flat shaped hovercraft and recorded which had the least amount of drag.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ET AT PH

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CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5511

Title: What Materials can block a Wifi Signal?

Student Name(s): A. Riego De Dios

Abstract:

Have you ever received poor wifi signals? This project looks at which materials block or damage wifi signals the best. In my project I tested the wifi strength using a app called Wifi Measurer that helped me determine which material gave my computer poor, medium, or great wifi signals. This experiment was tested in a empty room with a router being 5 feet away from my iPad mini. What I did to test my project was I made a barrier using materials such as aluminum foil, wood, glass, and tin foil which fully covered up the iPad mini, forcing the Wifi signals to penetrate the material. My hypothesis was that the tin foil would perform the best in deflecting or damaging most of the wifi signals. In my experiment I proved my hypothesis correct and the tin foil did perform the best.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CS AT

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CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5512

Title: Design, build, and program a robot using an Arduino Mega 2560 through an Android app to cheer up or relax children at a hospital

Student Name(s): B. Bruder

Abstract:

I proposed to make a robot that will make an effort to relieve the stress and/or fright of children in a hospital. Over the past three months, I have sketched, diagrammed, developed, programmed, and built my prototype robot to fit not only my personal expectations, but also those of possible users. In this time my robot has grown and evolved from spare parts on a table, to what it is today. Through voice control, I have programmed my "SmileBot" to bring choices of entertainment to young patients. I have currently selected and programmed a Java-based Android app and an Arduino with music and stories for my prototype; choices can be easily changed or enhanced for future testing and use. Hopefully my SmileBot will allow young patients to "Smile Awhile."

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CS EE AT

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5513

Title: How To Insulate Your House And Reduce Your Fuel Bills

Student Name(s): G. Kalker

Abstract:

The insulation installed in a building is a key factor in constructing a building which will be affordable to buy and own. To evaluate heat loss in a building, a double chamber test box was constructed with insulation board to measure heat flow from a heated chamber to an unheated chamber. By changing the orientation of the two chambers the heat flow through a ceiling, wall and floor could be simulated. Orienting the box with the chambers over each other would simulate the heat flow either upward through the ceiling with the heated chamber on the bottom or downward through a floor with the heated chamber on the top. Similarly, installing the chambers side by side would simulate heat flow from the heated chamber through a wall to the unheated chamber. By measuring the temperatures in each of the two chambers as well as the air outside the test box, the heat flows can be monitored. When the temperatures stop changing, the system has achieved equilibrium and the heat flow between the two chambers and between the chambers and the air outside the test box has become constant and the heat loss for the building element being evaluated (ceiling, wall or floor) can be computed using the thermal properties of the insulation board and the measured temperatures. The results determined that 44.7% of the total heat loss was through the ceiling, 31.4% of the heat loss was through the wall and 23.9% of the heat loss was through the floor.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ET PH EE

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5514

Title: Substitution of Metals in a Sea-Water Engine to Increase Energy-Efficiency

Student Name(s): B. Hawley

Abstract:

When surveying people of which alternative energies they are familiar with, most say solar or wind power. But how about sea water energy? Imagine all the applications for this as an energy source -- how about life boats? Over time -- now and beyond the CT Science Fair -- I hope to continue to test sea water with various combinations of elements such as: chromium, calcium, lead, and iron. The purpose of this experiment was to see if the chemical reaction of sea water + Aluminum (Al) combination would have a higher voltage (energy) than a combination of sea water + Magnesium (Mg) as found in the toy car. My hypothesis was that Aluminum would be a better metal to use because the element is located to the right of Magnesium on the Period Table. More specifically, Aluminum will be a better metal to use because it releases 3 electrons, more than magnesium, which only releases 2 electrons. The experiment involved researching a sea water fuel cell, and procuring: two metals (Mg + Al), a membrane, a refractometer to measure the salinity level of sea water, and a multimeter to measure the voltage of which metal/chemical reaction produced more energy. To my surprise, I learned that the Aluminum did not produce more energy than the Magnesium even though it releases an additional electron than Magnesium. My research will need to continue as I envision an alternative energy source that could someday be a major source of power for coastline settlements.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ET EV

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5515

Title: The Tensile Strength of Various Species of Wood

Student Name(s): A. Tracy

Abstract:

This experiment tested the hypothesis that temperature affects the tensile strength of various species of wood. This project tested five species of wood with different temperatures. Ten precision-cut pieces of wood were used for each trial. Half of the samples were put in an oven at 50 oC and the other half were frozen at -20 oC for 2 hours. Each specimen was placed in a vise, sticking out of the vise approximately 15 cm. Two binder clips were attached, one to the end of the wood and the other at the bottom to hold the first one in place. A spring scale was attached to the first binder clip and a rod was placed in between to prevent excess recoil. Each piece of wood was pulled until the breaking point. After testing the strength on the first side, the piece of wood was flipped and placed again 15 cm out from the vise. This process was repeated for each species. Testing was repeated using specimens soaked to contain 22% hydration and using specimens at room temperature (22oC) and low humidity (7%). Phase two used the same process (at room temperature) to examine laminated woods. The previous test concluded that the tensile strength of Shagbark Hickory when dry was the greatest and the tensile strength for White Oak was the greatest when wet. After testing the tensile strength of each species in different temperatures and laminates, it was concluded that the outcome was very different from recent tests done.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS EN AT

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): M. Loalbo

Abstract:

The purpose for this project is to create a working home-made particle accelerator that is able to replicate and simulate how larger models may function, as well as research questions such as why this machine was invented in the first place. After researching this project, it became evident that building even the most basic particle accelerator is very complex undertaking. Therefore, I was not able to create a fully functional particle accelerator. However, through my research, I did learn an extensive amount of information such as how these machines work as well as why they are used. I'd like to acknowledge my father for supervising and assisting me while I worked with power tools to create the accelerator. Overall, I am pleased how the model resembles an actual particle accelerator, and even though it is not functional, it can still be used as a good learning tool.

**Technical Disciplines Selected by the Student
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 vertebrate animals controlled substances

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CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5517

Title: Burning Biofuels: An Alternate Form of Energy

Student Name(s): M. Bilodeau

Abstract:

As years pass and gas prices go up, the world is looking for new sources of energy. One day, we will run out of our non-renewable resources and without a back-up plan, we will be lost. This is why I find it imperative to test and research other renewable resource options. My hypothesis was "If Motor Oil and Vegetable Oil were tested to see how much energy it produces, then I think the Motor Oil will produce the most energy because it currently powers most oil using appliances, rather than the Vegetable Oil which doesn't power much currently." I tested my hypothesis by placing a 1 ½ inch piece of cotton cordage onto a paperclip. I measured 3mL of oil and allowed it to soak into the cotton. I lit the cord and recorded the data until the flame went out. I analyzed my data and found that the Motor Oil (MO) stayed lit for approximately 6.05 minutes and had an average percentage change of 131.67%. The Vegetable Oil (VO) stayed lit for an average 8.12 minutes and also had an average percentage change of 131.67%. The results did support my hypothesis. The MO and the VO both had the same amount of energy, however, the VO stayed lit longer. I wondered if I tested two additional renewable resource options, would the same results occur. I tested Coconut Oil and Olive Oil and found they had drastically different results. This information is included in my continuation.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ET EV EM

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5518

Title: Strength of an electromagnet

Student Name(s): J. Tay

Abstract:

Electromagnets are useful in everyday life, but have you ever wondered what determines their strength? An electromagnet consists of wire around an iron core that is powered by an external source of energy. In this experiment I will use 3 different coils and 2 different batteries to explore how the strength of an electromagnet changes.

**Technical Disciplines Selected by the Student
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EE PH AT

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

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CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5519

Title: Instrument Science: Bell Flares/ Sound Blast

Student Name(s): M. Singer

Abstract:

My experiment was designed to test the effect of bell flare diameter on sound volume. I constructed an instrument made from 9 feet (2.743 meters) of clear vinyl tubing (15 millimeters inner diameter and 17 millimeters outer diameter). In separate trials, I attached two different plungers as bell flares, one large (16.982 cm diameter) and one small (12.382 cm diameter) to one end of the tubing. The control was the tubing without any plunger attached. I played three different notes, one low, one middle, and one high and recorded the volume to see how each "setting" responded in each register. Sound volume was measured in decibels using a decibel meter. I played each pitch three times on each setting. Research suggested that the larger bell flare should have a louder sound, and my experiment proved this to be true. In all registers, the settings with plungers produced louder sounds than the instrument without a plunger. The big plunger had a louder sound than the small plunger in two of the three registers, the one exception most likely due to hidden variables. When averaged across the trials for each setting, the volume margin between the instrument with a small plunger and the instrument without a plunger was quite large (3.33 decibels). The volume margin between the small and big plungers was .66 decibels, with the big plunger being the louder of the two. This experiment shows that bell flare diameter has an effect on sound volume.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AT PH EE

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5520

Title: The Heat is on

Student Name(s): A. Dascano

Abstract:

You know how everyone always says that dark colors absorb more heat than lighter colors, well I wanted to prove this theory right. I started by setting up the heat lamp 2ft above the table. Next I did a series of tests on black and white fabrics for 5 minutes each. I made sure to keep it constant by letting the thermometer cool down to room temperature after every test. When I had gathered the data, I had found out that the hypothesis was proven correct, the black fabric absorbed more heat energy than the white fabric. Now when you go and play outdoor sports, you'll know to wear lighter colors to keep cooler in the sun's heat.

Technical Disciplines Selected by the Student
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PH

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2. Student independently performed all procedures as outlined in this abstract. Yes No

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5521

Title: Zap That Zit

Student Name(s): S. Plotkin

Abstract:

Have you ever wondered which acne remedy is better at clearing up blemishes? In this experiment I tested three different remedies; natural, over the counter, and prescription to see which one is more effective at stopping bacteria causing acne. My hypothesis states that the prescription medication Tazorac would be the most effective at stopping the spread of bacteria causing acne. The first step in my procedure was to prepare agar plates by labeling them and make my bacterial lawns by swabbing the plate with E. coli bacteria. I waited five minutes for them to dry completely and then I was ready to add all of my remedies and negative control; sterile water. My next step was to grow the bacteria at room temperature. I began checking the plates after 72 hours of growing time, and saw noticeable results after 96 hours. After that time I measured the zones of inhibition using a millimeter ruler. My final step was to analyze my data. After analyzing my data I found out that after 96 hours of growing time the best results came from the natural remedy Tea Tree oil, even after 117 hours of growing time the best results were derived from the Tea Tree oil. My data leads me to the conclusion that Tea Tree oil is the most effective remedy at stopping the growth of bacteria which causes acne.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH AT

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2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5522

Title: Thermodynamics Of The Stirling Cycle: Testing the Effects Of The Relative Temperature Difference On Stirling Engine Output

Student Name(s): V. Aggarwal

Abstract:

First created by Reverend Robert Stirling in 1816, the Stirling engine uses a difference in heat across two points to compress and expand gas in order to do work. While the Stirling engine has the potential to solve all of the world's power problems, there are too many unknowns regarding the operation of the cycle. The purpose of my experiment is to find out whether the absolute difference in temperature across two points in a beta type Stirling engine is the only thermal factor affecting output. It is hypothesized that the baseline temperature will affect the engine, due to the higher operating temperatures, allowing the gas inside to expand more rapidly, which could compensate for the slower compression. To test this, a system was created that could control the heat of the two thermal points of an engine, and tested the engine output at several different temperatures, all with the same absolute difference. From the resulting data, it was concluded that there was little to no difference between higher and lower temperatures with a constant absolute difference. This should allow beta type Stirling engines to be used in a wide variety of areas that would not normally be considered for thermal energy production.

**Technical Disciplines Selected by the Student
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EE ET CS

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5523

Title: Power Wind

Student Name(s): D. Garcia

Abstract:

In the past, windmills have been used for grinding grains and pumping water. Today they're used for much more; to produce energy. Energy that is used anywhere from light bulbs above our heads, to industrial factories. During my trips from Connecticut to Rhode Island, I always observed this particular windmill. I wondered, "How do they work?, is there a way to take full advantage of wind (the source of the energy they produce) if a different blade is utilized?" Following the guidelines of US Department of Energy website, I proceeded to construct my basic PVC Wind Turbine. I installed a motor to the nacelle and connected a voltmeter to measure the output energy (millivolts) produced by four different types of blades. The first blade was an imitation of the typical blade you would see on windmills out there. The second one was a modified version of the typical blade. The third blade was a replica of one I found online, named GEDAYC by its maker (named technodrome blade for this project purpose). The fourth one was a scoop-like blade, wider at the outside end. Ten trials were made for each of the blades, then I calculated the average from the results. Surprisingly, the blade that produced the most energy under the same wind conditions was the technodrome blade. This one had the most atypical design. Possibly, the physical law that explains why ice-skaters spin faster whenever they pull their arms inwards, will explain why this design is the most effective.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE AT EV

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5525

Title: Solid Ground?

Student Name(s): J. Terry

Abstract:

Purpose: The objective of this project was to measure the weight bearing capacity of 3 different types of soil: sand, top soil, and backyard dirt. The hypothesis is that sand will support the most weight.

Procedures: Using a test rig that I made, 5 gallons of sand, top soil, and backyard dirt were tested to see which had the highest load bearing capacity. A plastic tub was filled with each soil. The legs of the test rig were pushed firmly down into the soil, and the rig's dowel rested on the surface. Weights were added to the platform on top of the dowel. Dowel penetration into the soil was recorded. Cured concrete was the control. **Results:** Depth vs. weight was graphed. The average penetration depth was calculated incrementally for each weight, and the final penetration depth was determined. The volume of each soil was the same but the soil weight varied. The control, cured concrete, weighed the most (100 lbs) and was completely incompressible. Sand had the most weight for the volume (60 lbs), and the dowel penetrated the least in sand where it sank 1 3/4". Dowel penetration depth was greatest in top soil (2 3/8") and in between in backyard dirt (2"). **Conclusions:** Weight affected load bearing abilities. My hypothesis was correct: sand compressed less under the load compared to the other soils. When controlled for volume, the soil that weighed the most, was the densest, and had the greatest weight bearing load.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EN EE

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5526

Title: Do Expensive Basketball Sneakers Outperform Inexpensive Basketball Sneakers?

Student Name(s): M. Carrara

Abstract:

Basketball sneakers come in a wide variety of styles and price ranges. The purpose of this project is to determine if the price of the sneaker affects its performance. The hypothesis is that if expensive basketball sneakers are made from higher quality material, they will outperform sneakers made with lower quality materials. To test the hypothesis three types of sneakers of different prices were tested to determine the starting and stopping friction forces. Variables that were controlled included the mass of each sneaker and the surface tested on. Each sneaker was weighed on a balance. Mass was added to bring each sneaker to 1,000 grams before testing. A spring scale was used to determine the amount of starting and stopping friction of each sneaker. These friction forces are important when playing basketball as they provide stability, traction, and improve performance. The results of the tests were compared to the price of the sneaker to determine the relationship between the price of the sneaker and its performance. Of the three sneakers tested, the mid-priced sneaker provided more stopping and stopping friction than the other two disproving the hypothesis. Doing more trials of the experiment would provide more data to support this result. Also, further investigation would be to test more sneakers with greater price variations. This information could be valuable to people who purchase high-priced basketball sneakers in the hope of improving their performance and/or having an advantage on the basketball court.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AT EN PH

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

Proj.
Num

P8

5527

Title: Hot Vs. Cold

Student Name(s): M. Balagna

Abstract:

The purpose of my experiment was to determine whether hot or cold water froze faster. I hypothesized that if water at varied temperatures were to be put in the freezer, then the hottest would freeze the quickest. The experiment procedure involved filling four glasses, each with a cup of water. One cup was refrigerated to 39 degrees, another was left at room temperature (67 degrees). The others were microwaved to reach 125 and 206 degrees. Each filled glass was placed in the freezer until the water reached 32 degrees. I recorded the temperature every five minutes. After timing each, I was able to determine that the initially cooler glasses took the shortest amount of time to freeze. The refrigerated glass took 25 minutes, the room temperature took 52 minutes, and the 125 degree heated water took 87 minutes. The glass 6 degrees below boiling took 104 minutes. Although the cooler temperatures froze quicker, I found that the hotter temperatures cooled the most rapidly. In conclusion, my hypothesis was proven incorrect, for the water initially the coldest froze the quickest.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH

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3. This project was conducted at a Registered Research Institution. Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): P. Mohanraj

Abstract:

Piezoelectricity is the principle that applying pressure to certain materials will produce electricity that can power devices, an approach to cleaner energy. In addition, it may be crucial to halting the current energy crisis. Producing electricity requires fossil fuels, nonrenewable resources that eventually will deplete. Although renewable resources are being implemented, most electricity originates from fossil fuels. Here, piezoelectricity can be implemented to temporarily eliminate fossil fuels. The purpose of this experiment is to use piezoelectricity to determine a material with high piezoelectric production, great durability, and high benefits. My hypothesis is that out of four tested materials, quartz would be most effective, because of its chemical properties, and that it is known to have high piezoelectric efficiency. Piezoelectricity can be implemented into shoes, where pressure generated through walking can power devices. The experiment involves measuring voltage per pressure ratios for all materials in three settings: dropping, pressing, and applying with shoes. Durability and benefits were also measured from piezoelectric data and separate research. The data supported that quartz was ideal piezoelectricity, producing 0.041 mV/Pa, having 98.3% durability, and exhibiting 87.5% benefits. I concluded that quartz was the best material, out of the tested materials, at the given criteria. Due to durability, small amounts can produce electricity for long periods of time before becoming damaged, thus less quartz becomes depleted and more electricity is produced. The ultimate goal is implementation of piezoelectricity into higher levels in society, such as transportation and households, on the path to cleaner energy.

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5529

Title: Impact of Angular Positions for Basketball Bank Shots

Student Name(s): M. Hills

Abstract:

The purpose of this project was to determine from which angular position on a basketball court a player has the highest or lowest chance of making a bank shot. It was hypothesized that the angular position with the greatest chance of making a bank shot would be 30° , and the angular position with the worst chance of making a bank shot would be 0° . A model was built to scale representing a portion of a real basketball court to test the likelihood of a successful bank shot from various angles. The players' distances from the basket were calculated to the equivalent of 3 meters away on a full-size court. A scaled down backboard was created, labelled and marked on each centimeter away from the middle of the backboard, then taped on a wall against the model. A ramp for the test ball was created to represent the path that the ball takes from the player to the basket. The end of this ramp was placed at each player's angular position to the central line on the scale model. The test ball was then rolled down this ramp from the 0° , 30° , 60° , and 90° angular positions from the central line, impacting 19 different points on the backboard for each angular position. The data was collected and the conclusion was drawn that the best angular position for a bank shot is the 30° position, followed by the 60° position, then 90° , and finally, 0° .

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5530

Title: What's Shaking? - A Study of Soil Liquefaction

Student Name(s): A. Larocque

Abstract:

This series of experiments tested how different soils react to excessive motion, as there water content changes. The process and representation of liquefaction, a process a soil undergoes when earthquake like forces are applied causing the soil to lose strength and become a “liquid”, was studied and measured. This was done by timing how long a block took to sink 2.5 cm into a soil while there was a constant motion. Three soil types were used, A river sediment, with consistently sized granules, a Glacial Outwash, with a wide grain size distribution, and an organic silt, with very small grain sizes, and a degree of organic material and clay. I believed that the river sediment would perform the worst due to the process of liquefaction, but data from testing showed otherwise. This was however due to the motion applied to the soils and the type of failure occurring to the representation of a building. Instead of failing because of liquefaction like phenomena the building failed due to the back and forth motion of the shake table causing soil to pile up against the side of the building, passing the failure line. This was a large hidden variable in the experimentation, and occurred in most scenarios of experimentation. Although data did not prove my hypothesis correct, visually I would say the river sediment best represented the process of liquefaction. In order to create liquefaction like failures a smaller lateral motion would be needed, or a better way to define liquefaction.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EA PH EN

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

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Title:

Student Name(s): E. Anderson

Abstract:

I have been studying the components of a Gauss Launcher to understand the affects of magnetism, momentum, and friction on the efficiency of the launcher's design. A one-stage Gauss Launcher begins with the starter ball traveling on a gentle slope. As it gets close, the magnet draws the ball in, and the ball accelerates. The starter ball impacts the magnet, and the energy transfers through everything, to the last ball. The last ball moves, because the momentum from the impact sends it away, similar to the transfer of momentum exhibited in Newton's Cradle. It is able to move because it is only being held lightly by the magnet. When the second ball is launched, it is moving approximately the same speed as the starter ball was when it made impact with the magnet, after its acceleration by the magnet. To study the effects of the three key factors, I did individual tests of each. First, I changed the number of magnet stages, from 1-7; then the distance between stages, from 10-30cm; and finally I varied the number of balls beyond the magnet from 2-3 balls. My tests found that the final ball travels with the greatest velocity when there are the maximum number of stages and three balls behind each stage. The distance between stages must be 10-30cm, but is otherwise irrelevant. The Gauss Launcher design, and variations using electromagnets instead of neodymium magnets, has many possible practical applications, including space launch, transportation on magnetic levitation trains, and military combat.

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5532

Title: Can Humans Distinguish What an Object is Just by Feel?

Student Name(s): S. Carey

Abstract:

I studied can humans detect what an object is just by feel? I investigated this topic because I thought it would interesting to see if there sight and other senses were taken away if humans could distinguish what an object was. This would kind of be like a blind person not being able to see or a deaf and blind person. I took a shoe box and cut a hole in it so the subject could put his or her hand in it. The subject would but their hand inside the box and tell me what the object was. The hypothesis was if a human touches an object just by feeling then the human will be able to tell what the object is over half the time. This hypothesis was not rejected by the data. It is true that people can detect objects %80-100 of the time. Humans cannot be specific when they just use there scene of feel.

**Technical Disciplines Selected by the Student
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BE

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5533

Title: The Fastest Way To Solve A Rubik's Cube

Student Name(s): L. Burkacki

Abstract:

The purpose of this science fair experiment is to see what method solves the Rubik's Cube the fastest. I predicted that the method with the least amount of moves will solve the Rubik's Cube the quickest. I solved the Rubik's Cube multiple times with three different methods, the beginner's method, the intermediate method, and the expert method. The result was that the expert method was the fastest in the solving of the Rubik's Cube. The Expert method had the least amount of moves compared with the other two methods, so my prediction was correct.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

BE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5535

Title: Does the Seebeck coefficient of a conductive material affect the generation of electric potential?

Student Name(s): E. Silva

Abstract:

The purpose of my experiment was to determine whether the Seebeck coefficient of a conductive material affects the amount of electric potential generated. I hypothesized that the wire combination galvanized steel/copper would produce a higher voltage than copper/copper and aluminum/copper. I believed this because galvanized steel (900°C) reaches its boiling point faster than copper (1084.62°C) and slower than aluminum (660°C). To conduct this experiment, I attached the end of the first wire to each of the two pieces of copper by twisting about one-half inch of wire together. Next, I placed the unattached ends of the first wire to the positive and negative terminals of the voltmeter. Then, I placed one end in ice water, leaving the other end at room temperature. After that, I placed the other end in the boiling water. It was discovered that my hypothesis supported my data, however, for the wrong reasons. The average millivolt for the galvanized steel/copper combination in both ice and boiling water was 0.64. The average for aluminum/copper combination in both ice and boiling water was 0.3 mV. For the copper/copper combination the average was 0.0 mV; that occurred because the Seebeck effect states that two different metals are needed to create electricity. Galvanized steel/copper generated the most electric potential; the Seebeck coefficients of the two metals had a greater range. The larger the range of the coefficients the greater the amount of electric potential.

Technical Disciplines Selected by the Student
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EE ET

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5536

Title: Tap Water vs Bottled Water- Is There a Difference?

Student Name(s): M. Voss

Abstract:

The sale of bottled water has been on the rise for years. Many people believe that drinking bottled water is more beneficial to health than drinking tap water. The purpose of this project is to analyze and compare tap water to bottled water to determine if there is a difference between them. The hypothesis is that if the chemical components of tap and bottled water are tested and compared, the bottled water will be shown to be better for human consumption. The standards for the production of bottled water are regulated by the U.S. Food and Drug Administration. Tap water supplies are regulated by the Environmental Protection Agency. The experiment tested tap water and three types of bottled water for; total alkalinity, pH, nitrates, total hardness, and total chlorine using colorimetric test strips and charts. The results of each test were recorded, then graphed and compared to determine the differences between the waters. While there were slight differences in the results for some factors tested all of the waters were found to be safe for human consumption. However, there are other factors to consider when choosing which water to drink. These include the taste, convenience, cost, and the negative effects of plastics on the environment. Plastics bottles in landfills, the oceans, rivers, lakes, and other areas of the Earth have been increasing. They are ugly to look at and dangerous to many organisms. Finally, tap water contains fluoride which prevents cavities in teeth while bottled waters may not.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH EM ME

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5537

Title: The Effect of Processing on the Vitamin C Content of Orange Juice

Student Name(s): A. Bonat

Abstract:

Vitamin C is an essential nutrient for the human body to function. According to the National Institutes of Health, the average adult male should consume 90 mg of vitamin C per day and the average adult female should consume 75 mg of vitamin C per day. Many people get their daily vitamin C from orange juice. Orange juice from the supermarket is often vastly different from freshly squeezed orange juice, though. At the factory, oranges are juiced then sent through a process of filtering, concentration, reconstitution, and pasteurization. The pulp is also frequently removed. Unconcentrated is called NFC (not from concentrate). This study determined how this process affects the amount of vitamin C in orange juice. Freshly-squeezed orange juice, orange juice pasteurized by heating it, and orange juice concentrated by freezing it and allowing the orange juice to drip out leaving the water behind then reconstituted by adding water back in were tested for the vitamin C content by iodine titration. It was hypothesized that processing would reduce the amount of vitamin C in orange juice, and pasteurization would have the greatest effect. It was determined that 100 mL of freshly-squeezed orange juice contained 68.3 mg of vitamin C, pasteurized orange juice contained 52.4 mg of vitamin C, and concentrated and reconstituted juice contained 47.5 mg of vitamin C. This shows that pasteurization, though a necessary procedure to get rid of microorganisms, substantially reduces the amount of vitamin C in orange juice, but concentration and reconstitution had the largest effect.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH PS

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5540

Title: How does the pH level of liquids used to take with medication pills affect dissolvability?

Student Name(s): E. Marcone

Abstract:

I am aiming to find out how the pH level of liquids used to take medication pills affect the dissolvability of that pill. I want to research and test this topic because then it would affect which liquid my family and I would take our medication pills with. Also, it would show which liquid would help dissolve the Advil gel would capsule the quickest and most efficient when mixed with stomach acids. I believe that any liquid that tends to be more basic will slow down the dissolvability rate. To conduct my experiment, I had to fill 6 test tubes with hydrochloric acid and then put the pills and other liquids in the test tubes. I put in a proportionate amount of acid to the other liquids that would be in the stomach, which is a 2:1 ratio. As a result, the pH level of the hydrochloric solution went up when mixed with the Advil gel capsule and other liquids. Originally at a pH level of 2, the hydrochloric acid solution went up 1-1.5 pH levels on the scale because the higher pH levels of the liquids and Advil capsules combined neutralized the hydrochloric acid solution. The capsule in the Pepsi solution dissolved quicker than the others. In my experiment I figured out that my hypothesis was correct because the Pepsi has the lowest pH level out of the group.

Technical Disciplines Selected by the Student
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CH ME

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5541

Title: Spot On! The Use of the Visible Electromagnetic Spectrum to Determine the Effectiveness of Stain Removers

Student Name(s): M. Baldini

Abstract:

My project idea was born one day while attempting to scrub a fruit juice stain out of my favorite cotton t-shirt. I tried removing the stain with a commercial spray-on stain remover and the results were underwhelming. I read the list of ingredients on the bottle and was amazed at the number of chemicals in the solution. I decided to concoct a stain remover using only natural ingredients and hoped that I could create an environmentally-friendly product that could effectively remove stains better than the commercial solution. I tested my solution on stains containing different chemical consistencies and viscosities (cherry juice, olive oil, and dark-roast coffee) and compared the performance of my stain solution to the performance of the commercial stain remover and to water. To evaluate the results of my experiment, I used Adobe Photoshop to determine the amount of visible electromagnetic light rays emanating from the stained test swatches. Using the electromagnetic spectrum to measure the performance of the three stain removers was essential to objectively evaluate the performance of these stain removers. The natural solution that I created had the greatest overall removal of the stain. This solution incorporates three common methods of stain removal (oxidation, solvents, and surfactants) and is effective on nearly all types of stains (most stain removers use only one of these stain removing methods.) These findings show that natural solutions can clean just as well and, in this case, even better than synthetic solutions. Also, these natural solutions are environmentally friendly.

Technical Disciplines Selected by the Student
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CH EV AT

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5542

Title: Measuring The Amount of Acid In Vinegar By using Titration

Student Name(s): M. Williams

Abstract:

Vinegar is a multi-purpose item in our everyday lives. Many use this item to cook and to clean, but how will you know which is the best for our health? The vinegar with the least amount of acid is better for cooking while the vinegar with the most amount of acid is recommended for cleaning. My project, measuring the Amount of Acid in Vinegar by Using Titration was about measuring which type of vinegar, white distilled, real red wine or apple cider vinegar has the most amount of acid in it. My hypothesis was that I believed the apple cider vinegar would have the more acidity in it than the white distilled and red wine vinegar. After I followed my procedure of adding 1.5ml of vinegar to the Erlenmeyer flask with 50ml of distilled water and adding 3 drops of .5% Phenolphthalein solution, I began adding drops of the Sodium Hydroxide in the solution until it turned purple. It was recorded that it took 3.34ml of sodium hydroxide for the real red wine vinegar to turn purple while it took 9.71 ml for the apple cider vinegar to change its color. Lastly, it took 29.44ml for the white distilled vinegar to turn purple. So, in my conclusion I can say my hypothesis was wrong and that red wine vinegar had the most amount acid out of the three.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH ME

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5543

Title: The Performance of Greener Alternatives vs. Standard Hydraulics Fluid

Student Name(s): L. Har

Abstract:

This project determines if green alternatives can be more efficient than standard hydraulic fluid. The hypothesis is if green alternatives and standard hydraulics fluid are pumped through the hydraulics system, then the green alternatives can lift the crane arm the same height or higher, and also same speed or faster, than the standard hydraulic fluid if the viscosity is the smallest. The first step was to measure the viscosity of these oils: extra virgin olive oil, corn oil, peanut oil, canola oil, and standard hydraulics fluid. And oil was poured into a beaker. It was then tilted at a horizontal angle. The fluid had ten seconds to flow into a graduated cylinder. The more liquid in the graduated cylinder the more viscous. Olive oil had the less viscosity while hydraulics fluid had the less viscosity. And oil was pumped through the hydraulic machine by placing a one kilogram weight on the end of the syringe. The oil flowed through the tube and pushed the end of the second syringe upward. The height the crane arm was lifted was divided by the time it took for the weight to push the end of the syringe down. Standard hydraulic fluid was the most efficient with the highest quotient while extra virgin olive oil was the least. So the hypothesis was correct. Even though the green alternatives did not lift the crane arm the highest or in the least time because they didn't have the smallest viscosity.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH EV EE

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5545

Title: Using Induced Wind Force to Increase the Efficiency of an Electric Vehicle Battery

Student Name(s): E. Fedor

Abstract:

Electric vehicles (EV) are the world's most eco-friendly cars. EVs are powered by an electric motor, which gets its power from an array of rechargeable batteries: lead acid, nickel metal hydride (NiMH) or lithium-ion. The battery needs to be recharged daily via a standard electrical outlet. But what if we could increase the efficiency of an EV by using induced wind force to charge the battery, which would reduce the overall charging time and the amount of electricity we draw from the power grid. For my project, I simulated induced wind force against a moving vehicle to charge a NiMH battery. First, I assembled a small 6-blade model wind turbine with a built-in generator and battery charger. The turbine was attached to the base of a battery-operated remote control car. When the car was in motion, the induced wind force turned the blades which activated the generator to transform mechanical energy into electric energy to charge the rechargeable AA 1.2V NiMH battery in the battery charger. Next, I used the same turbine in a stationary position, but with a different battery, to act as the control in my experiment. Voltage was recorded during each test run. The mobile turbine increased battery charge by 31% (from .884V to 1.161V) during a total run time of only 75 minutes; thus proving my idea that we could harness induced wind energy by incorporating wind turbine technology into the design of EVs; specifically at wind pressure points such as the front bumper.

Technical Disciplines Selected by the Student
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ET EE EV

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5546

Title: Is Your House Radioactive?

Student Name(s): S. Munshani

Abstract:

Electromagnetic Field Radiation (EMF) is in our microwaves, telephone wires, even the metal in our beds. EMF radiation can both harm us and help us. I tested the effect of EMF radiation on plant growth and development. My first hypothesis states that if plants were exposed to EMF radiation, they would suffer growth complications, or not grow at all. My second hypothesis was that the level of growth complications would vary depending on the amount of radiation exposure. Those exposed to the most radiation would grow the least. My two sources of EMF radiation were a microwave oven and a can opener. I had 15 plants in each test group, including a control group. Every night for 20 days, I exposed the microwave group to 13 minutes of radiation at an average of 0.102 MG, and the can opener group for about 5 minutes at 0.088 MG. The microwave plant group showed a significant difference in how many plants successfully germinated, and how fast the plants grew. Out of the microwave group only 20% of plants germinated. In the can opener group 66% of the plants germinated, and 73% of the plants in the control group germinated. Both of my hypotheses were proved correct because the plants that had the most exposure of EMF grew the least, and the plants with the least exposure of radiation grew the most, and the growth varied based on the different levels of radiation that the plants were exposed to.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ME EV PS

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5547

Title: How Everyday Substances Affect the Freezing Point of Water

Student Name(s): A. Pargen

Abstract:

How Everyday Substances Affect the Freezing Point of Water The purpose of this experiment was to discover if different household goods could change the amount of time it took for water to freeze or change its freezing point. I was inspired to do this experiment because ski areas use special chemicals to change the freezing point of water so they can make snow at any point. I wanted to see if anything that people normally have access to could affect water. My hypothesis was, if I add olive oil, sugar, honey, milk, vanilla, and rubbing alcohol to water, then they will affect its freezing temperature or time it takes to freeze. To investigate this, I had a freezer set at an average temperature for everything tested, and timed how long it took for everything to freeze. The control of water and the mixture of milk and water took about the same amount of time to freeze. The olive oil took about half an hour longer to freeze than the control. The water and alcohol would not freeze at all, even on the lowest setting of the freezer. The sugar and honey took about the same amount of time to freeze; about 53 minutes. The results showed if you want to keep something from freezing, mix it with alcohol. The sugar and honey made the water freeze a bit faster. If I were to do another experiment, I would probably test uncommon materials that would not be found in a household.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5548

Title: Making Music Louder Without Electricity

Student Name(s): D. Babineau

Abstract:

As unlikely as it may seem, wood can actually amplify sound. Different densities of wood amplify sound differently. For example, many instruments (such as guitars and violins) are made of wood. In my experiment, I found out what type of wood, poplar, pine or maple, amplifies sound the best. I hypothesized that poplar wood would work the best because of its low-medium density (it was the least dense). Using these three woods, I built three speaker boxes that fit most smartphones and/or music players, but works best with those that have speakers on the very bottom (or on the top). The boxes had wood on all sides but one. I put my iPhone 5c on maximum volume in the side with no wood with the speaker facing the back side and played a song that doesn't have much volume change. I measured the decibel level with a decibel meter. I did this three times per type of wooden box. I recorded and averaged the decibel levels. The averages were as follows: 65.40 dB for poplar, 65.93 dB for pine, and 66.90 dB for maple, compared to the control which was 62.63 dB (the control was the device used for playing music without a speaker box). This proves my hypothesis incorrect. My results showed that the densest wood (maple) amplified sound the best and the least dense wood (poplar) amplified sound the worst, proving the higher density of the wood, the better it amplifies sound.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EN PH MA

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5549

Title: The Effect of Catapult Arm Length on the Distance the Projectile Travels

Student Name(s): N. Rosselli

Abstract:

The hypothesis is that the longer the arm of a catapult, the farther the projectile goes. In order to test this, a catapult was designed and built with 3 different arms of different lengths. The catapult was built out of wood, a bolt for the axle, an elastic band and a plastic cup holding the golf ball projectile. The three different arms (14, 17 and 20 inches) were used to launch the catapult 20 times each and the distance the golf ball traveled was measured using a tape measure. The 14 inch arm threw the farthest (163.6 in), followed by the 17 inch arm (156.6 in) and the 20 inch arm threw the shortest distance (124.8 in). The average distance the projectile traveled was similar for the 14 and 17 inch arms, and the 20 inch arm threw the projectile the least distance. This data did not support the hypothesis because of the conservation of energy. The longer and heavier the arm got, the more energy was taken out of the elastic and put into moving the arm and less energy was available to launch the projectile. If the arms were made from a lighter material, perhaps the arm length would not impact the projectile distance as much.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE AT MA

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5550

Title: Evaporation Situation Part Two

Student Name(s): R. Thomas

Abstract:

Do factors such as surface area, color and room temperature, effect the evaporation rate of water? Evaporation is a type of vaporization that occurs only on the surface of the liquid. Therefore, I hypothesized that the water in the container with the largest surface area, would evaporate the most quickly, regardless of the volume of the water; that the color of the container would not affect the evaporation rate, but that food coloring would affect it; and that water would evaporate more quickly in a room with a higher temperature. To test the effect of surface area, I examined three differently shaped containers, containing the same amount of water. To test the effect of color, I examined water in two different colored, but same sized, containers. Then, I put the same amount of water in four identical tubes, but added three different food colors to the water. One tube contained clear water. To test the effect of room temperature, I repeated an experiment in two rooms with different temperatures. The results were: the water in the container with the largest surface area evaporated the most quickly; the water in different colored containers evaporated at the same rate; the water with food coloring evaporated at a slower rate than the water without coloring; and the water in the room with the higher temperature evaporated at a faster rate.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EA ET EV

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5551

Title: UV--C Lighting As A Supplemental Method Of Preservation In Refrigerators To Reduce Energy Consumption

Student Name(s): C. Hwang

Abstract:

An experiment is performed to test the possibility of using UV-C lighting to prolong the storage time of two types of foods in a standard refrigerator. Ground beef and chicken drumsticks were used as test samples. It is shown that the use of UV-C lighting as an adjunct to refrigeration prolongs the storage time of food and slows down its spoilage while allowing the refrigerator to be cycled on and off at 12-h intervals, thus resulting in a substantial reduction in U.S. energy consumption (41 billion kWh annually) and savings in electricity (\$2.6 billion). The use of this technology will benefit the environment in terms of reducing greenhouse gases and our carbon footprint.

Technical Disciplines Selected by the Student
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AT ET MI

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5553

Title: Effect of different pH of soils on plants.

Student Name(s): N. Woo

Abstract:

Many farmers want to know how to speed up the growth of plants. In this experiment change the pH of the soils in order to increase the speed of which the plants grow. The purpose of this experiment was to determine if a higher pH would be better at speeding up the growth of the plants than lower pH's. It was hypothesized that if the beans were in a higher pH soil it would be the most effective at speeding up the growth of the plants rather than the neutral pH, which is a pH of 6, or the acidic soils which has a pH of 4, the Basic soil has a pH of 9. It was thought that with more 'healthier' nutrients it would grow faster. The first step was to germinate the seeds. After that was to start making the soils more acidic and basic. Magnesium hydroxide was used to make the soil more basic. Carbonic acid was added to make the soil more acidic. After this put the plants into their new soils. The acidic plants started to grow during the first day, but then died off after a few hours after. The hypothesis was wrong, neutral plants had a slightly faster growth than the other plants, but it may have been caused by some other factor. The factors that may have affected these plants were the already fast rate of which the plants grew at before they were affected by the soils.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PS EV EA

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5554

Title: How Materials Affect Tonic Water Glow

Student Name(s): S. Kirn

Abstract:

Recently I was fascinated by white clothes glowing under black lights at an arcade. Black lights emit most of their light waves just outside the range of visible light. Scientific American suggested an experiment of adding bleach to tonic water (both items glow under black light). I was inspired to add other substances which glow under black light to tonic water. Tonic water contains quinine, a bitter crystalline compound containing phosphors which absorb light energy, releasing it as blue light. I tested six black-light-glowing materials that I researched (bleach, soap, toothpaste, petroleum jelly, household cleaner, and grapefruit (which also contains quinine)). I added .5 ml liquid or ¼ tsp solid of each substance to test tubes filled with tonic water. In a dark room, I shined black light on the test tubes. I ranked glow for each substance at intervals of 5-min, 10-min, 30-min, 1-hour, 12-hours, and 24-hours. Immediately, the soap and toothpaste had the brightest glow. The dimmest glow was emitted from the bleach and grapefruit. After 24 hours, the soap continued to glow the brightest while the toothpaste and household cleaner's glow diminished. Basically, glow is affected by how the substances interact with the quinine. The bleach glowed the least, causing an oxidation reaction which broke chemical bonds of quinine. Adding more quinine as in grapefruit did not "double" the effect of the glow. For the soap, the chemical structure of quinine must have remained unaltered even over 24 hours, and the florescent soap additives enhanced the glow.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5555

Title: Powerful Propellers

Student Name(s): A. Cloud

Abstract:

Global warming pollutants are rapidly collecting in the atmosphere, and causing the planet to warm up. Over the past 50 years, global temperatures have increased at the fastest rate in history. The leading contributor to climate change, greenhouse gases, need to be cut down or else average U.S. temperatures are predicted to be 3 to 9 degrees higher by just the end of this century. It is imperative for us to tackle this problem before it gets out of hand. In order to decrease the amount of polluting energy sources the U.S. uses every day, I have taken steps in utilizing renewable resources for clean energy. Micro Hydro energy uses the power of water to create clean energy and is completely renewable, as well as beneficial to the environment. In my experiment, I explored the most efficient way to use Micro Hydro energy in your home by building a micro-hydroelectric turbine and comparing the amount of electricity created by it with varying numbers of propellers. The turbine with the most propellers showed a 224% increase in electricity produced compared to the turbine with the least number of propellers. These results demonstrate the most effective way to use a world changing energy source that is safe for the environment and can prevent any further damage being done to our atmosphere.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AT EE ET

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): E. Ereshena

Abstract:

The purpose of this project is to determine if some commonly sold lipsticks contain the heavy metal lead. People who are exposed to lead can suffer from lead poisoning. Those who use lipstick can ingest lead when licking or biting their lips. Problems associated with lead exposure include damage to the nervous system, especially the brain. The hypothesis is that if lead is found in lipstick, then darker shades of lipstick contain more lead than lighter shades of lipstick. This experiment tested for the presence of lead in eight lipsticks. Dark and light shades of four different brands were tested by applying a sample of lipstick to aluminum foil and gently rubbing it with a napkin. A change in the aluminum foil from shiny to dull indicated the presence of lead due to a corrosion reaction between the aluminum and lead. A black residue on the napkin indicated the amount of lead present in the lipstick. Analyzing the data from the experiment showed that all of the lipsticks tested contained lead. Many of the lighter shades of lipstick caused greater changes to the aluminum foil and the napkin indicating that they contained more lead than the darker shades. This information is important for those who apply lipstick frequently and are concerned about exposure to toxins such as lead. Extensions of this project would be to test more lipsticks and to develop and create a lipstick made from all natural ingredients.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5557

Title: Injury Reducing Characteristics of Running Shoes Using Innovation and Design

Student Name(s): L. McCormick

Abstract:

The technology of sneakers is advancing quickly, and the new technology makes sneakers that are less prone to injury. However, the old technology is often still used and, because of this, these shoes may lead to many injuries that can be detrimental to any runner. During this experiment, shock absorbency and traction were tested on every shoe, and the results proved that some shoes that are marketed at a very high value have either very poor traction or very poor shock absorbency. The Nike Free Sneaker demonstrated a poor performance overall, exhibiting the worst qualities in shock absorbency and traction. The Nike Air and Asics Gel Sneaker performed best in Shock Absorbency and Traction, respectively. By combining these two characteristics into one shoe, one could effectively design a shoe that could reduce the runner's risk of injury in both categories. This is more important now than it ever was in history because there are younger, more intense athletes than ever before, and this combination of undeveloped muscles and bones with a higher intensity and frequency creates a much higher risk of injury. In order to protect any athlete, but especially this group, sneaker companies like Asics and Nike, which promote athletes throughout the world, need to make sure that they are providing the best quality footwear for these athletes.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EN ME PH

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5558

Title: Effects of Acids on Strength of Magnets

Student Name(s): M. Anumolu

Abstract:

This experiment was designed to explore the effects of various pH levels on the strength of magnets. Many machines, such as wind turbines, are put outdoors and can be exposed to acid rain. In this experiment, countersunk neodymium magnets were placed in 80 mL of different liquids for 48 hours and tested for strength. A screw was placed through the countersunk hole and the magnet was placed on a white board, screw pointing out. A spring scale was placed on the screw. Weights were gradually placed on the spring scale until the magnet was dragged down. The control magnet could hold 390-400 grams. Ten magnets were placed in the liquids in separate beakers: two in water (6 pH), two in black coffee (5 pH), two in vinegar (3 pH), two in lemon juice (2 pH), and two in sulfuric acid (1 pH). The magnets left in water held 290 g, black coffee held 350 g, lemon juice held 300 g, and sulfuric acid held 390 g. It was determined that the sulfuric acid, which had the lowest pH, had a very minimal effect on the strength of the magnets. The magnets that were left in the water could hold the least number of grams (290g). This disproved the original hypothesis that the lower pH levels would cause the strength of the magnets to lessen. However, this does open up the idea that rusted magnets may not be as strong as un-rusted magnets.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH PH

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CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5559

Title: Soaking It Up

Student Name(s): D. Cawley

Abstract:

Oil spills can be harmful to the environment. One way to clean these spills is by absorbing the oil. What is the best material to absorb the oil? The purpose of my experiment was to test which material would best absorb oil. I used shop towels, paper towels, absorbent pads, cotton, and artificial sponges. To conduct this experiment, I poured two cups of water and one cup of vegetable oil in a measuring cup. Then each material was individually placed in the measuring cup. After three minutes, the results were recorded. My hypothesis theorized that the absorbent pads would absorb the most oil, which was partially correct. The results surprisingly showed that the absorbent pads and the artificial sponges both had similar results. After further testing, results indicated that the sponges absorb more water than the absorbent pads. I believe this occurs due to both have similar polarity or makeup. Later research and testing showed that the sponges absorb much more water which would mean it has a greater attraction to water than oil. This would require a larger quantity of sponges in a real life situation making the absorbent pads the best material to use in an oil spill.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV EM EV

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3. This project was conducted at a Registered Research Institution. Yes No

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CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5560

Title: Energy Scavenging: Proving the Seebeck Effect with a Homemade Thermoelectric Generator—A Source of Free, Sustainable, Low Voltage Power

Student Name(s): K. Robertson

Abstract:

Energy Scavenging is a process which captures small amounts of energy that would otherwise be lost as heat, light, sound, vibration or movement. This captured energy can be stored and used to power low-voltage devices like wireless wearable electronics, wireless sensor networks, and even internal medical devices like pacemakers. A 2014 Google Science Fair project which used heat from the human hand and Peltier modules to power a flashlight inspired this project. I researched the Seebeck Effect and devised an experiment to see if I could create a Peltier-powered thermoelectric generator capable of powering LED lights and an iPod charger. My thermoelectric generator was made from aluminum cake pans and seven Peltier devices, wired in series. By applying different combinations of cold to one side of the thermoelectric generator and heat to the other, I was able to generate over five volts of electricity, enough to power a single LED light, a nine-bulb LED flashlight head, and a five-bulb LED headlamp. I was able to light the power light on the iPod charger but did not have enough sustained voltage to begin to charge the iPod. My research and experimentation has proven that energy by-products, such as heat, can be captured and used to create more energy. Thermoelectric generator technology is being used on NASA's Voyagers 1 and 2, and NASA's Jet Propulsion Laboratory has shared its knowledge to encourage development of thin film thermoelectric devices designed to power biomedical devices, increase vehicle efficiency, and cool military body armor.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

ET EE AT

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CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5561

Title: Fireplaces - To Heat Or Not To Heat? That Is The Question!

Student Name(s): S. Mehan

Abstract:

Will burning wood in a fireplace cool your house instead of heating it? My hypothesis is it will aid in heating a house because it is a source of heat in an enclosed environment. To test this hypothesis I set sensitive atmospheric thermometers in rooms throughout my house; including sitting distance from the fireplace, nearby rooms on the same floor and rooms on the upper floor. I measured the room temperatures at the start of the experiment. I then prepared the fire and waited thirty minutes before taking secondary temperature readings at all locations. I continued recording temperature readings at intervals over a seventy-five minute period. The starting temperatures ranged from sixty-five to sixty-nine degrees. The temperature at sitting distance from the fireplace increased throughout the experiment. The rooms on the same floor of the fireplace showed a slight increase in temperature before eventually decreasing throughout the remainder of the experiment. Of the rooms on the second floor, one maintained its temperature temporarily before decreasing steadily. The other room's temperature decreased throughout the experiment. This proved that using a fireplace as a source of heat for a house is inefficient, cooling a house instead of heating it. In fact, the fire was consuming oxygen and taking the hot air and pushing it back up the chimney; thus leaving all the cold air in the house. Proving that the increase of warmth within sitting distance of the fireplace was just an illusion, making me think the entire house was being heated.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ET EV

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5562

Title: Shrouded Wind Turbines and The Venturi Effect

Student Name(s): J. Wu

Abstract:

The formula for the power generated by a wind turbine is $P = \frac{1}{2} \cdot k \cdot C_p \cdot \rho \cdot A \cdot (V^3)$. So, for example, a 10% increase in wind velocity will result in a 33% increase in electricity production. My hypothesis was that if a “shroud” (nozzle or diffuser) was added to a wind turbine, then the electricity output would be higher. My procedures started with constructing a wind turbine with a motor and two outlets for measuring electricity output. For my control, I placed a box fan in front of a wind turbine without a shroud and measured the electricity output using a voltmeter. Then I added a nozzle in front of the wind turbine. Lastly, I added a diffuser behind the wind turbine. I repeated each experiment 6 times and calculated the average voltage. The nozzle model produced 41% more electricity, but the diffuser model produced 55% less electricity compared to the control. In conclusion, adding a nozzle will produce more electricity due to the Venturi effect, which causes a decrease in air pressure and an increase in air velocity when air flows through the constricted section of the funnel. In my experiment, adding a diffuser did not produce as much electricity because the diffuser increased air pressure and slowed down the flow of air. Following my experiment, I sketched a design for a wind turbine, which had a dodecahedron-shaped wind collector (eliminating need for wind tracking) and a nozzle that increased wind velocity. I also reduced the size and height of the wind turbine.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AT EV ET

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5563

Title: Conduction Junction

Student Name(s): F. Chieffalo

Abstract:

Have you ever wondered what materials conduct electricity? I have an answer for you. In my project Conduction Junction, I tested what materials would conduct electricity. It was believed that metal based materials will conduct electricity and illuminate the light. The materials tested in my project were rubber, a quarter, plastic, copper, cardboard, aluminum, and wood. I tested this by making a complete circuit and connecting the materials to the wires. By connecting the positive and negative wires to the 6V battery, some materials conducted, while others did not. The quarter, the copper wire, and the aluminum conducted electricity and illuminated the light. However, the rubber, the plastic, the cardboard, and the wood, did not conduct electricity.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5565

Title: Bio Mechanical Study of a Universal Soccer Shoe Design on Game-Relevant Surfaces

Student Name(s): M. Martiska

Abstract:

Soccer players use two different shoes when playing on outdoor and indoor fields. Soccer Cleats are used on outdoor fields. Turf shoes are used on indoor turf. A soccer shoe for all surfaces would reduce shoe costs, the complexity of carrying multiple shoes and the carbon footprint. Therefore, I designed a Universal Soccer Shoe that could be used on grass, outdoor and indoor turf fields. To design the Universal Soccer Shoe, I had to understand which shoe worked best on each playing surface and why. I conducted three experiments to determine which shoe worked best – Straight Line Running Experiment, Turning Running Pattern Experiment and Friction Experiment. These experiments were performed on the grass, outdoor and indoor turf fields using five 13 year old male players with different body sizes. Soccer Cleats performed best on outdoor fields and exhibited the highest friction. Since outdoor fields are used mostly during the year, I decided to make a removable attachment to the Soccer Cleat. The attachment was made of a silicone that would cover the studs on the cleats making them suitable for indoor turf. The silicone bottom was attached to the Soccer Cleat with screws through the silicone. The silicone bottom was modified to have a similar tread as a turf shoe to add traction. Aluminum inserts were included in the silicone to help the attachment maintain its shape. My Universal Soccer Shoe Prototype was used in the experiments described above to validate the design concept.

**Technical Disciplines Selected by the Student
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EN EE

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4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5566

Title: Can Common Household Cleaning Products Be Used As Makeshift Stain Removers?

Student Name(s): K. Morelli

Abstract:

The purpose of my experiment was to find out if common cleaning chemicals can be used as a quick and easy stain removers for fabric. My hypothesis states that Windex Original Glass Cleaner will be the most productive stain remover out of the 4 products I use. My procedure began by me polling my friends to discover the most common stain that they get on their t-shirts. Tomato sauce was the most common. Then, I stained a white cotton t-shirt with tomato sauce in 12 different places. I sprayed each product on 3 separate stains, and wiped each area 50 times. I then compared the color of the stain to the color of the t-shirt itself using a tool in Adobe Photoshop. My final data indicates that Clorox Kitchen Cleaner + Bleach was most effective in removing the tomato stain, most likely because of the fact that it includes bleach as an ingredient. This result did not support my hypothesis. In fact, Windex Original Glass Cleaner was the least efficacious stain remover. In conclusion, I have discovered that cleaning chemicals that are made for other purposes can indeed be used as stain removers for clothing, and that Clorox is one of the most efficient brands.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5567

Title: Super Suds

Student Name(s): D. Errico

Abstract:

The purpose of my experiment was to determine what dishwashing soap would be the best in cleaning aquatic animals exposed to oil spills. Soap contains both the lipophilic “fat loving” and hydrophilic “water loving” properties which makes it the ideal agent for removing oil. I conducted this experiment by combining a controlled amount of water, soap, and motor oil in a set of test tubes. After I inserted the liquids into the test tubes, I shook each test tube twenty times to simulate the cleaning process. I allowed the test tubes to rest at room temperature for 24 hours. This allowed the bubbles to fully settle and the unbonded oil to float to the top of the test tube for more accurate results. I measured the amount of motor oil floating at the top of each test tube. These results should indicate how much oil would remain on an oil soaked animal when washed with that particular brand of soap. My hypothesis was that Ajax dishwashing soap would chemically bond the best with the oil and water, therefore, leaving the least amount of unmixed oil in my test tubes. In conclusion, my hypothesis was not supported. I thought Ajax was going to bond with the oil best because I found it had more surfactants than the other soaps. When cleaning oil off of an aquatic animal, Dawn dishwashing soap is the best, as there was very little oil floating at the top of the Dawn test tube during each trial.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH EV

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4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5568

Title: Can You Walk Longer With Or Without Music?

Student Name(s): S. Begum

Abstract:

My experiment asked: does music affect the amount of time you walk for? This problem is important because I would like to know if music would help me walk longer. What I did was get two people to go on the treadmill and walk until they got tired, three times with music, and three times without. Both subjects walked for a longer period of time with music. Person 1 walked an average of 25.3 minutes with music, and only 16 minutes without. Subject 2 walked 30.6 minutes with music, and 21.3 minutes without. On average, they walked 21.5% longer with music. What I learned from this experiment was that you walk much longer with music. This would be useful to people who would like to feel less tired while walking.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BE

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

P8

Proj.
Num

5569

Title: Spandex: Speedy or Spendy?

Student Name(s): G. Murphy

Abstract:

The purpose of my experiment was to find what clothing is the most aerodynamic when riding a bicycle. I have created five groups, Group 1 (Loose Cotton Shirt, Loose pants), Group 2 (Loose Shorts, Zipped Jacket), Group 3 (Cycling Clothes top position), Group 4 (Cycling Clothes middle position), and Group 5 (Cycling Clothes tuck position). Group 1 is my control, as it is the most likely outfit that someone would wear on the when riding a bike on the street. Group 2 was deliberately created to be slower and less aerodynamic compared to the spandex. Groups 3, 4, and 5 were made to compare positions to see if there is a significant between them. I expect group 5 to have the best time because it is, theoretically the most aerodynamic. I tested groups 1, 2, 4, and 5 (I was unable to test group 4) by riding a bike down a hill (average grade of slope: -3%) without pedaling or braking. The results were what I had suspected, however the difference in times was far greater than I had suspected.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ET PH EE

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6001

Title: Drone-based, Tropospheric Gas Collection for use in Air Quality Monitoring

Student Name(s): L. Rosato

Abstract:

The objective of this engineering project was to create an air quality testing system that secured samples of air from various heights in the troposphere and tested for particulates and concentration of gases. It was hypothesised that because the emissions will become more diluted as they rise, the air will have less pollutants towards the top, which will allow for bacteria to live at such altitudes, despite harsher conditions. A drone was outfitted with several means of data collection: an airborne particulates examination sheet as well as an air collection container. After flying around at the testing height, the container was closed using a series of gears controlled by an Arduino Board. The drone was brought back to ground level and the air was tested using the Precision Gas Analysis Apparatus. The airborne particulates sheet was swabbed and cultured on a nutrient agar plate. Results were analyzed. The hypothesis was supported in that there were bacteria present and emissions diluted, however, weather conditions prevented a solid conclusion to be drawn regarding the source of the bacterial counts.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AT EV EA

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CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6002

Title: Developing an Alternative Technique of Mechanically Exfoliating Topological Insulator Bismuth Telluride

Student Name(s): K. Baer

Abstract:

Bismuth telluride (Bi_2Te_3) is relatively well-studied due to its role as one of the most important thermoelectric materials to date, a result of its high figure of merit at room temperature. However, like other bismuth chalcogenides, it also behaves as a topological insulator and thus exhibits properties that differ between bulk and thin samples. As such, thickness-dependent investigation of various material properties as the insulating bulk is steadily reduced and eliminated is an area of much recent study within the condensed matter physics community. Thin Bi_2Te_3 samples are commonly obtained through epitaxial growth methods, but this introduces the possibility of impurities into the sample and requires specialized equipment. The quintuple layered (QL) structure of Bi_2Te_3 means that mechanical methods to cleave the sample and obtain thin flakes while maintaining perfect crystalline structure are also viable. Graphene-style exfoliation (using adhesive tape to successively strip away layers of the crystal) has been shown to be viable in the past to obtain flakes down a single QL, but the difficulty of removing the adhesive residue has been cause to investigate other mechanical exfoliation methods. Proposed here is a new “pressing” method of mechanically obtaining thin samples from such quintuple layered crystals. This process is still being refined and repeated, but preliminary results are promising; image analysis reveals the new procedure to yield flake clusters with a 25-fold increase in sample area as compared those manufactured by way of the established graphene-inspired procedure.

Technical Disciplines Selected by the Student
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EN PH

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6003

Title: Boiling water with nano-particles

Student Name(s): C. Gamble

Abstract:

Project's purpose: The project's purpose is to develop a cheaper way to boil water for use in generating electricity using Nano-Particles. Procedure: 1. Fill 3 beakers with 100ml with de-ionized water 2. Add 2oz of silicon dioxide nano-particles to the first, 5oz the the second and 10oz to the third. 3. Place them all in direct sunlight making sure they all receive the same amount. 4. Time how long it takes for the water to start to boil and then measure the psi of the steam released. Results: So far only a proof of concept has been completed in witch a 100ml beaker was brought to a boil in 4 seconds with 5oz of nano particles. What was observed was that steam given off was intermittent at first and in low psi. Conclusion: Nano-Particles are a very quick and efficient way to boil water. The down side is that sunlight is paramount to them boiling and if not present an artificial light source would mean that more energy would have to go in than the device would give out. Also the steam might not be high pressure enough to turn a turbine. Additional testing is required along with testing the most efficient ratio to determine if this is still a viable way to produce electricity.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE PH AT

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CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6004

Title: The Effects of Ball Bearing Size, and Drop Height of Ball Bearing During Dent Resistance Testing on Galvanized Steel versus Aluminum-Alloy

Student Name(s): R. Baumann

Abstract:

The Ford F-150 pickup truck, in production since 1948, has recently been redesigned and is being manufactured using an aluminum-alloy body. Competitors are claiming their cars are still being made of traditionally strong steel. Ford is making this change because aluminum alloy is resistant to corrosion and lighter, giving the truck better fuel economy, without sacrificing durability. The purpose of this experiment was to determine the differences between the dent resistances of steel versus aluminum alloy. The hypothesis was, "If aluminum alloy and steel are dent-tested using different ball bearing sizes and drop heights of the ball bearings, then the data will show that aluminum alloy, with a higher yield strength, is the more dent-resistant material. Therefore, if aluminum alloy is used in the body of vehicles, although it will be more expensive, it will be lighter and more fuel efficient, resistant to corrosion, and safer". Eighteen tests were performed in the Materials Laboratory at CCSU. Ball bearings of three different diameters were dropped through PVC piping at three different heights onto sheets of steel. The experiment was then repeated with sheets of aluminum alloy to confirm the hypothesis.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

EN EE EM

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

Title: An Optically Self-Healing Metallo-Supramolecular Polymer Encapsulated UV-NIR Organic Solar Cell and Thermoelectric Nanofilm Tandem Assembly for Transparent Energy-Harvesting

Student Name(s): M. Minichetti

Abstract:

Existing photovoltaic and thermoelectric devices are confined in versatility due to conventional rigidity, chemical instability, impractical fabrication methodologies, and expense. Therefore, the objective of this study was to engineer an optically self-healing, energy-harvesting tandem architecture exhibiting visible transparency, structural flexibility, and optimal efficiency. A flexible, translucent polymer solar cell, which employs a PBDTT-DPP:PCBM, photoactive layer, harnesses ultraviolet and near-infrared wavelengths of incident light energy. Similarly, a doped/dedoped, PEDOT:PSS, thermoelectric nanofilm serves to convert temperature differentials into electrical energy while maintaining transparency. To supplement the operational longevity of this technology, a unique metallo-supramolecular polymer was synthesized and applied to the photovoltaic-thermoelectric device, serving to prevent chemical and mechanical degradation of the organic materials. Exposure to ultraviolet light allows this transparent, polymer-based encapsulation to repair the abrasions and minor lacerations it might encounter from use. Such a technology would be ideal for application in the automobile and construction industries, as well as the fields of bioengineering, robotics, and electronic displays. Optimized polymer solar cells produced 0.798 V and 12.85 mA/cm² at a power conversion efficiency of 6.07%, demonstrating a 135% increase in efficiency from control devices. Optimized thermoelectric generators achieved a Seebeck coefficient of 54.6 μV/K and a power factor of 393.51 μW/mK², demonstrating a 105% increase in Seebeck Coefficient and a 476% increase in power factor from control films. Finally, metallo-supramolecular polymers achieved a healing time of 32 ± 4 seconds, showing marginal deviation in healing performance after repetitive damage. The finished technology maintained upwards of 60% transmittance to visible wavelengths.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

EN ET AT

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- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6006

Title: Low Temperature Thermal Cracking of High-Density Polyethylene via Zeolite and Pillared Clay Catalysts

Student Name(s): S. Jepsen

Abstract:

The goal of this project is to develop a novel dual catalyst system to lower the thermal cracking temperature of waste High-Density Polyethylene via a system in which the catalysts are introduced in continuous order. The current catalytic cracking temperature of HDPE is between 400-500°C, 400-450°C resulting in a low product yield. This dual catalyst system was implemented to lower the cracking temperature to a maximum thermal threshold of 400°C and produce an oil that could be hydrogenated for use as a diesel fuel substitute. The catalysts that were used are Zeolite Y and Montmorillonite. In this process the catalysts were run in decreasing pore size, from a diameter of 10-18Å and to a diameter of 7-8Å. The reactor was under a Nitrogen gas atmosphere; preventing oxidation of gaseous free radicals during the reaction, mixing the liquid HDPE and providing a flow for the gaseous hydrocarbons through the reactor. Condensing tubes at 2-4°C were placed after the transfer tube to collect the product alongside a bubble flow meter at the end for flow rate regulation. Mass percent yields of the liquid portions were found to be lower but comparable in the dual catalyst system to the individual catalysts. Confidence in the products was increased after analysis in the Infrared Spectra revealed them to have characteristics of an oil and be similar across all samples. Further testing of the efficiency of the system compared to flow rate and other more cost effective catalysts, such as Commercial Zeolite will be done.

**Technical Disciplines Selected by the Student
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CH EM ET

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6007

Title: The effect of snow and ice thickness on the winter respiration Carbon Dioxide output

Student Name(s): J. Pusztay

Abstract:

The issue behind global climate change can most accurately be seen through the carbon dioxide output by humanity and nature. Nature naturally releases carbon dioxide through the ground, especially through frozen ground, every year. If the snow thickness is increased, then the frozen ground will decrease underneath and will result in greater winter respiration rates and a higher carbon dioxide concentration underground. Using specified marked areas, liquid nitrogen and an inert gas will be pumped underground down one tube in order for the soil gases to come up another tube. The exit tube is inserted in a solution of calcium hydroxide, where carbon dioxide will react and form a precipitate. The precipitate will be analyzed with a spectrometer in order to get a concentration of the precipitate and stoichiometry will be used to find the amount of carbon dioxide. An analysis of the points drawn will reveal an effect of snow thickness increase to a higher carbon dioxide concentration.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV CH EA

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6008

Title: Study to Improve the Constraint of Ultra-High Performance Concrete Double-T Bridge Girders by Adjusting the Architecture of Steel Fibers in the Web

Student Name(s): A. Dauphinais

Abstract:

Ultra-High Performance Concrete (UHPC), as a material that is becoming popular in the world of construction, especially in bridges, will be investigated. UHPC is a cementitious material that is composed of concrete, steel fibers, as well as chemicals used to reduce water percentage. The aim of this study is to improve the bending performance of Ultra-High Performance Concrete double-t bridge girders by optimizing the alignment or increasing the content of steel fibers in the bottom of the web. Although much is known about the mechanical properties of UHPC, more studies can be performed to change the alignment and density of fibers to optimize the performance of this material for certain application. Three 1/30 scale double-t bridge girders have been cast out of Ultra-High Performance Concrete. The first cast has a normal mix of approximately 2.15% steel fibers. No alterations to the web have been made for this cast. The second cast contains specifically aligned steel fibers in the bottom of the web, still with an approximate 2.15% mix. The third and final cast contains no altered fibers, but the percentage has been increased in the bottom of the web. Each cast will undergo a gradual 60 KIP of force within a load frame. The tensile strength will be compared to determine which cast is most effective in bending performance. Results are pending. If successful, the mixes are simple enough to recreate in real world situations to help aid girder construction.

Technical Disciplines Selected by the Student
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EN

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2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6009

Title: An application that Takes Notes Reliably for Full Student Engagement in a Teacher's Lecture

Student Name(s): M. D'Ostuni

Abstract:

In education, during a lecture, a student needs to learn and retain new information, which currently entails listening and taking notes simultaneously, splitting a student's focus between tasks, reducing reliability. Listening and having notes on critical information is also beneficial in work and daily life. Since active listening requires full student engagement, how can notes be taken reliably without student involvement? Allowing a student to be fully engaged in listening, this project designs an application to take notes with consideration to interfacing with multiple devices, distance to speaker, length of recording, definitions of unknown vocabulary, highlighting main points, and adding pictures of diagrams and other visual information. After mapping requirements for the application, research of existing applications showed use of the interfacing, vocabulary and recording distance and length requirements. Their purpose and current users' likes and dislikes were determined and further investigated. Identifying the programmability of highlighting and adding pictures options was necessary before designing the application. Creating the application using all stated requirements and correcting issues from users' dislikes in recording distance and length is possible. This project however, is limited to the design phase due to lack of programmer skills, even though skill development has begun. A programmer has expressed interest in creating the application together. Adapting the application with more specific requirements can tailor the product for work and daily use. For example, a salesperson's ability to link customer needs information to the inventory and ordering process for better communication and faster delivery.

**Technical Disciplines Selected by the Student
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CS AT ME

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2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6010

Title: Wax On Wax Off

Student Name(s): G. Krysiwicz

Abstract:

The purpose of this study was to determine how ski wax brands, Hydrocarbon levels and number of brush strokes affect the downhill speed of skis. To test the first problem, I would wax three similar skis, each with a different Hydrocarbon level of Swix wax (CH4, CH6, & CH10). For the second problem, I would re-wax the same skis each with a different wax brand that had the same temperature range (Swix, TOKO, & KUU(In order of popularity)). The last problem re-waxed the skis with wax (Swix CH4) and brush the wax off three different amounts (20 times, 25 times, & 30 times). For all trials, I timed over a set distance. In my results, the first experiment CH10 was fastest with an averaged time of 8.86 seconds, next with CH6 with a time of 9.06 seconds and CH4 at 12.15 seconds. In experiment two, Swix CH6 was fastest at 9.45 seconds, then TOKO at 9.46 seconds, and lastly KUU at 10.22 seconds. Finally 30 brush strokes proved fastest with a time of 8.63 seconds, then 25 strokes at 9.54 seconds and 20 brush strokes at 10 seconds. In conclusion CH10 wax was the fastest due to warm environmental temperatures. My hypothesis for experiment two was supported, Swix CH6 wax was perfect for the conditions. Finally in experiment three my hypothesis was not supported, the wax used was CH4 and the snow was 18F, proving more strokes necessary in cold conditions.

Technical Disciplines Selected by the Student
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AT CH

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

Title: Application of the near-Infrared (IR) Luminescence Property of Egyptian Blue and related Alkaline Earth Metal Copper Silicates (ACuSi₄O₁₀ - ACuSi₂O₆- ACu₂Si₂O₇) in IR Technologies

Student Name(s): D. Munteanu

Abstract:

Egyptian Blue was the first artificial pigment synthesized by humans, over 4500 years ago. There are numerous potential ways to apply this ancient technology in novel fashions. Egyptian Blue(CaCuSi₄O₁₀), Han Blue(BaCuSi₄O₁₀), Han Purple(BaCuSi₂O₆), and two still unnamed Alkaline Earth Copper(I,II) Silicates(SrCuSi₄O₁₀ and BaCu₂Si₂O₇) can be transmitters of infrared radiation in Diagnostic Infrared Thermographic Imaging (DITI) , among other uses. In this experiment, the compounds were synthesized using the melt flux method; this procedure was carried out in a muffle oven at temperatures between 875o C and 925o C with varying alkaline, lead(II,IV) and silver fluxes. Fourier Transform Infrared Spectroscopy(FT-IR) analysis was performed and indicated that each of these salts have broad areas of high transmittance extending from 4000 cm⁻¹(2.5 microns) to 1250 cm⁻¹(8 microns), with some negligible differences due to chemical and crystalline structure. This distinctive attribute is important because in order to be an effective Infrared Crystal the material must have high transmittance in a very broad region of the infrared spectrum; these compounds all do. Scanning Electron Microscopy(SEM) was performed and specified the structural differences between the oxidized form(BaCuSi₄O₁₀) and reduced form(BaCuSi₂O₆) of Barium Copper(II) Silicate. Based on this research, Alkaline Earth Copper Silicates have potential to be viable, more sustainable and far more cost effective alternatives when compared to the expensive rare earth metal crystals currently mined and used in Infrared Technologies today. Future research should include X-Ray Diffraction Spectroscopy to better characterize the alkaline-transition metal bonds within the crystals that give the materials these exceptional properties.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

EN CH AT

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6012

Title: Robots in the Classroom: The Effect of Social Robots on Student Memorization and Participation

Student Name(s): S. Saxe

Abstract:

According to USA News, 25% of American students failed to reach a level-2 Math benchmark, far below the international average. Discovering a method to improve student memorization could possibly improve scores and bridge the international learning gap. It is hypothesized that if students participate in an interactive story being conducted by either a social robot or human, then the group instructed by the robot will have a higher memory-recall ability about the material and participate more frequently. First, the social robot, NAO, was programmed to tell a story that included embedded questions for the audience that could be answered by touching the robot's feet. A memory quiz testing content from the story and a survey about the lesson were created. During experimentation, 50 students were split into groups: NAO recited to 27 students, and a human recited to 23 students. Participation frequency was also observed. Questionnaires (memory quiz and survey) were distributed immediately after the lesson. Two weeks later, an identical memory quiz was redistributed for short and long-term memory comparison. On the short-term memory quiz, the robot-taught group scored an average of 99.27% while the human-taught group scored 95.33% (p-value=0.0069). On the long-term memory quiz, the robot-taught group scored an average of 93.6% while the human-taught group scored 83.8% (p-value=0.0001). On average, 23.13% of the robot group and 8% of the human group volunteered to answer each question (p-value=0.0001). NAO's beneficial impact on student memorization and participation is invaluable to the development of a better educational experience.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

CS BE AT

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2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6013

Title: An Investigation of Chemical Looping With Oxygen Uncoupling For Solid Fuel Combustion

Student Name(s): R. Chang

Abstract:

Coal-fired power plants provide for about 40% of global electricity, producing copious amounts of CO₂, SO_x and NO_x to be emitted into the atmosphere. Chemical looping (CL), which has not yet been commercialized, is a novel concept for implementation in power plants to produce only pure CO₂, which can then be captured and stored away from the atmosphere. One variation of CL, chemical looping with oxygen uncoupling (CLOU), can be used for solid fuels such as coal and biomass. However, this process can only be done with metal catalysts that have multiple oxidation states and can thus release oxygen for combustion with solid fuel when changing states. One such catalyst is copper (Cu). Copper II oxide (CuO) can be decomposed into copper I oxide (Cu₂O) at high temperatures, which can be further decomposed into pure copper (Cu) at higher temperatures. In this study, oxygen production by CuO/SiO₂ at rising temperatures was recorded with a thermal gravimetric analyzer. Data was then analyzed with Excel and Matlab to find the ideal temperatures for each copper decomposition reaction. The ideal temperature for CuO decomposition with hydrogen was found to be 770 degrees Celsius while the ideal temperature for Cu₂O decomposition was found to be 800 degrees Celsius. These temperatures can be applied commercially for optimal cost efficiency and also to accurately predict the rate of oxygen production for copper. Additional variables in CL were also investigated, including CL with nickel, oxygen carrier load, and fuel concentration.

**Technical Disciplines Selected by the Student
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EN CH EV

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6014

Title: The Orbital Mechanics of the Space Elevator

Student Name(s): K. Lee

Abstract:

Geosynchronous orbit is at the height at which the speed of circular orbit of an object matches the rotational speed of Earth, making the object appear stationary from the ground. The Space Elevator is an elevator that connects the ground to a satellite in such orbit. This idea poses an immediate problem because, in order for the Space Elevator to maintain a straight path, all parts of the space elevator must maintain the same angular speed as that of Earth's rotation. This directly contradicts the Inverse Square Law which dictates that objects closer to the Earth must have a higher angular speed in order to maintain a circular orbit. How an elevator that spans all heights ranging from sea level to geosynchronous orbit can maintain a straight structure? Computer simulations were conducted starting with a satellite at the geosynchronous orbit, adding ever increasing number of bodies attached below. The results show that a straight vertical line construction is possible without any external force or propulsion. Essentially, the elevator cable would hang from the satellite to Earth because it would move too slowly to orbit on its own. A top heavy configuration would be more stable and require less cable strength. The whole system would move at the orbiting velocity at the centroid of the elevator, making the satellite move ahead of the ground location. This can be corrected by moving the satellite to a higher elevation so that the centroid is located at the correct height for geosynchronous orbit.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH CS MA

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

Title: Synthesis of an Electromagnetically-Controlled Corn-Starch/PVA Biopolymer Microcube for Extended and Targeted Drug Delivery

Student Name(s): M. Cirino

Abstract:

Scientists have recently focused on water-soluble polymer thin film matrices with integrated protein or starch bases to increase mechanical characteristics of extended-release drug delivery devices. Unfortunately, a biocompatible, dissolvable micro-carrier that can be maneuvered throughout the body has rarely been researched despite its potential for extended-release and targeted drug delivery. This research proposes the novel synthesis of a water-soluble cornstarch/PVA biopolymer matrix embedded with microclusters of iron colloidal spheres for subcutaneous maneuverability via external electromagnetic fields. Biopolymer films were synthesized with a 2:3 ratio of PVA (Mw-100,000) to cornstarch, using modified methods from Othman et. al. Fe₃O₄ magnetic nanoparticles (NP's) were prepared by co-precipitation of ferric and ferrous ions in an aqueous ammonia solution under N₂-atmosphere. Resultant NP's were then coated with PVA to ensure homogeneous mixing of colloidal spheres with the biopolymer, which was molded using a printed three-dimensional template. Coating of the biopolymer matrices was supported by FTIR/SEM analyses. Anticancer chemotherapy drug, doxorubicin hydrochloride (DOX), was loaded onto the PVA/Fe₃O₄ NP's. DOX loading, and subsequent release into aqueous medium (to mimic drug delivery), was quantified using the drug's native fluorescence at 553/590nm, with a 230nm excitation. 1.2µg DOX/mg PVA/Fe₃O₄ loading was achieved in as little as 5days, with as much as 70% release of the drug in only 50hours, into slightly acidic aqueous medium at 37oC. 100mm³ cornstarch/PVA films with embedded DOX/PVA/Fe₃O₄ colloidal-NP's were constructed, and found to be magnetically motorized and water soluble over 7hours, for release of the DOX load in ~2days from mimicked tumor-site localization.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

EN CH ME

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- | | |
|---|--|
| <input type="checkbox"/> human subjects | <input type="checkbox"/> potentially hazardous biological agents |
| <input type="checkbox"/> vertebrate animals | <input type="checkbox"/> controlled substances |

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6016

Title: More Holes More Goals

Student Name(s): A. Vannalath

Abstract:

The purpose of this experiment was to find out what was the effect of the number of apex vents on a parachute's canopy (0,1,3,5,) on the longest amount of time it took for the parachute to land in seconds. My hypothesis stated that the parachute with one apex vent would end up taking the longest to land because a parachute with too many apex vents would have little air resistance, so there wouldn't be a drag and the parachute would land quicker since the opening shock would be reduced. The data showed that as more apex vents were being added to the parachute's canopy the longer it took for the parachute to drop, but this wasn't the case for the parachute with five apex vents. The parachute with no apex vents took an average of 0.71979 seconds to land, the parachute with one apex vent took an average of 0.72816, the parachute with three apex vents took an average of 0.74804, and the parachute with five apex vents took an average of 0.73358. My results were the exact opposite of my hypothesis and it did not support it. The significance of this experiment was to permit a safer and more relaxed ride on a parachute.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH ET

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6017

Title: Size Variation in Ichthyornis From Humeral Articulation Facet Measurement in Comparison to Suspected Modern Analog Little Gull (*Hydrocoloeus minutus*).

Student Name(s): K. Hornick

Abstract:

Ichthyornis dispar is a prehistoric avian that belongs to the group Ornithurae. This group means “Bird Tails” and encompasses all modern birds as well as their close ancestors. This now extinct bird is crucial in understanding the evolutionary history of Aves because it possesses a unique trait; teeth which are positioned in the center of the beak. The goal of the research was to document and measure all fossil specimens within the Peabody Museum’s collection that were filed under the genus of Ichthyornis, a prehistoric bird that lived during the Cretaceous era. For each specimen, if possible, element, species name, age, locality, collector, date, and specimen number were recorded in a data table using Microsoft Excel. An additional measurement was taken from all elements identified as coracoids, a bone crucial to shoulder assembly in birds and most mammals. This measurement was the humeral articulation facet (HAF) and was measured by a digital caliper. The 19 recorded HAF measurements were entered into the equation $e^{[2.44(\ln HAF) + 2]} = \text{body mass}$, (equation originally created in Daniel J Field’s paper: Skeletal Correlates for Body Mass Estimation in Modern and Fossil Flying Birds, Daniel J Field, Plos One (2013)). The body mass estimations ranged from 73.9grams to 458 grams, a range below the expected mass of 60-160 grams. The estimation comes from a living bird The Little Gull (*Hydrocoloeus H. minutus*) that is similar to ichthyornis in wingspan and body length. This research will advance understanding of Ichthyornis’ metabolic rate and locomotor function.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AS EV

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6018

Title: A Novel Approach to Increase the Power Efficiency of a Wind Turbine with a Shroud and Diffuser Design

Student Name(s): A. Peck

Abstract:

Wind energy is a promising long term alternative to fossil fuels. By 2030, wind energy is expected to compose 20% of the total U.S. energy. Currently, wind turbines aren't near the Betz limit (the maximum amount power that can be extracted from wind). This project focuses on designing shrouds, (that direct air through the blades) and diffusers, (that create low pressure areas behind the turbine, accelerating the wind flow), to increase potential kinetic energy. These are used in conjunction with vortex generators to improve aerodynamic airflow, increasing power generation. After connecting a small turbine to a multimeter, voltage and amperage were recorded. Testing was done with the control configuration and compared to shrouds (2 configurations) and diffusers (4 total configurations). Each test was performed three times, and the average of the three were taken as the final result. Results demonstrated that the shroud with the 11" outside diameter sloping by 30 degrees to a 8 1/4" inside diameter, combined with the diffuser configuration of a 8 1/4" inside diameter, sloping by 15 degrees to a 9.5" outside diameter, with vortex generators (5mm*1mm) produced on average a 77.13% increase. Overall, all the designs resulted in a significant increase in watts produced, (ranging from a 19.27% increase to a 79.33% [unaveraged] increase). The maximum increase of 79.33% (shroud, diffuser and vortex generators) reached the maximum possible RPM for the turbine unit used. This experiment has significant implications for wind turbine design, maximizing power extraction, proving more efficient than present designs.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

ET EE MA

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6019

Title: Passive Solar Energy

Student Name(s): J. Masthay

Abstract:

The purpose of my experiment was to find out whether or not you can heat your home in winter with passive solar energy (without solar panels). To collect my data, I built a small model house out of a cardboard box, which had a 'window' cut out of it and covered with a thin sheet of plastic, and an adjustable 'roof' made of cardboard. I placed the house outside around noon on a sunny winter day, with a thermometer inside, and allowed the house to sit for ten-minute intervals, each with the roof at a different length (first fully shading the window, then three-quarters shading, and so on). In between each measurement, I opened the house to let the warm air out, so that I would be starting from the same point each time. Once my experiment was complete, I found that the more sunlight that was let in, the warmer the house became. For example, when the window was completely shaded, the temperature inside the house only went up 11.3 degrees Fahrenheit from the temperature outside, whereas when the window was completely unshaded, the temperature went up 22.3 degrees Fahrenheit.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV EA ET

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6020

Title: The Printlet (combination of a tablet and printer)

Student Name(s): T. Zolciak

Abstract:

The Printlet is the amazing invention combining a tablet computer with a printer. The Printlet allows you to print an 8.5" x 11" piece of paper directly from the tablet itself. The purpose of the Printlet is to make life easier and more convenient. Also, the Printlet allows documents to be scanned, copied, and even faxed. This invention can prove to be convenient, cost effective, and change the way that we do business. The problem that I was trying to overcome was not being able to print except when I was near a printer; I thought to myself how convenient it would be to be able to print right from my tablet and the idea for the Printlet was born. I believe that this idea appeals to the general public and is practical enough for travel and daily use. When investigating this product, I drafted the dimensions of the Printlet by studying the design of tablets, cases, and tablet bags of today. I created a 3D model of the Printlet using a 3D printer. I created this design by making the Printlet that appeals to not only businesses, students and the public as well. It brings all of the functionality of an entire office to a mobile device. The Printlet contributes to the world in a new, exciting, and unique way. This new idea would combine efforts from computer science and business and could prove to be the technology of tomorrow. The Printlet, everyone is going to want one.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE CS AT

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6021

Title: Measuring the Feasibility of an In-Home In-Situ Carbonation Device

Student Name(s): J. Schachter

Abstract:

Our atmosphere is suffering. Greenhouse gases, primarily CO₂, are released from cars, homes, and energy plants in excess everyday, contributing to the harmful effects of global climate change. According to the Intergovernmental Panel on Climate Change (IPCC), “CO₂ emissions must be reduced by 30–85% by 2050 to be on track for stabilizing atmospheric CO₂ between 350 and 440 parts per million by volume (ppmv)” (Lackner, 2012). This requires a global effort by all global citizens to not only reduce our carbon footprint, but to erase it. A process that happens naturally under the ocean is being studied by CarbFix and BigSkyCO₂ where CO₂ is sequestered by large mineral basalt deposits under high temperatures and pressures and converted into a white calcium carbonate precipitate. Much success has come from these studies and projects have started to directly inject 1000 tons of CO₂ directly into the deposits with almost complete sequestration (BigSkyCO₂, 2013). I have proposed a design to take this process used in nature and engineer it to operate in a modified pressure cooker apparatus. I will connect an in-line CO₂ tank to the pressure cooker and place a massed sample of basalt inside, and leave the system pressurized under two bars for two days. After, I will depressurize the system and mass the mineral basalt sample. Feasibility can be measured by the mass change. If the results suggest that in-situ carbonation of basalt is feasible in a domiciliary environment, the deadline for stabilizing atmospheric CO₂ can hopefully be met prematurely.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV EE EM

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6022

Title: The Effect of Electric Charge on the pH of a Magnesium Sulfate Solution

Student Name(s): C. Reid

Abstract:

The inspiration for this experiment came from a study of pH and what defines acidic and basic pH levels. I began to wonder if there was a correlation between the pH of a solution and the electric charge it was exposed to, and set up this experiment to test this relationship. It was hypothesized that the presence of a positive charge would yield a basic solution (high pH level) and the presence of a negative charge would yield an acidic solution (low pH level). This was hypothesized because opposite charges attract; thus, the positive charge in the solution would attract negative hydroxide ions, and the negative charge in the solution would attract positive hydrogen ions. In this experiment, two bowls of magnesium sulfate solution were prepared. Each solution was exposed to a different charge; one positive and the other negative. A "salt bridge" was formed that allowed ions to travel freely between solutions. The pH of each charged solution was measured every ten minutes to monitor how the electric charge influenced pH levels. The results of this experiment support the hypothesis. Generally, the pH of a positively charged solution increased with time and the pH of a negative solution decreased with time; however, there were a few time intervals during which the opposite occurred. All objectives in this experiment were met. The examination of the relationship between pH and electric charge gave a basis for future experimental research, such as the relationship between pH, electric charge, and salt concentration.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6023

Title: A Comparative Analysis of Rotating Solar Cubes vs. Horizontal Solar Arrays

Student Name(s): W. Gorman

Abstract:

The purpose of this experiment was to construct and compare the energy consumed and produced by solar panels with the same semi-conductive surface area, but with reduced ground-level surface area and at varying heights. It was hypothesized that a rotating-cube solar array would net the same or greater amount of energy as compared to a traditional horizontal array by maximizing absorption of solar radiation along the sun's annual trajectory and utilizing less ground-level surface area. To construct the first array, waterproof solar panels were arranged side by side in a traditional array. The second array consisted of five of the same type of solar panels attached to a wooden cube. The cube was placed atop a motor which rotated the cube 360o at a constant speed. Both arrays consisted of series circuits and the wires on the cube were set up so they would not become tangled or wrapped around the motor. In the data collection process the energy produced by each solar array was collected in a rechargeable battery and measured in millivolts at the end of each school day using a battery reader and volt meter. Initial analysis indicates that there is a difference in energy output between the arrays, but not a statistically significant difference. Additionally, energy consumed by the motor had to be subtracted from total energy produced by the cube array. Future studies should include rotating the motor using an additional solar panel to increase net output.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

EV AT EE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6024

Title: The effects of highly reflective material to be use for Urban environments and their ability to mitigate global climate change.

Student Name(s): J. Panos

Abstract:

Current active amplification of terrestrial albedo has focused on the land that is already on earth and how it is currently inhabited. Urban albedo increases have been explored by replacing roofing with titanium oxide (TiO₂) and paving road in white cement rather than asphalt. But the refractive index of TiO₂ is only 2.6 in its most refractive isotope. So what if we were to change the elements used to redo the roads to create a more refractive environment and increase the effects that these changes will have upon the environment. If they were able to increase urban albedos by as much as .37 Wm⁻² then what would we be able to reach if instead of asphalt we were to use titanium . TiO₂, for the roofing which has a refractive index of 2.7. The practicality in using TiO₂ is quite high because it is already used to paint lines on the road this would require it to become a cover for the whole road surface.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

EM CH ET

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6025

Title: programming your diet

Student Name(s): N. Natchiappan

Abstract:

The problem many countries such as the United States are facing is the growing percentage of obesity, which is due not only to the busy lives of the population, but also to the lack of knowledge concerning nutrition and proper eating habits. The purpose of this project was to create a program which will allow a person to select a few different dishes from the different food options which will then be used to calculate and tell the person which option is the best based on their individual needs (whether they are watching calories, cholesterol, proteins, etc.). The first step was research. I had to find out the most common foods eaten, and then I had to find the nutritional information for all these foods. To do this I asked about 20 people what they ate on a daily basis, especially during a busy schedule, and then I found the nutritional information, for the most common foods mentioned. The second step was to write the program. The program itself was written using Java, and with the help of Mr. Ganesh Nadraj. The program allows a person to select several different foods and what they are looking to control/watch (ex. calories). Then, based on the information given, the program should be able to tell the person what food has the most nutritional value(based on their specifications).

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CS AT ME

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

Title: Investigation of a Bacteriorhodopsin-Pt/TiO₂ Hybrid System for Enhanced Nanophotocatalytic Production of Hydrogen.

Student Name(s): M. Stich

Abstract:

Adaptation of current solar cell technology is limited by expense, poor efficiency, and lack of energy storage for consumption other than times of peak sunlight. Direct conversion of solar to chemical fuels, such as Hydrogen, may offer an alternative to standard photovoltaics, as they provide clean energy that can be stored and used elsewhere. Researchers have investigated use of TiO₂ as a semiconductor photocatalyst for the H₂-generation via water-splitting, however advancement of the technology has been slowed by poor energy conversion. Recent work has focused on extending the visible light reactivity of TiO₂, by sensitizing the nanoparticles with natural and synthetic dyes, such as Ru-(bipyridyl)₂ or natural proteins. The former is costly, while the latter often possess limited stability. This research investigated enhancement of photocatalytic hydrogen production via a natural phototrophic system, where Halobacteria bacteriorhodopsin proteins (bR) are utilized as a proton pump. In the proposed hybrid bR/Pt/TiO₂ system, bR's protons are reduced to H₂, using methanol as the sacrificial electron donor. To create the hybrid photocatalyst, a Pt/TiO₂ slurry was created; SEM/EDS analysis suggest a ~1%Pt loading. 3mg/ml Pt/TiO₂ was then suspended in 50mM CH₃OH and 0.003μmol bR to create the natural photocatalyst. For H₂-production, 2ml of the bR/Pt/TiO₂ slurry was irradiated for 100min using a 50W-60Hz pulsed Xenon source. GC-TCD analysis suggests that up to 7984μmolH₂-(μmolprotein)⁻¹-h⁻¹ was produced. bR/Pt/TiO₂ photocatalysis was also examined using a 30W halogen bulb; 9181μmolH₂-(μmolprotein)⁻¹-h⁻¹ was produced. These results represent a 51.4% and 74.1% improvement (respectively, Xe: Halogen) relative to previous, more costly models.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project) EN EV ET

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- | | |
|---|--|
| <input type="checkbox"/> human subjects | <input type="checkbox"/> potentially hazardous biological agents |
| <input type="checkbox"/> vertebrate animals | <input type="checkbox"/> controlled substances |

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):
 Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6027

Title: Financially Superior Energy Source for Subterranean Inhabitants

Student Name(s): A. Gartland

Abstract:

Traditionally, buildings have been built above the surface and are visible in every direction. In the coming years, land is becoming scarce, and therefore the world needs to find new places to build to accommodate the growing population. Countries have started building subsurface homes, also known as “subterranean buildings.” In this experiment, we investigated what type of energy (wind energy versus solar energy) would be less expensive to power a subterranean home and its efficiency as compared to an above surface home. For the experiment, we designed and created a model for a subterranean home using CAD and the Connecticut standards for building. Next, we calculated the cost for solar panels, wind generators, and batteries based on how much energy the house would use. Finally, after finding an above ground house to compare to, we performed calculations to find the efficiency of energy usage on each house when taking monthly degree heating days and exposed walls of the building into count. We found that solar energy was both easier to power the house and a cheaper approach, while also finding that subterranean homes are approximately 30% more efficient on saving energy than those of above ground homes. In the end, subterranean buildings are a substantial possibility for future living sources.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE ET

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6028

Title: An Analysis of Mechanics-Driven Physics Simulations

Student Name(s): D. Ramsay

Abstract:

Abstract: Theoretically, it is possible to construct a computer program that uses only the lowest level mechanics of physics to simulate macroscopic events. The universe is theoretically reducible to a series of discrete moments in time, known as a Planck Unit. By simulating the basic mechanics, such as gravity and electromagnetism, using Planck Units as the time step, a computer program could mimic the universe exactly. This would require an immense amount of processing power, and is therefore infeasible. Increasing the time step, to a manageable amount, such as 60 Hz, allows for a slightly less accurate simulation to run on a conventional computer. This method stands in contrast with the more conventional method of using representative equations, such as the ideal gas law, to more quickly get less accurate results. This seems as though it sacrifices accuracy for speed, because it makes certain assumptions, such as the assumption that gas molecules have no volume or intermolecular forces. However, experimentally collected data suggests that while the low-level mechanics of physics are theoretically sufficient to simulate macroscopic scenarios, high-level equations should be considered optimizations rather than hard-coded shortcuts. Effectively, the conventional method for simulation is unerringly superior to a low-level mechanical simulation.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CS PH MA

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6029

Title: Analyzing and Evaluating Quantum Computational Operating Methods and Algorithms Using Classical Computers to Simulate a Quantum Computer

Student Name(s): J. Mo

Abstract:

As one of the more recent feats of engineering, quantum computers have been developed to simulate and calculate progressively greater complex quantum phenomenon. In our age of technology, these computers have greatly benefited physicists all around the world, allowing them to calculate quantum behavior at a faster rate. Many national governments also have a growing interest in quantum computers, as they are doing both practical and theoretical research into developing quantum computers for business, trade, economics, civilian, and national security purposes such as crypt-analysis. The goal of my project was to be able to create a method to analyze and evaluate the different operating methods of quantum computers. As quantum computers don't violate the Church-Turing Thesis, I was able to use a classical computer to simulate a quantum computer using "Q-Script". Using Q-Script and Google's Quantum Computing Application, which simulated quantum bits, qubits, using my graphics processing power, I was able to write and run quantum algorithms. I then ran these same algorithms using a classical computer limited to the same number of bits as the number of qubits that the simulated quantum computer used. What I found was that quantum computers don't necessarily perform faster than classical computers for ordinary tasks. However, quantum computers perform faster than classical computers, often by a large margin, when solving certain problems such as integer factorization and the simulation of quantum many-body systems.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

CS PH MA

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6030

Title: Project Aquero - The World's self-filling water bottle.

Student Name(s): Z. Frew

Abstract:

Project Aquero concerns the development of a self-filling water bottle. In a world where less than 2% of liquid water is drinkable a decentralized and alternative source is desired. Aquero uses contemporary dehumidification technology to condense atmospheric moisture into potable water. Key innovations such as the selective patterning of condenser fins, increase condensation yields and make Aquero a feasible means of collecting potable water. The device is fitted in a 3D printed shell that is both portable and practical. The device has been built with the anticipation of using it with a battery and charging it with alternative technology such as solar. It is attractive and it is effective. In relatively standard conditions of 24 degrees Celsius and 80% relative humidity, Aquero is capable of condensing 50mL of water per hour. Assuming full use during light hours and a 6 hour battery life, Aquero is capable of condensing 1L per day in standard conditions. While this may be insufficient as a sole producer of an individual's water needs, it is extremely promising as a supplementary source. In emergency situations, Aquero can be a sustainable and portable solution. It is economical costing < \$50 to produce personally and likely substantially less using modern manufacturing. It is light and portable, using thermally conductive plastics in the place of metal heat sinks to lessen weight. It is a revolution in atmospheric water generation.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE AT BI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6031

Title: The Affect of Source Oil on Biodiesel Properties

Student Name(s): W. Pierre-Louis

Abstract:

As the crisis over the use of the world's current dependency on gasoline continues, biodiesel fuel serves as an alternative fuel source. This study was conducted in order to test whether different cooking oils used to make biodiesel fuel would have better viscosity and lubricity readings. Three cooking oils, soy, corn and olive were blended with sodium hydroxide and turned into fuel. Afterwards, the oils viscosity and lubricity were tested. The corn biodiesel fuel boasted the lowest viscosity and lubricity reading compare to the other two which means that corn made fuel is not very resistance and flows easily as well as being durable. With this knowledge, the use of biodiesel, preferably corn made, should replace the toxic gasoline used today which will reduce greenhouse gas emissions.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ET EN

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6032

Title: Effect of mass ratio on galaxy merging.

Student Name(s): A. Sobelman

Abstract:

Galaxy merging is vital to understanding our universe. The knowledge of galaxy evolution can explain our origins. The goal of this study was to find the relationship between the mass ratio of two galaxies, and its effect on the amount of time needed to merge. The study also examined how larger dark matter halos affect the aforementioned relationship. This goal was accomplished by using a java applet called Galaxycrash. Through Galaxycrash, independent variables such as size of the dark matter halo and the mass ratio of two galaxies can be manipulated. Simulations were run using "normal" sized halos and only the mass ratio of the galaxies changed, making one galaxy twice the mass, three times the mass, until one galaxy was 20 times the mass of the other. After running the simulations, the equation $10x^2 - 9.505x + 512.7$ quantified the data collected. This means the greater the mass ratio, defined by x , it will take that much longer to merge. I compared this data with data collected from simulations run with four times more massive and larger dark matter halos. The new data was collected and modeled by the equation $1.331x^2 - 28.88x + 908$, which means that a galaxy with larger halos will merge faster over time. When looking at how morphology is affected, galaxies with the larger halos will not be as likely to form bridges while merging, and have smaller tidal tails. Galaxies with larger halos take less time to merge, this results in no tidal tails.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6033

Title: Transforming Keyboard Strike Vibrations Into Energy Via The Use Of Piezoelectric Sensors

Student Name(s): D. Drittel

Abstract:

From the tips of our toes to the tips of our fingers and everywhere in between, we are constantly in motion. Why waste the energy we expel on a daily basis when we could convert it into an electrical form such as voltage or current? An excessive amount of time is spent each day keyboarding, or typing. While a seemingly simple and facile task, we exert energy during this activity. What if we could transfer the energy created from key strikes into current to be used to power other devices? Through the use of piezoelectric sensors, vibrations from key strikes can be harnessed which, in turn, will generate voltage. I have prototyped and tested a device that will transfer energy from key strikes to a direct current supply capable of charging a battery pack. Vibrations resulting from the fingertip movement on the keyboard will produce enough current to charge a 1.2 volt nickel-metal hydride rechargeable battery.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

EE CS ET

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6034

Title: The Synchronous Rotation of the Eris-Dysnomia Binary System

Student Name(s): Y. Owainati

Abstract:

The discovery of Eris and its moon, Dysnomia, (in 2003) prompted a reevaluation of Pluto's status as a planet and the creation of a new category of orbiting objects known as "dwarf planets." However, the rotation period of Eris, the time taken for it to rotate on its axis once, remains uncertain. This research intends to determine Eris' rotation period using data from the ESO Schmidt Telescope with Yale University's "QUEST" camera. To detect brightness variability, telescopes measure small changes in the intensity of light reflected off the surface of the object. Surface color or composition variations may contribute to fluctuations in the brightness of the reflected light. A pattern in brightness variability points to a rotation period. The plot of Eris' magnitude over time shows that the Eris-Dysnomia binary system is synchronously rotating since Eris' rotation period matches Dysnomia's orbit time around Eris (15.774 days). This is surprising given that mathematical calculations predict that the time it would have taken for Eris' rotation to slow down to a synchronous is longer than the age of the solar system. Additional research regarding Eris' orbital properties will further our knowledge of the evolution of our solar system.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH EA CS

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6035

Title: The European Centre for Medium Range Forecasting verses the Global Forecasting System

Student Name(s): S. Pecoriello

Abstract:

Improving our ability to understand and forecast the atmosphere is vital as we move into an era where our climate is rapidly changing and extreme weather is becoming more common. Research will be conducted on how to improve forecasting major weather events by testing the accuracy of two multi-layer global dynamical models, and comparing them to one another. This will allow meteorologists to determine which dynamical global computer model will perform best during certain time periods and geographical locations. In addition, by blending the models together in different ways, the overall solution will be notably more accurate. The experiment will help to determine how exactly to go about taking a blend of the two computer forecasting models, something that meteorologists currently struggle with. The experiment will use specific parameters set for short range (24 hours), medium range (72 hours), and long-range (120 hours) time frames, in order to then be able to later analyze how the two models performed in each timeframe. Next, textual data will be collected from each forecasting system. After extracting the data from both models, results will then be compared to current observations, and then calculated through percent error to get verification readings. The final results of this experiment should show that between the two multi-layer global dynamical computer models, the Global Forecasting System (GFS) will handle the long range and short range with the most accuracy, and European Center for Medium-range Weather Forecasting (ECMWF) will handle the medium range with the most accuracy.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

EA EV

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6037

Title: The Effect of 2-dimyristoyl-sn-glycero-3-phosphocholine (DHPC) Dillutions on Nanoparticle Radius Using Small Angle Neutron Scattering (SANS)

Student Name(s): R. Oleynik

Abstract:

Targeted drug delivery has been a major advancement in cancer research. The motivation of this study is to learn more about the effectiveness of fabricating nanoparticles. Nanoparticles are used to help guide anti-cancer drugs to the desired tumor area. Prior to the discovery of these nano-scale carriers, cancer patients faced multiple intravenous treatments of very potent anti-cancer drugs. This would cause the patient internal damage to healthy cells as well as external side effects such as hair loss and tiredness. These side effects are due to the drug being dispersed throughout the body. With nanoparticles, anti-cancer drugs are able to deliver the medicine directly to the area of the malignant cells. This study will be conducted in two phases. The first phase will be a data analysis phase. This will conducted during this year. In the future, the nanoparticles may be fabricated at the Self-Assembled Functional Nanomaterials (SAFN) lab and an in vivo test may be conducted. Graduate students will train the researcher on how to use data analysis software, Igor Pro. The data will consist of the nanoparticles produced in different dilutions of a phosphatidylcholine called 2-dimyristoyl-sn-glycero-3-phosphocholine (DMPC). DMPC was diluted in another phosphatidylcholine called 2-dihexanoyl-sn-glycero-3-phosphocholine (DHPC). Different models where then fitted to the size of the nanoparticles. Results thus far show that increases in DMPC dilution have resulted in a decrease in the radius of nanoparticles created. The results of this study could provide a more effective way of controlling nanoparticle radius for targeted drug delivery.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

EN BI MA

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6039

Title: Optical Properties of Etched Gallium Nitride Films

Student Name(s): M. Lichtenberg

Abstract:

Solar panels are most efficient when they reflect the least light energy. This is often accomplished with an antireflective surface. The goal of this project is to understand how various 3D nanostructures can be imparted on gallium nitride (GaN) surfaces by photoelectrochemical etching to determine the least reflective surface. In this experiment, GaN was used as the semiconductor because of its durability and stability, both physically and chemically. Although silicon based semiconductors are often used, GaN is potentially more cost effective and suitable for use in harsh environments. The surface structures of GaN wafers were modified using a wet chemical etching process which included either 0.3 M nitric acid or tribasic phosphate. In this process, the wafers were treated with both UV light and either 2.0 or 3.0 Volts, which are between the etching threshold and the band gap. The surface structure was dependent on both the etchant and the voltage. Further, all modified wafers were measured for photoluminescent properties. The results show that nitric acid combined with 3.0 V produced the lowest reflectivity compared with trisodium phosphate and an unetched wafer. The low reflectivity produced by the GaN was comparable to that of silicon making GaN a potential alternative.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH EN EE

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6040

Title: Gender-Specific Copepod Susceptibility to Phytoplankton Neurotoxins at Various Concentrations

Student Name(s): L. Meyers

Abstract:

Copepods are marine microorganisms that constitute the lowest trophic level in their aquatic environment. Copepods play a vital role in the nutritional uptake in an ecosystem and the amount of toxic substance they ingest affects the entirety of the ecosystem. This research was conducted to discover if the gender of copepod *Acartia Hudsonica* affects ingestion rates of varying concentrations of toxic alexandrium. Male and female copepods were separated and placed in half liter bottles with varying concentrations of toxic alexandrium (0,25,50,75,100%) along with standard f/2 feeding medium. Water samples from were taken from each bottle and initial particle counts were measured on a coulter counter particle analyzer. The bottles were placed on a rotating plankton wheel over night. The copepods were then removed, water samples were taken, and particles were again analyzed with the coulter counter. The absence of particles after the feeding period was calculated into an ingestion rate. The ingestion rates of the males and females for each toxic concentration were compared. It was found that overall, male copepods took in fewer particles in total due to their smaller size, yet proportionally more toxicity compared to females. Females were able to more successfully undergo selectivity, where they discerned between toxic and nontoxic particles, taking in less of the harmful particles. Male copepods were more impaired and died off faster due to their inability to undergo selectivity. Therefore, scientists can utilize copepod gender ratios as a diagnostic tool when evaluating energy deficiencies or pollution levels in an aquatic environment.

Technical Disciplines Selected by the Student
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EV MI AS

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3. This project was conducted at a Registered Research Institution. Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6041

Title: A Highly Efficiency and Customizable Hydraulic 3D Printable Piezoelectric Array

Student Name(s): H. Zaidi

Abstract:

This project involves using hydraulics to create a housing that increases the efficiency and durability of piezoelectric generators (by 2 to 3 times). The generators can be configured into cells, rows, stacks, or layers. It utilizes a heat - induced magnetic adhesive (non-hazardous) and a wiring system that separates each individual stream of electricity through the use of inducers. The final model is 3D printable. Each cell can be magnetically attached, and through the heat energy provided by electrical output, the adhesive will set. This increases the structural integrity, and allows for the option to be dismantle the cells. Force can be inputted from two faces, since common piezoelectric generators follow this same functionality. As an additional component, a gear and lever system that is opposite to that found in a compound bow can be utilized to further increase the efficiency by increasing the force on one point and decreasing it on the other point. To see if this technology could be applied to a real-world environment, a sing-cell layer of 20 cells was arranged in a school hallway. It resulted in keeping it's structural integrity and producing a total of 25.4 volts in one hour, in comparison the control was a layer of piezoelectric generators and only produced 4 volts. Specifically, it was producing 0.2 volts per student. Thus, it can be concluded that these housings greatly increased the efficiency of quartz piezoelectric generator. In the future, this can be used in roads, shoes, and other appliances.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE ET AT

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6042

Title: Biomimicry of Whale Fins

Student Name(s): E. Alber

Abstract:

Biomimicry is the imitation of a system in nature used for the purpose of solving a human problem. In this context, whale fins were studied and tubercles on the leading edge were found to increase the lift of the whale fins. In my experiment, I wanted to test this concept and apply it to airplane wings. The hypothesis was that the airfoil with whale tubercles on the leading edge would have more lift, shown by the angle at which it stalled. I built a simple wind tunnel that would show the airflow, and tested each airfoil. The hypothesis was proven correct, and the airfoil with tubercles took a higher angle to stall.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE PH ET

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6043

Title: Design of an Axial-flux Generator

Student Name(s): G. Herold

Abstract:

The main objective of this research is to design and construct an axial-flux permanent magnet energy generator that is more compact and efficient than its predecessors. Previous versions have created axial-flux generators with a power output of 60 watts at 60 revolutions per second. It is important this goal is reached because the finished design has many applications, such as humanitarian usage in third world countries. People who might not have access to an electrical grid or other power sources can use cheap, portable electricity thanks to this device. For the research and experiment to have been successful, the final design should have more than 60 watts of power generation at 60 revolutions per second, surpassing other's designs. It should also be compact enough for an average person to carry around easily. To achieve these goals, research will be done into creating an efficient gear ratio within the device that will allow the magnet rotor to spin over the stator coil as fast as possible, while requiring the least amount of energy from the user. If the design is successful, it will not take much effort from the user to power the device. Although the finished device was not able to generate an electrical current, research shows that improving the gear ratio further would have yielded a generator of higher efficiency and output.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AT EE

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6046

Title: Sequestration of Carbon Dioxide by Lithium Orthosilicate in a Clay Body in Ambient Air

Student Name(s): L. Bozzone

Abstract:

Lithium orthosilicate sequesters carbon dioxide by reacting with it to produce lithium carbonate and lithium metasilicate. It has been tested mostly at the higher temperature ranges of 500 to 700 degrees Celsius and at room temperature as a powder and has absorbed up to 36.7% of its weight in CO₂ (Kato, 2001; Yamauchi, 2007). This ability may allow people to reduce their carbon footprints. When lithium orthosilicate is mixed into the clay body WC -610 #66 (by Laguna Clay) at an average ratio of .1147 grams of lithium orthosilicate to every gram of clay and baked in an oven to 250 degrees Celsius to simulate a kiln, it sequesters, on average, .2293 grams of CO₂ per gram of lithium orthosilicate over a period of 50 days in about 20 degrees Celsius and 200 ppm CO₂. At these ratios, an average three pound pot would sequester 35.80 grams of CO₂. In a normal living room (223 square feet and eight feet tall) with 200 ppm CO₂, the clay pot would sequester 183% of the original CO₂ in the room (given that as the pot reacted, more CO₂ would flow into the room) (National Association of Home Builders). It also has a cyclic nature, able to regenerate the CO₂ through the reverse reaction at a fairly low temperature of about 1000 degrees Celsius, allowing the pot to be reusable (Yamauchi, 2007). Therefore, results suggest that this is one viable in-home concept that can lower the carbon footprint of households.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EN EV CH

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

Title: The Effect of Different Checkerboard Sizes on Steady State Visually Evoked Potentials

Student Name(s): R. Deng

Abstract:

A major challenge since the invention of the steady-state visually evoked potential (SSVEP)-based Brain-Computer Interface (BCI) has been improving accuracy and signal recognition. Although SSVEPs have exhibited high accuracy rates with subjects with minimal BCI exposure, to be reliable for everyday use, BCIs must achieve high, if not 100% accuracy. In this study, we examine the effect of altering the size of the checkerboard pattern on the SSVEP signal at 6Hz and 10Hz. The size of the pattern was evaluated on a continuum from a large pattern, which is equivalent to a solid flashing stimulus, to a bounded single pixel checkerboard (256x256 pixels) with the same boundary. The boundary was a 256x256 pixel square. The number of checkerboard tiles quadrupled with each increase (the number of checkerboard tiles in each side was doubled), resulting in the following checkerboard sizes: 1x1, 2x2, 4x4, 8x8, 16x16, 32x32, 64x64, 128x128, and 256x256 (pixel size). A Fast Fourier Transform was done to graphically display the power spectral density (PSD) of the SSVEP signals and a paired t-test was done between the increasing checkerboard and solid stimuli with their respective frequencies to see if there was any significant power difference. Results indicate that 2x2 and 4x4 stimuli generally create the most distinct SSVEP signal, which becomes less noticeable as the checkerboard stimuli size became smaller.

Technical Disciplines Selected by the Student
 (Listed in order of relevance to the project) CS AT EE

- As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

<input checked="" type="checkbox"/> human subjects	<input type="checkbox"/> potentially hazardous biological agents
<input type="checkbox"/> vertebrate animals	<input type="checkbox"/> controlled substances
- Student independently performed all procedures as outlined in this abstract. Yes No
- This project was conducted at a Registered Research Institution. Yes No
- Is this project a continuation? Yes No
- My display board includes photographs/visual depictions of humans (other than myself or my family):
 Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): S. Lusker

Abstract:

Overall purpose of my experiment was to show if it is worth spending more money on expensive brands of golf balls and golf clubs over cheaper brands. To test my experiments I designed and constructed a golf club apparatus that I used to test the distances a typical range would travel using a Talyormade and Delta 5 iron club. The apparatus was also used to test the distances of a Wilson Range Ball and a Titleist Pro V1 golf ball. Also for the golf balls I tested their rolling friction by using a ramp, and tested their ball elasticity by filming the rebound of the ball. In result of all the golf ball experiments the Wilson Range Ball was short 12.3% from the Titleist Pro V1 ball showing that it is worth the money to buy a more expensive golf ball, but it is not worth buying a more expensive ball according to my bounce and roll results. The Titleist Pro V1 ball and the Wilson Range Ball had 0.6 centimeters difference, and their rolling friction had a difference of 4.8%, which shows that neither of these factors have a great significance when referring to cost value. In my last experiment testing the golf club distances I concluded that it is not worth all the money to buy a more expensive golf club over a cheaper club because the Taylormade club only hit the ball 0.04 meters further, which is not a great significance.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

Title: RECOVERING CARBON NANOTUBE FLUORESCENCE THROUGH CONFORMATIONAL CHANGE OF SIDE CHAINS

Student Name(s): C. Augustinos

Abstract:

Single-walled carbon nanotubes exhibit natural fluorescence upon photoexcitation, which can be toggled by the forming and breaking of a charge-transfer (CT) complex. The goal of this study is to use this fluorescence, as well as flavin's ability to self-assemble around single-walled carbon nanotubes, to find molecules that could be used to build nanotube-based optodes. This proposed molecular system consists of three components; donor, acceptor, and spacer between donor and acceptor. Flavins were a constant donor throughout all tests, while the structure and length of the spacer, as well as the acceptor, were variable. The research was conducted using Accelrys Materials Studio 5.5, a molecular modeling program. Candidates that failed to form a CT complex upon undergoing a test in the program were modified in three ways. The carbon chain of the spacer could be lengthened, a rigid complex such as cis-azobenzene could be added or removed, or the acceptor could be replaced. CT complexes were identified by finding the molecule in its lowest-energy state and observing whether or not the system underwent conformational change, bringing the donor sufficiently close to the acceptor to form a CT complex. After running tests on several configurations, the most effective candidate used azobenzene as a spacer with a 7-carbon long chain and NO₂ as an electron acceptor. The isomerism of the spacer as well as the chain length allowed the conformational transition. Distance between donor and acceptor was compared to identify the successful candidates, which will yield the desired effect on the nanotube fluorescence.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

CH BI ME

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6050

Title: Engineering Turbines for Energy Reclamation of Wastewater

Student Name(s): V. Palmer

Abstract:

The purpose of this experiment is to generate energy from wastewater leaving a sink drain, in an effort to conserve energy. The goal was to create a system that would be easy to install in current houses, and generate energy in the process. Turbines were placed in PVC pipes using bottles to simulate water flowing down a sink drain. The length and diameter of the pipe, as well as size and type of turbine, were varied, in an effort to discover the setup that maximized energy reclamation. The turbines were connected to a motor, where current and voltage were measured over time to discover the watt seconds produced. Through statistical analysis of the data, it was found that there was a statistically significant difference between the energy produced from the 10cm, 20cm, and 50cm pipes for the 95mm propeller, 60mm propeller, and pelton turbine, with the 60mm turbine and 20cm of pipe producing the highest amount of energy. The 20cm of pipe produced the highest energy output for all propeller sizes, however the 50cm pipe led to the greatest power produced for the pelton turbine. Overall, the highest amount of power, 1.04E-02 watt seconds, produced resulted from the 60mm propeller with 20cm of pipe.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE ET

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6051

Title: Revolutionizing A 16th Century Product For The Modern World: A Thermoelectric Chair That Creates Energy From Human Body Heat

Student Name(s): A. Fraser

Abstract:

The purpose of this engineering project was to build an inexpensive wooden chair that could power either an LED or a USB charging port with the heat radiated by the human body. The project was completed in four phases. The first phase involved building one large peltier tile that consisted of 16 small peltier tiles enclosed between two square pieces of aluminum sheeting. The small peltier tiles were soldered together in a series circuit and connected to the larger aluminum tiles by thermal compound. The second phase included the construction of a full size wooden chair. A section in the seat of the chair was chiseled and removed to allow the tile to fit. A low voltage step up circuit was designed and assembled to amplify the output voltage of the large tile, and in the final phase the generated electricity was directed and connected to a USB port and a LED built into the arms of the chair. The objective of this project was met, proving that an affordable thermoelectric chair could be utilized by consumers to potentially reduce household energy charges, power their own reading light, and benefit third world countries that do not have electricity.

**Technical Disciplines Selected by the Student
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EE AT ET

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6052

Title: Fabrication of Enhanced Organic Solar Cells Using 3M Reflective Micro Prismatic Technology

Student Name(s): C. Gaiser

Abstract:

In the changing power hungry world, new and more reliable sources of energy are becoming more and more imperative. Sources other than dirty and expensive coal and oil. One of the most promising and reliable sources of energy available to us is the sun. Collecting this energy efficiently requires innovative, environmentally friendly, solar cells. Fabricating transparent cells on reflective substrates improves light conversion because the light passes through the active layer is reflected and scattered to be collected once again as it passes back through the cell. The reflective substrate used is the DG3 reflective tape made by 3M. Creating an efficient solar cell on the 3M tape, would mean that solar cells could be mounted adhesively in light exposed areas without the heavy, expensive mounting equipment conventional solar cells use. Achieving this goal of a transparent solar cell on top of the 3M required engineering techniques like spin-deposition coating, lamination, and UV treatment. After, the process was completed the results suggested that the tape substrates improved cell efficiency due to both the scattering the reflective surface caused and the multiple passes the light made through the active layer.

**Technical Disciplines Selected by the Student
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ET EN CH

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6053

Title: The Derivation of Habitable Zones around Binary Star Systems: Is Stability Possible?

Student Name(s): L. Andriuk

Abstract:

This project examines the relationship between orbital stability of Earth-like planets within binary star habitable zones (HZ), and when these planets can exist within the HZ. The objective of this project was to explore the stability of Earth-mass planets in the gravitational fields of both single star cases and fixed, generic binary star cases of 1:1 stellar mass ratio and stellar separation of 6 AU's, and to find out if planetary stability within the HZ was possible. In order to carry out this experiment, a 4th-Order Runge-Kutta numerical integration code was used. This code allows for binary star systems with fixed parameters to orbit and move as their locations are mapped out as a function of time, and Earth-mass planets to be placed in these systems. The planet was placed in an S-Type orbit in both of these systems, and through many runs, data was extrapolated regarding initial parameters necessary for yielding a planet in its habitable zone for at least 90% of the time, showing the "islands of stability" for planetary habitability. Based on these results, it can be concluded that, for any given binary system, there will always be a specific set of initial planetary conditions, including mass and velocity vectors, that will yield the most stable and potentially habitable orbit for said planet in any given binary system. This code will provide astronomers with the knowledge of which known binary star systems may have a chance of possessing potentially habitable planets, based on the system's parameters.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH CS AT

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6054

Title: Saving the Bees: A Metagenomic Survey of Honeybees

Student Name(s): E. Drippe

Abstract:

Saving the Bees: A Metagenomic Survey of Honeybees Paige Drippé Darien High School, Darien CT Brenna Traver, Mentor Christine Leventhal, Teacher The domesticated Western honey bee, *Apis mellifera*, global population is currently undergoing increased colony losses due to unknown causes. Suspected causes include but are not limited to different pathogens, nutritional deficiencies, pesticides, and parasites. Honey bees contribute over \$14 billion annually in pollination services (Cornell University). The total number of managed honey bee colonies has decreased from 5 million in the 1940s to 2.5 million in 2014 (ARS-USDA). Beekeepers reported an average loss of 33% of their colony populations annually (Kevin Hackett, ARS-USDA, 2006-2011). One of the factors contributing to increased colony losses are widespread diseases (Tentcheva, Comparative Pathology Laboratory of Invertebrates). One thought for the widespread infection in honey bees is the widespread use of pesticides (Pesticide Action Network). Three of the diseases I focused on that affect honey bees were deformed wing virus, black queen cell virus and *Nosema ceranae* (Nielsen, Department of Integrated Pest Management). The current overall prevalence of infection of these viruses, like deformed wing virus and black queen cell virus, is unknown. When the honey bees are tested in a field study in southwestern Virginia, high rates of infection were found in honey bee samples.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV BI AS

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6055

Title: A Novel Method of Controlling Size of Carbon Nanotubes

Student Name(s): J. Neumann

Abstract:

Carbon nanotubes (CNT's) are cylindrical arrangements of carbon in hexagonal tiles. These materials possess electrical and mechanical properties that make them an interesting prospect for applications such as thin film transistors and composite materials with high modulus and strength. However, the many of the properties have inconsistencies detrimental to their possible use, as a result of significant variation in the sizes between individual tubes. Managing the dimensions of large quantities of CNT's is difficult because of their high count per given volume and high overall strength. Sonication, however, may be a viable method of this previously inefficient task. It is hypothesized that if various samples of carbon nanotubes are sonicated for different amounts of time, then carbon nanotubes sonicated for longer periods of time will have shorter average lengths. 2 mg carbon nanotubes were prepared and placed in a specific solution of distilled water and chloroform, and evaporated onto a glass slide. After being sonicated for a controlled amount of time, the slide was then analyzed using an optical microscope, and the lengths were recorded using imaging analysis software. The current data suggests that higher sonication times yield significantly shorter median length and a smaller standard deviation, and that sonication may be a viable technique of mass-producing especially small nanotubes. The data also suggests that nanotube sizes will approach a minimum length, though more testing is needed. Future work may study the frequency of the sound waves used in sonication and analyze nanotube lengths for longer periods of sonication.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EN AT PH

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title: A Field Study Comparison of Carbon Fiber Electrodes and Conductors in the Construction of Sedimentary Microbial Fuel Cells

Student Name(s): K. Provost

Abstract:

Microbial fuel cells (MFCs) use wastewater or marine sediments to produce electricity from anaerobic bacteria and are currently being studied as a sustainable, renewable resource. In this project, MFCs were designed and their electrical output was recorded over time. The design of the tester was modified several times to achieve stability and to ensure consistency of data. Voltage, amperage, temperature, pH, and electrode spacing were recorded for three unique prototypes, which lead to a final design. At each design stage, MFCs were field tested in a freshwater pond and data was gathered. Tested variables included the weave of the carbon fiber electrodes and the conductor material. In the final design stage, eight MFCs were constructed using nine different carbon fiber weaves. Three additional MFCs were built using carbon tow instead of copper wire. Data was collected over several months and into the winter, revealing potentially optimal materials. The results from this project could be used in the future to continue research and further develop MFC efficiency.

Technical Disciplines Selected by the Student
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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):
 Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6058

Title: Oil from Biomass

Student Name(s): J. Peck

Abstract:

Abstract This project was designed to show that biomass can become a viable energy source in Connecticut, replacing some of the state's dependence on oil produced in other states and other countries. A device to extract oil from biomass was constructed. The biomass (pine tree roots) was heated but not burned to produce oil. The small refinery unit produced 10.610 oz. (313.773 mL) of oil from the biomass. It should be noted that Connecticut's large amount of forested land could supply biomass from the roots, trunks and branches of the naturally occurring dead trees. For this experiment, pine roots from a tree knocked down by Storm Sandy winds were utilized. There are many areas in Connecticut where large swaths of trees were knocked down from this storm. In these locations, even those which have been cleared, the roots can be excavated for the oil-extracting process. In the near future, the product of the small refinery unit will be tested for use as a fuel source. The test will compare the oil produced in this science project with commercial oil extracted from the ground.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ET EE AT

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6059

Title: A Statistical Analysis on the Effects of Volcanic Sulfate Emissions on Precipitation Patterns as an Analogue for Geoengineering

Student Name(s): M. Siedman

Abstract:

As a result of their molecular geometries, sulfur aerosols formed in the stratosphere during volcanism change the ratio of incoming to outgoing heat and light in Earth's atmosphere—known as the planetary albedo—thus cooling the Earth and counteracting many of the negative effects of global climate change (Crutzen, 2006, Keith, 2000, Rasch et al, 2008, Robock, 2010, Trenberth and Dai, 2007). Using the natural phenomenon as an analogue, many scientists propose that humans anthropogenically inject sulfur species into the stratosphere to manually change the planetary albedo and counteract climate change; however, geoengineering by this method has a variety of unexplored concerns and constraints such as potential for further ozone depletion, changes in precipitation, and the effects of constant forcing. By running a series of paired t-tests on average monthly precipitation data archived by National Oceanic and Atmospheric Administration (NOAA)-based weather stations in ten different volcanic regions before and after eruptions, this study explored the effects volcanism has on precipitation patterns as an analogue for the feasibility of geoengineering by stratospheric sulfur injection. Based on the data collected, changes in precipitation after volcanism were not statistically significant in these regions, suggesting that changes in precipitation patterns are a negligible concern for geoengineering. Thus, additional variables should be further assessed for feasibility in the same manner because geoengineering by stratospheric sulfur injection could be a conceivable solution to global climate change should the negative effects of climate change become increasingly and dangerously severe.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

EM MA EN

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6060

Title: Hydrogen Fuel Cells How Electrode Material Affects Them

Student Name(s): G. Bonnell

Abstract:

In a little more than 100 years, roughly 85% of our current energy sources will be exhausted. Current alternative energy sources that could meet the energy demand are either too expensive to be feasible, or unsafe. Hydrogen Fuel cells typically use platinum (an extremely expensive metal) electrodes. My experiment tests a collection of metals, in search for a cheaper alternative to platinum, with minimal sacrifice for efficiency. My hypothesis states: "If brass electrodes are used in a hydrogen fuel cell, then the greatest yield of electricity will be produced, because it is the most conductive material". To perform the experiment, I created three hydrogen fuel cells, which break ionized water solution into hydrogen and oxygen via electrolysis. After one minute, the process is stopped, and the electric output generated by the Hydrogen recombining with the Oxygen is measured. The experiment included brass, zinc, and stainless steel electrodes; all considerably cheaper than platinum. After three trials with each material, the average electricity output with the zinc electrodes was .50v; for the brass 1.11v; and 1.48v for the stainless steel. The results contradicted my hypothesis, by showing that the electricity output is greatest with the stainless steel electrodes. This discovery shows that of the three metals, stainless steel is the most viable replacement for platinum. It also implies that there is room for further development in making hydrogen fuel cells less expensive, while still producing a usable amount of electricity. Depending upon costs, hydrogen fuel cells could answer the world's energy demands.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE CH ET

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6061

Title: Radio Propagation Deterioration as a Result of Sunspot Activity

Student Name(s): R. Bhavsar

Abstract:

The focus of this experiment is to observe what effect the sunspot number has on radio propagation on Earth. It was hypothesized that if sunspot count increased, then radio propagation would be less clear and the sound production less intense, because the emission of Coronal Mass Ejections from solar flares in the form of plasma violently interrupts the Earth's magnetic fields in low ionospheric levels. The two related factors were studied over the course of two months as data was collected at 9:30 and 10:30 PM each night to measure the sound intensity of what the radio emitted at a 50.050 MHz frequency. Keeping the time a constant is important since the sound beams passing through the Ionosphere layer of the atmosphere is thicker during the day than at night, thus the data is easier to collect at a later time. In order to analyze the data, a Correlation test and a T-test were performed to determine if the results obtained were significant. The linear regression found that at 9:30, r value was -.931, while at 10:30 the r value was -.964. The T-test, which compared data collected from both those times, determined that there is not a significant difference between the data collected, with a p-value of .484. Through the gathered results, an inverse correlation was found between the variables that as sunspot number increased, the sound intensity decreased from the radio, as it was hypothesized in the beginning.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH EA

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6062

Title: Ferromagnetism: Using ferromagnetic fluid to control prosthetics

Student Name(s): S. Roychoudhury

Abstract:

Most prosthetics today are relatively basic and offer a limited range of motion. Smart prosthetics that can respond to motor requests are the future. Effective prosthetics require mechanical systems that can respond as fast and predictably as human limbs do to neural requests. One way of developing suitable solutions is using ferrofluids, a fluid laden with nanoscale iron filings, which can be controlled by an imparted magnetic field. I demonstrated this proof of concept by resembling a human hand with the help of straws filled with ferrofluids dispersed in solutions of varied viscosity. Each straw, resembling a finger was subdivided into insulated chambers and wrapped around with wires forming solenoids. By selectively energizing each chamber, I was able to control the stiffness of the chambers thereby mimicking the opening and the closing of a human fist. Ferrofluids, though fluid in normal conditions, can stiffen up and consolidate into a smaller region in the presence of magnetic fields. This feature enables the formation of the fist. Once the electrical field is removed, the iron particles go back into solution state thereby relaxing the chambers. Our results indicated that the response to the electric field was dependent on the concentration of the ferrofluid and the viscosity of the surfactant used. The expanding world of robotics and smart prosthetics research is looking for ways to better adopt to biological systems by implementing comfort, softness and flexibility along with stiffness AND phase-changing ferrofluids might be the real solution to this quest.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EN EE AT

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6063

Title: The Affect of a Drainage System on a Concrete Driveway

Student Name(s): C. Peterson

Abstract:

In an ideal world everything stays perfectly intact and never shows signs of age. One such human creation that often breaks down in time is a driveway. The many seasons cause thermal expansion in the ground, sublevels, and driveway itself. A stronger foundation within the frost level makes for a well prepared driveway, but at some point even the best materials still can not stop the heaving that will happen over time. A French Trench is a drainage system that runs along the side of the driveway to collect the water and direct it to the road instead of under the driveway. This design results in trapped water or the water goes around the pipe increasing the possibility of the driveway heaving. I engineered a system with a "T" pipe and plastic sheeting to try to improve the problem. The "T" pipe eliminates the issue with the water being trapped in the pipe, and the plastic sheeting sits under the driveway to direct the water to the pipe preventing the water from going underneath the driveway. The new engineering design with the "T" pipe and sheeting was tested against traditional driveway designs. A T-test showed there was a significant different between the system with the drain system and the system without the drain system; with a p value of less then .0001. In conclusion the new engineered design substantially outperformed the traditional driveway design in eliminating heaving and preventing cracking in theory creating a long-lasting driveway.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EN AT EV

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6064

Title: Power generation via downdraft of humidified dry air

Student Name(s): A. Roychoudhury

Abstract:

The primary drawback of clean energy wind turbines and solar panels is the inability to work continuously because of its dependence on the weather (wind and sun). A manually created downdraft chimney in hot, dry regions, has the potential to offset this problem by utilizing the dry hot air, regardless of wind or sun availability, to generate power. We set up an environment inside a heated room to mimic hot, arid regions of the world. A 5ft long, 5inch diameter cardboard tube was used as a chimney. Water vapor was sprayed around the top of the downdraft chimney via a sonicator atomizer from a room humidifier. The dry air at the top of the chimney absorbed the water and became heavier than the prevailing air. This created a downdraft. The air draft exiting the bottom chimney was directed through a vane meter calibrated to measure air flow speed, anemometer. The potential energy of this air mass was calculated using the air velocity as measured by the Anemometer. Observations indicated that temperature differences between the inside and outside the chimney and rate of water introduced into the air stream entering the chimney resulted in different amounts of energy created.] We also observed during our testing that the water from the downdraft air could be condensed and reused. However, this chimney will not be able to create sufficient amounts of energy in colder areas of the world. This model of a downdraft chimney definitely shows promise for use in the future.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AT CH EE

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6065

Title: A Low-Cost Solid-State Cosmic Ray Observatory

Student Name(s): A. Elias

Abstract:

Described is a new design for a cosmic ray observatory consisting of small, low-cost, easy-to-use detector nodes based on PIN diodes. Cosmic rays are particles and nuclei which bombard the earth's atmosphere and create cone-shaped showers of secondary particles. Observatory nodes are able to detect and record the time of impact of single gamma ray photons of these showers to within a few nanoseconds, as well as the energy of the photon, and are low-cost enough to create cosmic ray observatories of unprecedented size. Nodes communicate to a central database to upload data, which is later analyzed to determine the energy, angle, and location of the original cosmic rays. This information can be used to test the runaway breakdown theory, which proposes that almost all lightning is triggered by cosmic rays. This information can also be used to learn about the origin of ultrahigh-energy cosmic rays and help solve the Greisen-Zatsepin-Kuzmin paradox, in which experimentally determined cosmic ray energies are higher than theoretically possible due to scattering by cosmic microwave background radiation.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE PH AT

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6066

Title: Biochar Electrodes Incorporated with Cuprous Oxide Substrates to Optimize Solar Cells' Efficiency

Student Name(s): N. Santandrea

Abstract:

The U.S. uses 3300 Gigawatts of energy every year. Solar cells offer an alternative energy source, but in order to make solar energy more appealing to the masses it needs to offer a better return on investment. It is purposed that the application of biochar electrodes and cuprous oxide substrates in solar cells is a solution which can lower costs while maintaining high electrical yield. Cotton biochar was produced by placing cotton in an oxygen depleted environment and exposing it to high heat. Experimental testing procedure incorporated a constant light source from a metal halide lamp coupled with a Labquest 2 Pro[®] to maintain a constant data collection of current and voltage (mA, volts) over a two hour testing period. The experimental cells composed of cuprous oxide and biochar were compared to the control cells that had titanium oxide annealed to the anode and a graphite layer on the cathode. Experimental cells averaged 0.39 volts and 3.20 mA during trials. That is 160% more voltage and 46% more current than the control cells. Based on the price of Cu₂O and biochar the experiment cells cost \$0.11 to produce, that is a 827% decrease in cost when compared to the control cell. In order to further this research, these solar cells could be produced on a larger scale to determine if output is linear in in relation to surface area.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

ET EE AT

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6067

Title: Efficient Soundproofing: Design of a System using Multiple Technologies

Student Name(s): T. Calcano

Abstract:

The purpose of this engineering project was to create a box that will most effectively negate sound waves, creating the quietest environment outside the box when the sound waves originate from inside the box. It was hypothesized that a sheetrock wall with two decoupled layers secured with WhisperClips secured by Green Glue noiseproof compound and edges with Green Glue noiseproof sealant will be the most effective method of minimizing sound heard from an external location. Frames made of 1/2" by 2" wood were built and used to secure the various models built. Model 1, the control, was a single layer of sheetrock all around. The second model was built similarly, with two exceptions. Model 2 was built with two layers of sheetrock glued together with Green Glue noiseproof compound. All glue in this model was replaced with Green Glue noiseproof compound, and Green Glue noiseproof sealant. Model 3 was constructed with decoupled walls. Metal furring channel was attached to one side, while WhisperClips were attached to the furring channel and the other wall. WhisperClips absorb and dampen sound; they help to more effectively decouple and in turn soundproof the wall. Sound was played from inside the boxes at various frequencies and decibel levels were collected outside all three models using a decibel reader and analyzed for statistical relevance. This effective method of decoupling is inexpensive and not overly difficult to build; it was concluded that it is a viable method to be implemented in homes as an efficient soundproofing method.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE AT PH

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6068

Title: Evaluation of Several Resonant Power Electronic Converters in Capacitively Coupled Wireless Energy Transmitters

Student Name(s): P. Han

Abstract:

Wireless charging for mobile devices is experiencing a surge in demand, with total market value expected to reach \$13 billion by 2020. Unfortunately, current inductively coupled systems, such as Qi, possess significant manufacturing premiums and limited efficiency, usually 70%-85%. The use of capacitive coupling in certain applications may reduce the severity of these limitations. However, there has been little research in suitable transmitter topologies for capacitively coupled wireless energy transmission. The purpose of this study is to evaluate the performance of the h-bridge and half bridge converter in transmitters for capacitively coupled wireless tablet charging systems. Separate 12W h-bridge and half bridge based systems were designed to charge a tablet, the Apple iPad 2. Mathematical modeling and computer simulation respectively predicted 96% and 92% efficiency for the h-bridge and 98% and 96% efficiency for the half bridge. The results indicate that the half bridge is more efficient than the h-bridge in this application, suggesting that the half bridge is a more compelling topology than the h-bridge in capacitively coupled wireless tablet charging systems. As of this writing, both systems have been constructed and are currently undergoing testing. Preliminary results indicate 60% percent efficiency, however the systems have not been optimized for ZVS and operation at resonance. Immediate future work will focus on optimization and evaluation of efficiency at correct operation. Long efforts may include investigating the class e topology or the effect of transmitter-receiver distance on efficiency.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

EE ET AT

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6069

Title: Bio-Fuel Magnetic Levitation Vehicle

Student Name(s): J. Ariyibi

Abstract:

Global warming is the most imminent threat to the survival of humankind on Earth. Global warming is fueled by the greenhouse effect, causing the entrapment of thermal radiation. One of the largest contributing factors to greenhouse effect is carbon-emissions produced by transportation, a crucial part of human life. There are around 1 billion vehicles on the roads of the world everyday, single vehicles annually account for more than four tons of greenhouse gases. The U.S. houses 254.4 million individuals with vehicles, thus producing over 20% of the world's emissions. In addressing this critical problem, my goal is to develop a vehicle with zero emissions and total independence of fossil fuels. Present efforts at developing renewable energy cars have been focused around Electric Vehicles, however recent research show that EVs are more detrimental than helpful to the environment. Their use of electricity requires burning fossil fuels, producing more emissions than combustion engines. My project harnesses the earth's magnetic field in order to develop an electromagnetic induction engine to power propulsion. Combining with a fuel cell engine to provide quantum freezing for levitation and countering gravitational inertia. This Maglev vehicle would travel over a conductive road surface. The Earth's magnetic field is the key factor in this project because the motion created by magnets is perpetual; which would not stop unless an opposing force is applied to it. Furthermore, the levitation of the vehicle eliminates a large amount of friction that the vehicle would otherwise encounter, were it traveling on the ground.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ET EE EV

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6071

Title: Designing a Braille E-Book For the Visually Impaired and Blind People

Student Name(s): A. Yilmaz

Abstract:

While most of the people are enjoying high standards of life due to recent inventions in technology, there are millions of people who cannot feel the joy of life because of visual impairment or even full blindness. 285 million people are estimated to be visually impaired worldwide of which 39 million are blind and 246 million have low vision (WHO). Today in the time of tablet computers and smartphones, visually impaired people must be feeling unimportant and less valuable because no one is caring about the fact that they cannot use touch screen technology. I wanted to design my own E-book reader to help those people enjoy reading. My device is called GE-BOOK, an E-book reader for the visually impaired. Throughout my research I found out that there are some E-book readers for blind people, but all of them are based on a digital voice which is reading the book to you. The GE-Book consists of a Braille cell which reproduces the Braille alphabet that blind people use for reading books. The software part is translating every normal text book to Braille and sending it to the device which then displays it on the Braille cells. In this way the reader can feel the joy of reading instead of listening to a boring monotone voice. It has also some advanced options like reading text from your phone via Bluetooth and reader can read the electronic formats of the books on GE-Book.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE AT CS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6072

Title: Omni-Directional Magnetic Levitation Elevator

Student Name(s): L. Baker

Abstract:

The purpose of my project was to determine the potential uses and practicality of magnetic levitation elevators. In order to accomplish this, I designed a model of one of these elevators using architectural design software. Unlike conventional elevators that use cables, maglev elevators would be propelled upwards by magnetic force, just as maglev trains are propelled forward by the same force. While designing this elevator, I became aware of several possible issues with my initial plan. For example, power failure, earthquakes, and fires all pose serious problems for a free floating elevator that is not physically restricted by a cable. However, through analytical thinking, I was able to create effective solutions to these issues that eliminate any critical safety concerns regarding the design. Magnetic levitation elevators could reach heights that are simply unattainable by other escalation methods, and could do so at higher speeds. The world's tallest elevator is currently in the Burj Khalifa at Dubai, at 504 meters tall, which is only five eighths of the structure's entire height. Magnetic levitation would allow elevators to reach any discernible height. Furthermore, the application of magnetic levitation would allow elevators to move in any direction necessary. Elevators could move laterally or even diagonally if required. Despite high construction costs, elevators of this kind would become popular and practical in the same way magnetic levitation trains have become popular. Their extra speed and capabilities would be of use in new, high tech constructions such as those in Asia and the Middle East.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE AT ET

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6073

Title: Chef NAO: The Humanoid Cooking Robot

Student Name(s): K. Sacco

Abstract:

The NAO humanoid robot developed by the Aldebaran-robotics company is a worthy candidate in the field of human-robot interaction, specifically as a service robot (a robot involved in human-robot interaction and assisting in home environments). Previous research has shown positive results when the robot worked with the elderly in the use of medication and daily routines, along with autistic children in understanding the common behaviours. This research is aimed to further the capabilities of the NAO humanoid robot using Choregraphe, a computer application which is used to create and test behaviours to have the robot prepare toast. Vision recognition capabilities of the robot were tested and enhanced using NAOMark, a package of symbols that the robot recognizes as having numerical value. A NAOMark was attached to the toaster and the optimum distance and size of the mark had to be determined to see how far and how the robot would recognise the toaster when the mark was on it. The Timeline feature in Choregraphe, which allows the user to program robot animations by manually moving parts of the robot, was used to implement an environmental scanning function as well as a toaster operation function. Successful execution of the program was measured by the robot's ability to recognise the toaster and push down the lever. Once completed, the program will be made available to the NAO robot programming community. Future work will include a continuation of this project but with the robot performing more actions such as picking up the toast.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CS EE AT

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6074

Title: Converting Ambient Water Vapor to Potable Drinking Water; Inspired by the Shorebird beak

Student Name(s): S. Shaikh

Abstract:

The purpose of this engineering project was to determine the most efficient device that offers drinking water based on the designs of the shorebirds' beaks. This project took place in two phases: testing the most efficient shorebird beak for the conversion of ambient water into liquid water by building an artificial atmosphere, and secondly constructing said apparatus to produce water at an efficient rate. Using a humidifier and a plastic bin sprayed with a hydrophobic solution, an artificial humid climate was created to test the beak water collection rate. Four beaks were placed inside, along with a storage container to store the collected water and left inside the chamber for one day. Collected water was measured and results analyzed. Different humidity levels were tested, as well as the dimensions of bird beaks at each level, to determine the most efficient size beak for maximum water collection. After testing, a moderate amount of water was collected from all dimensions, achieving the purpose of this project. Further testing will be required to design a more perfect apparatus using the beaks, but it was clear that the beaks were able to harvest water directly from the atmosphere, creating safe, drinkable water in areas that may not have accessible liquid water.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

EN EE

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3. This project was conducted at a Registered Research Institution. Yes No

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5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6075

Title: Long Range Electrical Transmission via Laser Power Beaming

Student Name(s): J. Howarth

Abstract:

While traditional copper transmission cables work well connecting permanent electrical users to power sources, their necessary physical connection makes them impossible for moving applications, such as UAVs, manned aircraft, spacecraft and ships, and their large initial cost makes them prohibitive for temporary outposts, such as oil rigs and military bases. A high power, targeted laser-photovoltaic receiver pair provides a solution to such transmission challenges. The transmitter would consist of a Continuous Wave (CW) laser operating in the infrared wavelengths and several devices could be configured in an array to supply demands as high as a hundred kilowatts. When receiving monochromatic light, photovoltaic cells can achieve efficiencies as high as 50-60% while staying compact compared to microwave rectennas for use on aircraft or other space sensitive settings. To reduce risk of accidental contact with the beam, four or more low power beams would surround the main beam and if their connections were broken, the laser would immediately power down until the space cleared. I constructed a small scale version using 200mW and 1.7W lasers, optics and a small solar panel to measure the output voltage and total wattage at different distances and visibility conditions. While efficiencies were low, improvements to calibration, optics and a monochromatic PV panel would likely push practical efficiency to 20-50% of laser output power. For applications where standard copper transmission cables are either prohibitively expensive to construct or impossible and advantages of off site power production compensate for transmission loss, laser power beaming offers promising solutions.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ET EE PH

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6076

Title: A novel approach in helping the disabled and bed bound through robotics.

Student Name(s): K. Krawczuk

Abstract:

The miracle of both modern medicine and technology has granted those who are unable to use or have lost a limb too have it replaced with a prosthetic arm. However, prosthetic limbs are not only expensive but also require precarious surgery. In order to find an alternative, I set out to build a robotic arm that was not only inexpensive, but also can be used without any sort of medical procedures. The reason for the high price tags was simple, the methods of controlling the arm are expensive. Although revolutionary and having a lot of potential, current methods of controlling robotic arms are not only expensive, but also inaccurate and impractical. I have tested three methods of controlling the arm: mind control, voice command, and using a color sensing camera. Using a headset, a user is able to control an arm using the power of their own mind. The next method I tested, voice control, was a lot more practical and has a lot of potential, and it is also the cheapest of all three methods. The third method that has a lot of potential is the color sensing camera. Unlike most cameras, this one has the ability to identify objects by their color. After a lot of testing I have found that these methods are impractical for a prosthetic limb but are perfect as a robotic assistant for the disabled and bed bound.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

EE CS MA

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6077

Title: A Novel Solar Powered Photobioreactor Design for Wastewater Treatment and Producing Biofuel from Micro-Algae

Student Name(s): G. Herrick

Abstract:

A Photobioreactor (PBR) was constructed using algal culture *Chlorella vulgaris* for the treatment of urban waste water and biofuel production. To maintain the level of nutrients found in urban waste water, AlgaGro was added to the PBR. A porous stone aerator connected to air pump was placed at the bottom of the PBR for mixing. A mini pressurized CO₂ kit was attached to the PBR for injecting the CO₂. Sensors were used for recording pH, temperature, dissolved oxygen, nitrates and phosphates. A custom LED based lightbulb was built to help photosynthesis with only the photosynthetically active spectrum with 440, 470, 630 and 660 nm wavelengths. The LED assembly was coupled to an acrylic light guide to illuminate the PBR. The resulting illumination was characterized using a photometer and a PAR meter. Algal cell count was monitored with the help of a hemocytometer. As the cell count grew, the nitrates diminished implying the waste water was getting treated. The biomass produced by the PBR was measured and found to be 0.85 g per 5 gallon PBR per day. The constancy of the pH and the temperature indicated that optimum environment for algal growth was achieved. In addition, the system was built to be self-sustaining using conventional photovoltaic panels for powering it. A cost model was built in MS Excel to estimate volume pricing of the PBR, revenues from the products and services including the biofuel from a plant with a manifold of PBRs with operating expenses.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

EV AT PS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6078

Title: Planet Discovery: The Transit Method

Student Name(s): N. Ames

Abstract:

The search for exoplanets is a difficult process. One of the methods used is the transit method, which is tracking a drop in light intensity when a planet or object passes in front of a star. For this experiment, I simulated this method using a bead and marble passing in between a light measuring device, an application on the Ipad known as LuxMeter, and a lamp. In order to simulate a Transit, I moved my simulated planets in an orbit around the light source. I took a series of light intensity measurements at every quarter of the interruption of light. I repeated this with yellow and red light sources to simulate the sun and red dwarves respectively. I could detect a change for both the bead and the marble, but the bead provided a larger drop due to its larger size. In general, when the object passed into the center, it blocked out more light then on the sides. In conclusion, I was able to simulate the Transit Method through a variation in light intensity.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

EA PH

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

Title: The Application of Sub-undulatory Locomotion Principles Utilized by Sub-carangiform Swimmers to Increase Submersible Efficiency

Student Name(s): A. Dhar

Abstract:

Deep Submergence Vehicles (DSVs) are used by surveying and military agencies, and are recognized as highly ineffective due to mere and minimal posterior thrust. In contrast, undulatory swimmers, especially sub-carangiform, generate more lateral thrust than many other fishes and in doing so, are regarded as some of the most efficient underwater creatures. This study examined how sub-undulatory locomotion principles utilized by sub-carangiform swimmers can be applied to increase submersible efficiency. An apparatus was constructed, which mechanically models thrust production of a sub-carangiform body, internally equipped with four motors positioned on the longitudinal axis of the craft. This craft was set underwater with motor arms rotating, and colored dye droplets were released to test wake flow with lateral propulsion. Roughly an eighth of a meter away, a checkpoint bar was placed to measure distance away from motor arm. The experiment consisted of a control test and live motor test; in the former, dye was dropped without motors operating, to set benchmark arrival times at the checkpoint. As for the latter, there were three sub-tests with three different sized arms, each producing different wakes and rendezvous times. With arm lengths of 4.6 cm, 4.4 cm, and 4.2 cm, dye met the checkpoint at 1.42 s, 4.54 s, and 7.55 s, respectively. These results indicate an inverse relationship, in that as arm length is shortened, dye arrival times are lengthened. In conjunction with these results, other calculations bolster the conclusion that lateral locomotors will improve efficacy of DSVs and other submersibles.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects
- potentially hazardous biological agents
- vertebrate animals
- controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family): Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6080

Title: A Water-Resistant, Piezoelectric Precipitation Generator A comparative analysis of mobile v. stationary systems

Student Name(s): D. Ruf

Abstract:

The purpose of this engineering project was to create a prototype of a waterproof piezoelectric system that could capture the energy from precipitation. Once built, the energy collected in the stationary system was compared to the energy collected in a mobile version of the same system. It was hypothesized that placing the waterproof piezoelectric energy system on a mobile system would collect more energy from the rain when compared to a stationary system because of the increased exposure to rain. This project had multiple objectives and occurred in several phases. The first phase was the design of a large scale, efficient piezoelectric circuit un through a breadboard that could handle the voltage. The next phase was to waterproof the system by using two sheets of adhesive plastic thin enough for precipitation to compress the discs, but thick enough to protect the circuit from any water damage. The piezoelectric sheet was then attached to a mobile system and voltage readings analyzed and compared to a stationary system during "precipitation." Due to sources of error, precipitation could not be replicated in each experimental group. Conclusions drawn therefore showed no significant difference between the mobile and stationary systems. Researchers believe that a statistical significance could be established if precipitation could be replicated in a closed system.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

EE AT ET

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6081

Title: New Invention Utilizing Wave Power to Facilitate Reverse Osmosis Water Desalination

Student Name(s): M. Rogers

Abstract:

The purpose of my invention is to address the issue of a lack of clean drinking water in both developed and undeveloped countries. I plan to do this by a mechanical device that uses the force of ocean waves to extrude saline water through a reverse osmosis membrane. The implications for such a device will be for: Impoverished nations, sites of natural disasters, individuals looking to decrease their water bill, and environmentally responsible businesses/individuals. This invention revolves of cylinders and pistons that are actuated by the perpetual reciprocation of waves. As a wave advances, water fills each of the cylinders through a port on the top. As the wave further advances, it pushes a plate connected to the pistons, forcing the water through a reverse osmosis membrane. While there are many other effective solutions to desalinating water, mine is by far the most adaptable. It can be scaled up and down depending on desired output. It also requires not advanced construction/excavation of land prior to setting up. Many current advanced water desalination methods require the excavation of land and months of construction to facilitate. The compactness of my design makes for a near instant placement perfect for situations such as poverty or disaster recovery. My goal is not replace or supersede existing desalination methods, but rather to provide an alternative for both individual and near instant use. By creating this invention, I aim to better the lives of both the impoverished, needy, and environmentally-conscious.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

ET EE AT

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- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6082

Title: Developing an Ontology-Based Search Engine with Voice Integration

Student Name(s): D. Wang

Abstract:

The rapidly growing amount and availability of diverse types of biomedical data has played an important role in advancing the field of biomedicine. However, being able to access and find the information that one is looking for is now becoming a challenging issue. This study aims to address this issue by creating a semantic search program with voice integration, which also utilizes existing biomedical ontologies. The search engine will be created as an Android application and will use Google's advanced Speech API which will convert speech input from the user into machine-readable information the search engine can utilize. The choice to develop the search engine as an Android application was made because of the open source nature of Android. The Android application will be implemented using java and xml. The goal of the project was to create an ontology-driven virtual assistant (like SIRI), where a user can use speech to formulate a query and the program will respond by providing related ontology terms from which the user or computer can choose to refine the search. Researchers could use such a virtual assistant to get more accurate and relevant data/information annotated with terms that would not be discovered otherwise if only a keyword search was used. The use of an ontology increases our ability to search data through relationships between concepts and terms. Overall, the proposed Android application is the first step in establishing a voice-based semantic search engine integrating biomedical ontologies and mobile technologies.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CS AT CB

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6083

Title: Engineering of ZnO Tapered Pillar Nanostructures as Antireflection Coatings on Silicon Solar Cells

Student Name(s): S. Kadimi

Abstract:

Reduction of reflection losses of light from solar cells is an important method to create solar cells with greater efficiencies. Traditional quarter-wavelength transparent anti-reflection coatings (ARCs) are not always reliable over a wide spectral range or angles of incidence. A promising avenue of research is the fabrication of moth-eye inspired nanostructures (NS) of tapered pillars, which gradually decreases the refractive index from the surrounding air to the solar cell material, reducing reflection losses. ZnO NS provide a low-cost, relatively low-temperature methodology that can be easily scaled to industrial levels. ZnO NS can be grown by an aqueous solution-based method onto a substrate coated with a seed layer of ZnO. This experiment aims to vary the conditions of the solution-based growth of ZnO to minimize reflectance losses from solar cells. ZnO NS were grown onto glass slides under various conditions (manipulating temperature, chemical concentrations, and time in solution). It was hypothesized that growing NS at 10 mM zinc nitrate-hexahydrate, at 95° C for 1 hour would minimize these reflectance losses. Analysis of the ARCs showed that the aforementioned synthesis conditions could reduce reflectance to about 23%, as compared to 42% for a bare silicon surface. A similar decrease in reflectance was observed across the visible spectrum, and at various angles of incidence. Future work will look into the morphology of the ZnO NS in relation to their AR properties, as well as transmittance of light through the AR layer.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

EN CH ET

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6084

Title: Determination of Illicit Drug Residues on Currency Using LC-MS/MS

Student Name(s): V. Liu

Abstract:

Macau, a southeastern Asian island whose economy is based predominantly on gambling, is thought to attract individuals who abuse controlled substances. Previous studies on currency contamination from drug users in the United States and other countries indicate that patterns of drug residues on currency can have socio-geographical correlations. This study determined the following analytes on currency from Macau: cocaine-related substances, amphetamine-like stimulants, ketamine, and others. A method was developed to analyze drug residues on banknotes collected from major metropolitan areas in Macau, using a liquid chromatography-tandem mass spectrometry (LC-MS/MS) system, and it is hypothesized that the method is highly sensitive and accurate to detect these drug residues. This methodology utilized methanol solvent extraction, solid phase extraction, and LC-MS/MS analysis. The assay sensitivity, defined by the lower limit of quantitation (LLOQ) of these drug compounds using reference standards was first determined, using this method. The method showed high detectability of the drug compounds with ultra-low LLOQ in low ng/ml range (1-10ng/ml). Furthermore, it also showed that the clean Macau currency paper extract could amplify the detection of some drug compounds by showing increased percent recovery. The evidence indicated that LC-MS/MS is highly sensitive to detect drug residues on Macau currency papers, and was successfully applied to the analysis of Macau banknotes. Future studies can use the data obtained using this method to create a drug map, then compare it with official statistics from the Macau Judiciary Police to show correlations between drug arrests and residue measurements to monitor drug trafficking.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CH AT

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6085

Title: Creation of a Fresnel Lens Array for use in Water Purification

Student Name(s): J. Stefanou

Abstract:

The objective of this engineering project is to create an apparatus capable of lysing and subsequently incapacitating Escherichia coli in a water sample using a fresnel lens array. Success of the apparatus was tested by comparing baseline colony counts to purified colony counts grown on inoculated agar plates. It was hypothesized that proper alignment of the fresnel lens would result in reduced colony counts in the treated samples as compared to the colony counts of the control. The construction began with cutting fresnel lens to form isosceles trapezoids with bases of 11 cm and 25.5 cm respectively. The lenses have beveled edges at 30 degrees for correct fit. Wooden panels were created by vector cutting alder wood strips on the laser cutter to form trapezoidal frames for the lenses. The lenses were inserted into these ridges without the use of glue, allowing for the ability to quickly change the lenses. After the apparatus was built, E. coli culture tubes were placed with the apparatus and treated in various time intervals. After treatment, samples were pipetted and spread on agar plates. Plates were allowed to incubate at 37oC for 4 days and colony counts of the samples will be measured using a grid system. Collected data was analyzed for statistical relevance. Results indicate that samples treated for longer periods of time decreased the growth of E.coli on the plates. Future studies should include a more sophisticated potable water evaluation and a cost analysis of effectively producing this unit.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AT EV EA

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6086

Title: Maximization of the Profit of a Large, Prestigious University in the Presence of a State University

Student Name(s): A. Davidovich

Abstract:

A large amount of time and effort has been dedicated to finding a means by which a vendor should sell their product in order to maximize their profit. While researching the mathematics by which national brand companies set their prices, I wondered if such tactics could be applicable to other scenarios. As a high school senior applying to colleges, the controversy that surrounds university pricing was also on my mind. Thus, I combined these topics and attempted to answer question "At what price should the tuition of large, prestigious universities be set to maximize their profit in the presence of state universities?" I am performing this research to provide a theoretical means by which any university may maximize their profit. To do so, I used the Calculus III method of optimization called the Lagrange multiplier technique. This technique states that the gradient vector of the function you are trying to maximize/minimize is equal to the sum of the gradient vectors of the constraint equations each multiplied by a distinct Lagrange multiplier constant. After completing the research, a final function of two variables remained along with multiple unknown constants. I then modeled for these constants knowing that their product is correlated with the product of the two variables that were not included in the final function. To do so, I compiled publicly available data on over 60 different public and private universities of various sizes and found them to be in an almost perfect exponential correlation (r^2 value of .9782)

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

MA

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

Title: Investigation of Transition Metal-based Acetylacetonate Species for Optimized Performance of Hybrid Non-aqueous Redox Flow Batteries

Student Name(s): N. Szabo

Abstract:

To combat the global energy crisis, there is a necessity for development of large-scale energy storage systems that can store electricity from intermittent energy sources. The redox flow battery (RFB) presents a novel solution through its offering of high scalability and energy efficiency. Specifically, the non-aqueous (versus aqueous) RFBs represent a promising area of research for energy storage, due to their wide voltage window, long cycle life and low temperature sensitivity. In this research, the application of two acetylacetonate metal redox species together in a novel RFB flow system was investigated. In order to purposefully circumvent the unfavorable reactions displayed in the oxidized or reduced state of $\text{Mn}(\text{acac})_3$ and $\text{V}(\text{acac})_3$, these compounds were utilized in conjunction to yield an optimized Mn-V non-aqueous RFB configuration: utilizing $\text{Mn}(\text{acac})_3$ and $\text{V}(\text{acac})_3$ in anolyte and catholyte solutions of V(III)/V(II) and Mn(III)/(Mn(IV)) redox couples, respectively. FT-IR spectroscopic properties of the Mn and V-based "acac" species were studied, revealing virtually identical chemical structures. For electrochemical studies, electrolyte solutions were prepared by dissolving 0.05M $\text{Mn}(\text{acac})_3$ or 0.05M $\text{V}(\text{acac})_3$ in CH_3CN with 0.5M TEABF₄. Cyclic voltammetry performed at a glassy carbon electrode revealed a 2.42V cell potential, 92% higher than aqueous vanadium RFBs (1.26V). Charge-discharge characteristics of the hybrid Mn-V battery were evaluated on a dynamic flow battery with a custom-made flow system. Results reveal coulombic and energy efficiencies greater than previously reported for non-aqueous RFBs.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

EE AT CH

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6088

Title: Determining the impact of viscosity of ethanol based fuel's particulate matter production and efficiency of combustion

Student Name(s): J. Mulcahy

Abstract:

American roads have hundreds of thousands of cars using millions of gallons of gasoline. Gasoline that often contains an ethanol blend- typically between 5%-20%. Ethanol is used to increase the effectiveness of the combustion in the engine, but there are certain, much more specific concerns. The use of ethanol in gasoline blends, like most fuels, varies with the environment surrounding the car. Little research has been done into how the outside conditions impact the ethanol portion of the fuel, especially the size and mass of particulate matter produced and the effect on the overall energy produced. The viscosity, manipulated by temperature, is needed to be researched in order to determine the impact of the fuel on the environment. This was done by measuring the viscosity at various temperatures - specifically 24.6°C, 10.3°C, 5.2°C, and -1.9°C- and then combusting the ethanol in various tests. Test one measured the mass and size of particulate matter by collecting the smoke on filter paper. The second test combusted the ethanol underneath a beaker of water to determine energy production. However, cooling the ethanol proved to have minimal impact on ethanol's viscosity, and therefore had little impact on energy production or the particulate matter. Ethanol cooled to -1.9°C had a viscosity only marginally lower than that of ethanol at roughly room temperature, 24.6°C. For these reasons, it can be determined that outside conditions have a minimal impact on how the ethanol produced more particulate matter or a higher efficiency. .

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

CH ET

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

Title: The Effect of Application of a Solenoid on the Magnetic Properties of Gadolinium at Varying Temperatures and Current Levels

Student Name(s): M. Marcussen

Abstract:

Gadolinium is one of the only materials with a Curie temperature (T_c ; the point of transition from a ferromagnetic to paramagnetic material) near room temperature (293oK). The proximity of gadolinium's T_c to room temperature and its relatively high magnetocaloric effect make it ideal for use in magnetic refrigeration. While the effects of applying a magnetic field to gadolinium have been extensively studied, application of a solenoid to create a gadolinium electromagnet remains unexamined. This research examines creation of gadolinium electromagnet, to be included in the design of a temperature-induced fuse, that can easily be reset, and does not require replacement after single use. A solenoid was separately wrapped around 125x10mm cylinders of gadolinium and iron to create analogous electromagnets. For each, magnetic field strength was examined as a function of temperature to determine each metal's magnetic permeability (MP). While iron's MP remained predictably constant with temperature at 1250H/m, gadolinium's MP decreased from 2000H/m at -20°C (the lowest temperature tested) to -200H/m at 20°C . The temperature-dependence of gadolinium's MP was used to construct a magnetic fuse that releases (or breaks) when the circuit's temperature exceeds 293oK. A 125mm gadolinium rod was inserted between two $1.5\Omega/10\text{watt}$ resistors, and current was applied so that heat was transferred to the gadolinium rod at a rate of 20watts due to ohmic heating. As the gadolinium passed its T_c , it became paramagnetic, and detached from an opposing iron magnet, breaking the circuit. This fuse is easily reset and does not require replacement like traditional fuses.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

PH EE AT

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6091

Title: Smoking Gun in the Milky Way Galaxy: Open Clusters and Dwarf Galaxies

Student Name(s): X. Zhang

Abstract:

Although many open clusters (OCs) have been found to date, little has been done with them to investigate problems and questions about the Milky Way Galaxy (MWG) itself. This project found clues regarding the Milky Way's formation process and the role of open clusters and dwarf galaxies in it. The project was conducted using data on 520 OCs published by Kharchenko et al. in 2005, which includes distance, spherical coordinates, radial velocity, proper motion, measurement error, and other data on the clusters. In the process of discovering connections between the astronomical bodies, several mathematical and analytical techniques were used, including coordinate transforms and 2D and 3D scatter plotting. With data analysis, new evidence for connections between dwarf galaxies and open clusters were discovered, including the transfer of open clusters during galactic collisions and for collisions between dwarf galaxies and the Milky Way. The findings give a new perspective on the historical role of open clusters, and how they can be used as markers for astronomical events. They also show new details of the events in a galactic collision.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

PH MA CS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6092

Title: Developing a Tool to Repeatably Extract Cartilage Tissue Samples: An Application of 3-D Printing

Student Name(s): G. Yoon

Abstract:

This project's purpose was to expand the possibilities of cartilage biomechanics research and modeling by developing a device which aims to extract and separate cartilage from the subchondral bone, in order to expedite the collection of cartilage tissue samples for use in various other laboratory tests. The project first involved creating multiple sketches of the device, each being a possible candidate for the final device's design. After receiving feedback from my mentor, the best aspects of each design were gathered into one finalized design -- eventually the design resembled a hand-held device that would "peel" the cartilage from the bone as the user slid it over the bone's articular surface. The development of the prototype of the device was completed through computer replication in a computer-aided design program named SolidWorks. The device was finally produced utilizing the SolidWorks model and a metal-compatible 3-D printer at the University of Connecticut. A plastic copy was produced initially in order to observe and adjust the physical dimensions for the device; the actual model was produced subsequently using the appropriate various metal components. The product must subsequently finish undergoing various quality assurance tests in order to gauge its ease of extraction and consistency in extracting samples, but the design successfully was produced using 3-D printing for laboratory use in cartilage extraction.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

EE

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6093

Title: Wind turbine blade weight vs. Energy production

Student Name(s): T. Pond

Abstract:

In a world where energy resources are withering; new, renewable, sources of energy, are in a demand to help solve the problem at hand. One of these methods include wind turbines, which convert wind energy into electricity. So my problem was to find a way to increase the energy output of the wind turbine, making them more efficient. I chose to measure how the weight of the blades affected the energy output. I did this by building a wind turbine out of PVC, and testing three blades (Made of styrofoam, wood, and steel). I set up 4 blades on the wind turbine, set them to a 45° angle, and set the turbine 4 feet away from a 350 cfm fan. After going through the results, I found that the steel blades had the highest energy output, but not by much. The steel blades had an average energy output of .54v DC while the wooden blades had an average energy output of .51v DC. The energy difference is small but the weight difference is high, and the reason is because of inertia. I found that because the steel blades weigh more, it take more wind energy to get them to move. However; it requires less energy to keep them moving due to momentum. This implies that wind turbines are more efficient as the weight of the turbine's blades go up, to a point. This is the point where it takes more energy to get the turbine going, than the output.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE PH ET

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6094

Title: The refinement and production of biodiesel derived form laboratory grown Nannochloropsis algae

Student Name(s): S. Mack

Abstract:

The purpose of the experiment was to test if an alga grown in a high concentration of a photosynthetic catalyst would yield more efficient biodiesel. The catalysts used in the experiment were substances high in nitrogen and carbon. The type of algae chosen was Nannochloropsis Algae because it contains a high lipid concentration as a pond-growing alga. The algae were then grown in two different ways: in a salt water solution which contains carbon and in a highly concentrated nitrogen fertilizer. The alga was then harvest using the transesterification process and the yield of biodiesel recorded. Then each of the algae were tested for energy content by using the calorimetry equation. It was concluded from the experiment performed that the algae grown in salt yielded more biodiesel and a biodiesel with higher energy content. Although the high carbon concentration yielded more biodiesel, there was little difference in the energy content.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

ET EN PS

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6095

Title: Creation of a versatile, low-cost water purification system via a graphene oxide composite membrane with incorporated nanostructures

Student Name(s): S. Bardos

Abstract:

Today, one-third of all nations suffer from clean water scarcity, most prevalently in underdeveloped nations. The problem for many is not simply access to water itself, but rather access to drinkable, uncontaminated water. Harmful chemical contaminants include herbicides and insecticides, of which oral consumption results in vomiting, diarrhea, developmental/reproductive defects, and cancer. Current filtration measures require energy and are too complex for routine use in rural areas. Recent studies have shown that graphene oxide can be modified in regards to capillary size via insertion of a metal oxide. This modification allows graphene to function as a filtration membrane for chemical compounds, as the inserted metal increases the distance between graphene sheets. This research investigated the synthesis of a graphene oxide (GO)-titanium oxide (TiO₂) freestanding membrane for the purification of 2,4-Dichlorophenoxyacetic (2,4-D) herbicide contaminated water. Synthesized freestanding composite filter membranes were characterized via SEM and were found to exhibit a layered-stacking pattern, more so than the plain graphene oxide films. Deionized water with 100 ppm 2,4-D (moderate toxicity) was passed through the GO-TiO₂ membrane, housed in an inexpensive and simple plastic cartridge, and the filtrate's herbicide content was determined via HPLC. Results indicate that 86% of 2,4-D was removed (100 to 14 ppm) with a single pass through the composite filter. Two additional filtrations reduced the 2,4-D content to <1ppm. AA analysis of the GO-TiO₂ filtrate indicates that it is free of titanium, while SEM analysis of "used filter membranes" show minimal fouling, suggesting prolonged filtration service prior to membrane replacement.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV ET EM

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6098

Title: The Development of an Immunosorbant Assay (ELISA) for Detection of IgG and IgA Antibodies against Tissue Transglutaminase for the diagnosis of Celiac Sprue

Student Name(s): A. McGowan

Abstract:

Celiac Sprue, commonly known as Celiac disease, affects many Americans each year. It is estimated that 83 percent of Americans who have Celiac Disease are undiagnosed or misdiagnosed with other conditions (National Foundation for Celiac Disease Awareness). Because of this, it is necessary to develop an assay that can efficiently and accurately diagnose patients. To begin this process, the test conditions were optimized, running several trials until the best optical density for cost efficiency was achieved. The ELISA functioned optimally with 1000 ng tTG per well, a Sample dilution of 1/100, and a 1/500 dilution of anti human IgG ALP Conjugate, read with a plate reader at 405 nm. These conditions were used during test calibration to properly diagnose the positive and negative samples. The calibration process included the pooling of serum from 25 patients diagnosed with Celiac disease. The pool was assigned the arbitrary unit of 300 AU/mL. The pool was then further diluted with negative human serum. With this dilution, a dose response curve was graphed with AU/mL of the calibrator vs the average OD for both IgG and IgA antibodies. This allows for the AU/mL of each sample to be calculated when optical density is read. Finally, 25 different human serum samples were tested using the ELISA method, which was optimized and calibrated. Each known positive and negative sample was correctly read and diagnosed. The test read with 100% accuracy with the 25 samples, however more patient population testing will occur to confirm the current results.

**Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)**

ME EN BI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): T. Fenty

Abstract:

The experiment I performed was the effect of the level of fluorescent light Chlorella Algal balls are under (2700 lumens, 1750 lumens or 875 lumens) on the amount of drops it takes the bromothymol blue to full change color. Then my hypothesis to this was IF I test the effect of the level of fluorescent light Chlorella Algal balls are under (2700 lumens, 1750 lumens or 875 lumens) on the amount of drops it takes the bromothymol blue to full change color then the Chlorella Algal balls that are in 875 lumens fluorescent light will have a low drop amount because there will be an increase in carbon dioxide that the hydrogen carbonate indicator can sense because little photosynthesis took place. The results that were obtains were for the algae balls under 2700 lumens of light had an average of 40.4 drops to turn yellow, under 1750 lumens of light it took an average of 35.0 drops to turn yellow ,and for 875 lumens of light it took an average of 30.6 drops to turn yellow. The trend shown was that with higher intensities it took more drops for the cup of algae balls to turn yellow and compared to my hypothesis this trend was supported. The significance of this experiment was to show actual evidence of photosynthesis and with the results retrieved this task was completed.

**Technical Disciplines Selected by the Student
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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): M. Zabrocky

Abstract:

Radio is and has been the most widespread form of transmission of sound over long distances for more than a century. However, radio transmission can be inefficient, as it requires massive antennas and power to broadcast. In addition, radio is not ideal for the transmission of sensitive information, such as military planning, because it can be heard by anyone who tunes in to the right frequency. Sound can be transmitted over distances of up to 50 feet without radio if sound is converted into light and received through a solar cell. If sound waves are converted into volts and used to power a handheld laser which will then be fired at a solar cell, the cell will convert the light back into voltage which will power a speaker, recreating the original sound. The transmitting and receiving circuits are made up of breadboards, resistors, capacitors, op amps, a speaker, a phone or MP3 player, a handheld laser, a solar cell, and two 9V batteries. The efficacy of the system is measured in distance over which sound can be transmitted, in feet. The quality of sound that the system produces is measured by amps of static visible through an oscilloscope. This optical audio link can be used as a secure means of transporting sensitive information, and as a more materially efficient means of transmission than traditional radio.

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6101

Title: Novel Low Grade Waste Heat Recovery System with Simultaneous Electricity Generation, Carbon Sequestration and Urea Production

Student Name(s): E. Novek

Abstract:

Over 60% of energy generated during electricity production is discarded as low-grade waste heat. Concurrently, modern power plants are reluctant to capture and sequester flue-gas CO₂, due to high cost and significant efficiency reductions. The novel system invented in this research converts untapped low grade waste heat into valuable byproducts including electricity, captured CO₂, and Urea. The system generates electricity by engineering a concentration gradient using CO₂ emissions and recycled NH₃(aq) in an Osmotic Heat Engine. An NH₄HCO₃ solution then selectively decomposes into pure CO₂ and NH₃ gas streams for carbon capture and Urea production. The performance of each component was separately evaluated, and integrated to determine viability of the complete process. In electricity generation, a high concentration solution was created through NH₃(g) (recycled) and CO₂(g) absorption with pH 8.6 and NH₃:CO₂ 1.3:1, parameters exceeding draw solution requirements. 14.4Wh electricity was produced per kg CO₂ scrubbed, translating to 180 MWh per day from a 500 MW power plant. The Pressurization-Depressurization CO₂(g) capture at 45°C produced 98% NH₃(g), 1.02atm; 99% CO₂(g), 2.1atm and was 85.5% more efficient than current carbon-capture systems. Ammonium Carbamate/Urea production achieved conversion efficiencies of up to 99% and was carbon negative, net sequestering 770 kg CO₂/ton Urea. Based on the CO₂ emissions of 500MW coal power plant, the system will produce 335 metric tons of Urea/hour respectively. The proposed integrated system dramatically lowers the cost of carbon capture/sequestration and converts otherwise waste products into valuable Urea, while simultaneously improving the efficiency of power plants and industrial facilities.

Technical Disciplines Selected by the Student
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ET EE AT

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6102

Title: Investigation of Mesoporous Cobalt-Doped Cerium Oxides in the Water-Gas Shift

Student Name(s): K. Wijendra

Abstract:

Cerium oxide has been widely investigated because of its multiple applications, such as a catalyst, an electrolyte material of solid oxide fuel cells, a material of high refractive index, and an insulating layer on silicon substrates. Prior research has found that cerium oxide can be used in water-gas shift, the reaction of carbon monoxide and water vapor to form carbon dioxide and hydrogen. The main focus of this study is to investigate the effects of cobalt doped cerium oxide on the water gas shift. The cobalt doped cerium oxide samples were synthesized using an in-situ method which caused the cobalt to become incorporated into the cerium oxide. These samples were synthesized with 1%, 5%, and 10% cobalt. The samples were then analyzed using X-Ray Powder Diffraction, Raman Spectroscopy, Thermogravimetric Analysis, Solid State UV-Vis, Scanning Electron Microscopy, Transmission Electron Microscopy, and BET analysis. The results collected show that 4-5nm particles were successfully made and that the cobalt successfully incorporated into the cerium oxide. The trends that were found in the results show that cobalt doped cerium oxide is an effective catalyst to use in the water-gas shift. Upcoming experimentation using gas chromatography will actually use the samples of cobalt doped cerium oxide in the water-gas shift to test its effectiveness. These results and the knowledge gained from this study could help make the water-gas shift more efficient.

Technical Disciplines Selected by the Student
(Listed in order of relevance to the project)

CH

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6103

Title: Hardening of electronics and satellite communication systems from sunspots and coronal mass ejections

Student Name(s): J. Jin

Abstract:

The new technology inventions are based on satellite to function such as smartphones. However, the coronal mass ejection and sunspots cause magnetic fluctuation, which would interfere with the communication system and bring inconvenience to our daily life. Therefore, I want to find a way to minimize the damage from the magnetic fluctuations, thus people can obtain their regular lifestyle. One way to limit the magnetic fluctuation is to develop shielding to protect the electrical infrastructure from the magnetic fluctuations. Four types of different cages were used in this experiment: aluminum, gauze, iron mesh and solid steel cage. Cages were placed in front of the magnetic probe (an equipment used to measure the magnetic field and collect data) in multiple positions. The distance began at 10 cm, and increased by increments of 5 until reaching 55 cm. The data has shown that the three magnetic shields do help to limit the magnetic fluctuations. The solid steel cage worked the best, followed by the iron mesh and gauze cage. The aluminum cage appeared to have no effect. It was also observed that as the distance furthered from the center of the magnet, the magnetic field size decreased. This project clearly shows that only the magnetic shielding has the ability to limit the magnetic fluctuations. In practical application, the solid steel will be too heavy for satellite. The gauze is the lightest and has proven to have great effect on limiting the magnetic fluctuations.

Technical Disciplines Selected by the Student
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EA EE PH

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6104

Title: Investigating the Efficacy of Face-To-Face Versus Distance Learning

Student Name(s): A. Kane

Abstract:

Transmitting and gaining knowledge are essential benefits of communication. New technologies make it easier for people to communicate over long distances. My experiment examines differences in knowledge retention in distance learning versus face-to-face lecture format. The experiment consisted of two treatments. One group was shown a video of me presenting information on the history of the violin while the other group received the same information in a face-to-face setting. Both groups were given the same four questions testing knowledge retention of the information along with questions regarding demographic characteristics: gender, age, previous experience with online learning. Test subjects ranged from 13 to 60 years and were recruited from the Fishers Island School community. 29 subjects were enrolled in the experiment: 13 viewed the video, 16 received the in-person lecture; 62% were male, 38% female; 14 subjects had prior experience with online learning, 15 did not. Overall, the average score was 2.5; the video group averaged 2.3; the lecture group averaged 2.5; males averaged 2.3 with video, 2.5 with the lecture, females averaged 2.5 with video, 2.4 with the lecture. Subjects aged 19-40, scored best overall: averaging 3.5 with the video and 3 with the lecture. The 13-18 age group did worse than the other groups scoring 1.5 with video and 2 with the lecture. Past experience with online learning did not affect scores significantly. These results indicate that distance learning does not appear to be significantly different than in-person lectures in its ability to facilitate the transmission of knowledge.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

BE AT CS

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PS

Proj.
Num

6105

Title: 3D Printer for Creating Cement Domestic Utilities for Developing Countries

Student Name(s): D. Corsi

Abstract:

3D Printing is a technology in its exciting early stages. It is a way to express an idea into a physical object. Since its creation, it has empowered millions with the ability to express themselves. This tool allows anyone the power to solidify their ideas and benefit others through the open source environment that is fostering its rapid maturation. By utilizing additive manufacturing technology, I have designed, optimized, and fabricated from basic building components, a scaled down version of a 3D printer that has demonstrated the feasibility of producing a 3D printer on a larger scale. This project contains all of the information needed in order to construct a 3D Printer capable of creating cement domestic utilities for developing countries. I hope to create foundation in which I can create these printers and send them to countries that are in need of them. The full size 3D printer will have a build size of 2m x 1m x 1m that will extrude cement to produce life enhancing domestic utilities such as toilets, sinks, bathtubs, desalination units, water purifier, zeer pots, septic system components under the conditions found in developing countries. The project has conceptual, hardware, software and execution challenges that have been noted through tests and experiments. By using a small scale printer, it has allowed me to be able to test different cement mixtures as well as different speeds for the extruder. With this, I have formulated the best way to manufacture the larger scale printer.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EN EE AT

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PST

Proj.
Num

6501

Title: How do Sensory Cells Function to Make You See After Images?

Student Name(s): D. Portillo-Serrano, S. Kmetz

Abstract:

Sensory cells are cells in the eye that perceive light and color. When fatigued, sensory cells will see false images, called afterimages, that can last for a certain amount of time depending on the image and the length of time the image was looked at. This experiment investigated how sensory cells can be manipulated to see afterimages. Test subjects stared at different images for different lengths of time and recorded the amount of time it took to have the afterimage disappear. It was determined that it took the same amount of time or at least half the amount of time that an image was looked at for the afterimage to disappear which indicated the cone and rod cells had regenerated.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

CB BE ME

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PST

Proj.
Num

6502

Title: Heat Retention

Student Name(s): R. Pilj, J. Ledoux

Abstract:

Most modern industries generally rely on the same types of materials. The reason the material used cannot be narrowed down to only one because of the specific performance levels fulfilled by each type. Each material's performance can be measured by the amount of heat gained in twenty minutes and retained for ten minutes. This project aimed to see which one out of cotton, wool, and Nylon fabrics had the better performance. To do this, we wrapped a commercial absorbent material in each of the chosen fabrics. Overall, wool had the greatest averages for the amount of heat gained in heat up and in net increase, cotton had the least average for percent change in the cool down, and Nylon had the least averages for heat gained and net increase. Nylon also had the greatest average for percent change in the cool down. We hypothesized that Nylon would have the best performance out of the three materials overall. However, with further analysis of our data, we were able to conclude that there were no considerable differences between Nylon, wool, or cotton. These results may be useful to clothing companies because the results can be useful in determining what type of material should be used for clothing in each season.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EN

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

Proj.
Num

PST

6503

Title: Vertical Wind Turbines

Student Name(s): C. Aytekin, F. Aldemir, F. Sahin

Abstract:

The aim of this scientific project is to find cheaper, environmentally friendly, and more efficient alternatives to the current wind turbines. Contradictory to what most people think, the horizontal wind turbine is not completely environmentally friendly. Over 328,000 birds are killed by horizontal wind turbines each year. Horizontal wind turbines not only possess the capabilities to bring about the mass extinction of various bird species, but also have disastrous effects on the economy, as they are nowhere near as cost efficient. Another defect of horizontal wind turbines is the ineffectiveness of turbines during low wind speeds and on low altitudes. In order to work at their primal efficiency, these turbines require above average wind speeds and relatively high altitudes. Our wind turbine, however, can work in almost any climate. It is also 100 times cheaper than horizontal wind turbines. The blades are implemented into the design in such a way that they can freely tilt over the arm, naturally shifting to the best possible position to allow the wind to push them. We lasercut the wooden wings that will be attached to the 6 meter aluminum tower. Our turbine is also relatively small compared to the average horizontal wind turbine. Consequently, it does not hinder the beauty of a landscape. What makes our turbine even more unique and efficient is that it uses an organic, award-winning, solar panel made from the "Rosa Canina" plant. The solar panel is attached to a platform between the blades.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EE ET EV

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 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PST

Proj.
Num

6504

Title: The Effects of Cell Phone Radiation with Various Functions and Cell Phone Brands on Differences in Water Temperature

Student Name(s): E. Rigsby, C. Yerxa

Abstract:

Frequent cell phone use is a norm in modern society; however, what today's culture fails to realize is that cell phones, along with other stationary or portable technological devices, actually engender harmful effects which can become detrimental if one is subject to frequent exposure. Cell phones, as well as other technological devices, emit electromagnetic radiation in the form of microwaves which can negatively impact the numerous biological systems in the human body such as the brain, reproductive organs, and skin. Cell phones are manufactured by various platforms such as Apple, Android, and Windows, so judging upon the amount of radiation each platform of phone emits, one could discern which phone would be the safest to buy. In order to gauge the EMF radiation emitted from the phones, an apparatus was assembled where the screen of the phone was facing directly towards a test tube full of 8 mL of water, and the change in temperature was measured with a Vernier LabQuest temperature probe. Then, each phone was involved in a 0, 5, and 10 minute phone call, game, and internet search. During the phone call by the Windows phone, the water temperature increased by 0.9°C in 10 minutes, decreased by 0.7°C in 10 minutes when playing a game (Angry Birds), and increased by 0.7°C in 10 minutes of searching the Internet. After the results were collected, the data supported that the Windows phone emits the most EMF radiation.

**Technical Disciplines Selected by the Student
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AT ET EE

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PST

Proj.
Num

6505

Title: The Mineral Balancing Act of Bottled Water

Student Name(s): R. Roncaioli, K. Baker, C. Kirschbaum

Abstract:

The process of desalinization allows for freshwater to be obtained from seawater. There are over 17,000 desalination plants in the world that produces approximately 21.1 billion gallons of water each day. Unfortunately, this process strips water of all of its minerals, leaving it nearly tasteless. I used data from a published article in which a group of testers ranked different brands of bottled water on their taste on a scale of 1-10. Looking at these beverages I determined that there must be a consistent factor that can make one brand of water taste distinctly "better" than another. I decided to investigate how mineral concentrations contribute to the taste of water in order to find out just how many minerals should be added back into water after it has been desalinated to produce the best-tasting water. I tested ten different brands of bottled water to determine if there was a correlation between the total dissolved solids (TDS) in each brand and their ranking on the water taste-test list. After testing each brand of water, I was able to determine that water with around 200 TDS were said to have the best taste, while those with a number of TDS drastically lower or higher than this had the lowest taste rating.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV EA BI

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):

- human subjects potentially hazardous biological agents
 vertebrate animals controlled substances

2. Student independently performed all procedures as outlined in this abstract. Yes No

3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PST

Proj.
Num

6506

Title: Validating the Effectiveness of Biosensor Imaging of Redundant Deviation in Shifts

Student Name(s): V. Silverman, K. Dardik

Abstract:

Medications used in treating potentially cancerous tumors vary based on the environment of these tumors. Current magnetic resonance or MR methods use contrast agents to measure important characteristics like temperature and pH, but are also sensitive to other parameters. However, the new MR method known as BIRDS uses agents designed specifically to be less sensitive to external parameters. This project is designed to validate the accuracy of the results acquired by this method. The experiments to collect these results were run by inserting samples into a 500 Megahertz magnet, which is used to model a practical MRI machine. These experiments were conducted using various samples, many of which were TmDOTP (the primary contrast agent used) in a solution designed to model various physiological conditions at varying pH and temperature conditions in order to examine the sensitivity over changing parameters. This process was repeated for multiple temperatures and pH values and graphed to determine the sensitivity of the agent to these parameters. The data collected thus far shows high accuracy within the data collected using the BIRDS method. With r^2 values all greater than .95 for temperature sensitivity, the data supports the expectation that the BIRDS method provides accurate results. However, this data has not yet been compared to previous data collected using other methods. Once enough data is collected to determine which method is more accurate, the data collected from this project will enable researchers in the future to design contrast agents that are more effective than the current process.

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EN BI ME

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

Proj.
Num

PST

6507

Title: Environmentally Friendly and Low-Cost Usage of Naturally Extracted Dyes from Organic Materials to Produce Renewable Energy at Efficient Rates

Student Name(s): A. Sirrik, T. Kesen, A. Akcakir

Abstract:

The issue of energy production and its usage has resulted a worldwide search for an alternative to fossil fuels such as crude oil, coal, and natural gas. Fossil fuels could be better used to produce medicines, synthetic fabrics, and rubber. This study seeks to determine an alternative energy source to fossil fuels, which is renewable, economical, and eco-friendly. After initial research, it was established that an organic solar cell composed of beta- Carotene, a red pigment derived from plants, would be the best solution for the problem. This is because the pigment has photovoltaic properties, allowing it to easily capture solar energy. Furthermore, it is completely natural, leaves no waste, and is inexpensive when compared to usual components of a solar cell. The design process entails the gathering of low-cost organic materials that have high amounts of beta-Carotene, such as red carrots, romaine lettuce, and chili peppers. After distilling the plants separately to obtain their dyes, they were placed inside of a vacuum for two days. Subsequently, 2 cm x 2 cm of ITO glass panels were painted with titanium oxide (TiO₂) and heated to 200oC. The panels were dipped in the dyes and pressed on a thin film to complete the photovoltaic cells. Then, upon being connected to batteries, they were left in the sun to see which dye from which plant was more efficient in producing energy. Amongst the 17 various plants that were tested, the dye obtained from red carrots proved to be the most efficient.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

ET EV EE

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 vertebrate animals controlled substances

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category Proj. Num

Title:

Student Name(s): S. Pandit, K. Serindag

Abstract:

The purpose of this study is to determine what makes a song a hit and to determine whether or not there is any identifiable cultural correlation between current events and hit music. By analyzing quantifiable variables in the top five hits within every year from 2001 to 2014, variables such as beats per minute, syllables per second, word count of the chorus, and duration of the song, we can determine the trends over time and any recurring patterns in the data. Songs are given different weights depending on the number of weeks at number one on the Billboard Hot 100 of their respective years. Organizing this data onto histograms will allow for the trends to be easily distinguishable. By cross-referencing the major cultural events since 2001 to the data sets within the same time-frame, we are attempting to find connections between the quantifiable data and the events. The analysis that we provide on this data can be used by major record producing companies as well as radio stations to help better quantify the needs and wants of the consumer. All businesses are dependent on the market's demand, and the music industry does not have much of an insight into the typical listener's wants other than by looking through his or her music library. The procedure and technique that we outline in this can be used by these companies to determine what the market wants.

**Technical Disciplines Selected by the Student
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CSEF Official Abstract and Certification

Fair Category

Proj.
Num

PST

6509

Title: Echocardiogram-Based Wireless Left Ventricular Assist Device (LVAD) with Mobile Application Monitoring and Control

Student Name(s): D. Giebisch, N. Gallant

Abstract:

Recently, a wirelessly powered left ventricular assist device (LVAD), or heart pump, has been developed that increases patient mobility and eliminates blood infection risk. Unfortunately, the new circuitry does not yet include external monitoring or control of the wireless LVAD. Additionally, LVADs utilize a continuous flow mechanism that does not account for changes in a patient's heart rate, leading to cases of ventricular collapse. The focus of this research was to combat both issues by developing new circuitry and software that controls the LVAD's speed based on ECG signals and pairs the pump to a mobile device. To begin the project, research was done to find power-saving and space-efficient electronic components. Next, a physical system was constructed to combine ECG monitoring, motor control, and Bluetooth signalling. Then, the circuit board and mobile phone application were coded to send, receive, calculate, and display information. Finally, the new LVAD system was tested in a water mock loop. Water flow delay rates and speed of the Bluetooth signal were measured. The mobile application successfully received, analyzed, and controlled the wireless LVAD. Additionally, ECG leads sent signals that were interpreted to regulate the heart pump speed based on heart rate, reducing the risk of a collapsed ventricle. This complete system demonstrates the possibility of complex, sensor-based mechanical medical devices that can be easily monitored and controlled by patients and physicians through mobile devices. Future experimentation will include research for the consolidation of electronic circuitry into a smaller device and subsequent in vivo animal testing.

**Technical Disciplines Selected by the Student
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EE ME CS

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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CSEF Official Abstract and Certification

Fair Category

PST

Proj.
Num

6510

Title: 3D Animation and Ebola

Student Name(s): T. Robledo-Thompson, J. Madden

Abstract:

The purpose of our project was to make a 3D animated simulation of the Ebola virus and to accurately show what Ebola does within the human body's immune system. We believe that we can create a well designed simulation of the Ebola virus because technology has advanced to the point that high school students can create a professional quality simulation. To make this video we conducted elaborate research on the Ebola virus. We then created a storyboard of the simulation. From there we created our models for the simulation. We then took those models and made them into a well designed animation. Our conclusion is, that our hypothesis was correct because we did make a simulation and we narrated it well enough to to the point where we cleared up confusion for people trying to understand how Ebola works. This has been a very valuable learning experience for us. It forced us to really learn a great deal about our subject before we could even consider creating an animation. It also tested the limits of our technical skills to create our final product. During this project we encountered many problems during the video simulation process. For example, creating most of the characters were difficult because there were problems with the Lightwave software. While we were taking objects through different software packages, Lightwave would crash because it could not handle all the polygons that we used to create the character in Zbrush, this was very frustrating.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AT ME CS

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3. This project was conducted at a Registered Research Institution. Yes No

4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PST

Proj.
Num

6511

Title: A Study on the Feasibility of Portable, Surface-Based Ice-Penetrating LIDAR for Resolving Cartography Deficiencies

Student Name(s): R. Callaghan, A. Mariani

Abstract:

The purpose of this investigation was to prove that portable, surface-based ice-penetrating LIDAR (a portmanteau of Light and Radar) is a feasible method for resolving the cartography deficiencies that plague USCG operations in the polar regions. It was hypothesized that an infrared LIDAR system, when mounted on a mobile surface vehicle, would provide a cheap, reliable, and non-invasive method for producing reliable maps of the arctic seafloor. Experimentation involved 5 steps. First, the creation of a Data Collection System (DCS) consisting of an infrared emitter/receiver pair, and an Arduino UNO board for regulating and interpreting collected data. The second step was to develop a computer program that would collect and interpret data using the Arduino 1.0.6 programming system. The third step was to mount the DCS on the modified chassis of an all-terrain remote control car and create a final, mobile, surveying device (SD). The fourth phase of experimentation was the data-collection period, during which the SD collected information regarding the depth and topography of a model seafloor with known measurements through a sheet of ice. The fifth and final step of the process was to compare the data collected by the SD with the known measurements of the landscape in order to determine whether or not portable, surface-based LIDAR was a feasible mechanism for correcting the cartographical errors plaguing polar sea-travel. It was concluded that systems utilizing ice-penetrating LIDAR (such as the SD) were in fact effective tools for correcting charts of polar waters.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

AT EV EE

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4. Is this project a continuation? Yes No

5. My display board includes photographs/visual depictions of humans (other than myself or my family):

- Yes No

CSEF Official Abstract and Certification

Fair Category

PST

Proj.
Num

6512

Title: Herb Hotspots: A study of CO₂ intake in different photosynthetic groups

Student Name(s): J. Piciw, M. Bandyopadhyay

Abstract:

This project examined if the photosynthesis rates of different plants over a prolonged period of time can effectively reduce high carbon dioxide levels in Connecticut. Data analysis then established which group of plants, C₃ (basil), C₄ (mint), or CAM (aloe) is most efficient in reducing CO₂ levels present in the atmosphere. Data was collected using Vernier Probes with LoggerPro software in a chamber which contained a sample leaf from each plant, a sample which consisted of a four-inch long stem in a beaker of water. The chamber simulated an artificial environment with an incandescent lamp serving as a synthetic light source. The Vernier Probes determined the levels of carbon dioxide and oxygen present in the chamber over time. The data procured shows, as hypothesized, that the different plants, when grown individually or in conjunction with other plants with either similar or varying photosynthetic characteristics, take in CO₂ at different rates and in distinct amounts. After finding the rates of CO₂ intake, the rates at which those values were changing, the average values of each trial, and the maximum and minimum CO₂ levels, a mathematical model was constructed to show which of the plant combinations would best remove an excess of CO₂ over ten years. Based on this model, further conclusions about possible synergistic effects of the plants were made, in addition to extrapolations about how the information obtained can be used to determine how long it would take to reduce the ever-growing levels of CO₂ in Connecticut.

Technical Disciplines Selected by the Student (Listed in order of relevance to the project)

EV MA

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4. Is this project a continuation? Yes No

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- Yes No

CSEF Official Abstract and Certification

Fair Category

PST

Proj.
Num

6515

Title: Exploring the Effects of Ammonia on the Electrical Resistivity of Graphene

Student Name(s): A. Golbazi, O. Khan

Abstract:

The aim of this experiment is to define and measure graphene's ability to detect exceedingly low molecular concentrations of toxic chemicals like ammonia through a change in its resistance, allowing applications as a nanosensor. Due to graphene's extremely sensitive conductivity when in contact with foreign molecules, it is hypothesized that graphene will show a change in electrical resistance when introduced to extremely low concentrations of liquid ammonia. To perform the experiment, we exposed individual, multilayered sheets of graphene to liquid ammonia concentrations dissolved in distilled water (all under 1%). The change in resistance of the graphene was then measured using a digital multimeter connected to a computer's LabView program. Afterwards, the graphene was replaced, and 3 additional trials were conducted at each concentration. A control trial with only distilled water was also conducted. Results show that the introduction of ammonia results in a significant increase to the graphene's resistance at any concentration when compared to control trials. This change in resistance is most likely due to the ammonia particles adsorbing onto the surface of the graphene and interacting on a molecular level. Because of graphene's sensitivity, the lower concentrations have a lower change in resistance. The results indicate graphene's potential use as an extremely efficient nanosensor capable of detecting toxic liquids where conventional sensors fail. Being able to detect liquid ammonia at such low concentrations allows for the prospect of using graphene to test one's blood in search of abnormal quantities, which can detect upcoming gastrointestinal diseases.

Technical Disciplines Selected by the Student
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EE EN ME

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CSEF Official Abstract and Certification

Fair Category

Proj.
Num

PST

6516

Title: The Use of Multi-Walled Carbon Nanotubes (MWCNT) for Water Filtration

Student Name(s): U. Qureshi, A. Ahmed

Abstract:

Researchers are seeking innovative treatment techniques in light of the increasing demand for clean water. There is a need for a method that is not only effective in filtration, but also sustainable and cost-efficient. Advances in nanotechnology have revealed the potential of carbon nanotubes to fulfill such requirements. A select amount of unmodified MWCNT (multi-walled carbon nanotubes) was added to varying ppm solutions of nickel nitrate and copper chloride and vortexed for a period of time. The filtrate was then isolated using vacuum and syringe filtration. UV-Vis spectroscopy was employed to determine the adsorbance impact of the MWCNTs. Optimization studies involving the manipulation of variables including contact time were later investigated. A select amount MWCNT were purified via thermal oxidation in order to remove amorphous nanotube. The nanotubes were stirred in 6M hydrochloric acid, then 6M nitric acid and classified as purified. Purified MWCNTs were sonicated and refluxed with nitric acid (70%wt) and classified as modified. Modified nanotubes were left in the dry oven overnight. Raman spectroscopy and UV-Vis spectroscopy were employed to confirm modification and adsorbance ability of modified MWCNTs, respectively. Heavy metal ions in water samples obtained from Long Island Sound are currently being tested. Data collected indicate that MWCNTs have a positive impact on heavy metal ion levels found within water. Optimization studies as well as modification show that circumstance plays a role on level of adsorbance. Further testing is required to determine renewability of MWCNT as well as methods of countering health risks they pose.

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Technical Disciplines

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Animal Sciences

Project Number	Title
1014	To Hatch or Not to Hatch: Brine Shrimp & Pollution
1019	Pill Bugs On Mars?
2015	Troublesome Turf
2033	Why Did The chicken Cross The Road?
2034	All About That Bait
2038	Smoking Wars
2502	Toxic Chemicals Found In Detergents
2503	The Effect of Caffeine on the Heart Rate of Daphnia Magna
2505	Brine Shrimp Hatching
2509	The Effects of Honey on the Healing and Regeneration of Lumbriculus variegatus
2524	An Investigation of the Ingestion of Microscopic Plastic Particles by the Blue Mussel, Mytilus edulis
2532	How Much Organic Material Can Earthworms Decompose?
2544	Fruit Fly Fatality
3002	The Effects of Atypical PH on Bay Scallops (Argopecten irradians)
3007	Quantitation of Regeneration in Planaria
3013	The Effects of Organic and Chemical Fertilizers on Snails of the Long Island Sound
3019	Pollutants and there Detrimental Effects on Shrimp
3021	Side Effects of Frequent Propofol Use on Canines and Felines
3022	Determining the Most Effective Tick Repellent in Replace of DEET Based Products
3032	Enhancing the Collagen Yield from Aurelia aurita through Bio Encapsulated Highly Saturated Fatty Acid Feed
3034	The Effect of alcoholic, nicotized, caffeinated, and adrenergic solutions on Arrhythmias
3040	Utilizing Piscivorous Birds as Low-Impact Primary Biological Indicators
3043	The Effect of the Invasiveness of the Zebra Mussels in Lake Lillinonah
3047	The Effect of Cold Stress on the Frequency of CD8+ T Cells in Aged Mice
3053	The Efficiency of Bivalve Mollusk Filter Feeding in the Long Island Sound
3057	Do Color Words Affect The Stroop Effect?
3070	The Effects of TBBPA and HBCD Brominated Flame Retardants on Zebrafish Embryonic Development
3073	Determining the Effect of Biofouling on a Restocking System for Homarus americanus
3079	Accumulation and Biomagnification of Microplastics in Marine Bivalves and Gastropods
3094	The Effect of Cinnamaldehyde on the Chemical Memory of Dugesia Tigrina
3115	The Viability of Planarian as an In Vivo Model for Cancer Research
3119	Investigating the Growth Rate of Procambarus clarkii under different Environmental Stressors
3128	The Effects of Pollution On the Regenerative Process of the Nematostella Organism
3129	The Internal Effects of Amino Acids (Leucine and Taurine) on Cardiovascular Zebrafish Embryonic Development
3505	DNA Barcoding to Detect Mislabeling and Endangered Species in Turtle Meat
3511	The Behavioral Effect of Molting Patterns in Hermit Crabs
3514	The Effect of Vitamin C on Echinoderm Leg Regeneration
3515	Manure to Methane
3523	The Thermal Stress Of A Coenbita Clypeatus(Land Hermit Crab)
6017	Size Variation In Ichthyornis from Humeral Articulation Measurement
6040	Gender-Specific Copepod Susceptibility to Phytoplankton Neurotoxins at Various Concentrations
6054	A field study on the widespread effect of three viruses on the domesticated honeybee, the Apis mellifera

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Applied Technology

Project Number	Title
1025	Survive with Salt Water
2009	What liquid germinates seeds the fastest?
2039	Novel Bioluminescent Display using <i>Aliivibrio fischeri</i> for efficiency and low cost
2521	Electric Energy Production In A Bio-fuel Cell For Varying Electrogenic Bacterial Samples
2529	Indirect measurement of the pliability of vocal folds and singer comfort after direct steam inhalation.
3017	Clinical application of 3D printing technology in cancer radiation therapy: A novel method to improve dose conformity with patient specific treatment aid device
3041	Remediating Rivalry?
3045	A cheap, accurate, and rapid test for identifying ESKAPE bacterial pathogens in urban and rural environments.
3052	The Analysis of Clay Flocculation's Effect on the Benthic Zone Used as a Mitigation Technique for Harmful Algal Blooms (HABs)
3054	Preparation and Comparison of EGCG-Loaded PLGA and Cellulose Acetate Microparticles for Osteoarthritis Treatment
3073	Determining the Effect of Biofouling on a Restocking System for <i>Homarus americanus</i>
3088	Unprecedented Glycerol-Free Biodiesel Production using Enzyme Catalysis
3090	Analyzing Cathode Placement in a Simple Single Vessel Microbial Fuel Cell: Potential Implications for Efficiency and Practical Applications
3091	An Investigation of Drone Downdraft as a Viable Alternative for Insect Pollination of Essential Crops
3096	Temperature-Independent, Portable, and Rapid Field Detection of Ebola via a Silk-Derived Lateral-Flow System
3099	3D Printer for Creating Cement Domestic Utilities for Developing Countries
3124	The Optimization of Conditions for an Enzymatic Bio-Battery
3130	Ultraviolet Bacterial Eradication Using Low Cost Light Emitting Diodes
3135	Impact of Geometrical Structure on the Durability of Stereolithographic Sea Turtle Shell Prototypes
3512	The Influence of Time Consistency and Processing Speed on Multimodal Perceptual Experience
4003	Analysis of Safer Electroplating Metals and Electrolyte solutions with their Environmental Impact
4010	Analysis of Nature's Digestive Enzymes and Effect of Inhibitors and Enhancers on Nutrition and Cell Absorption.
4013	Power Brace: A leg brace designed to help the victims of Duchenne Muscular Dystrophy and other diseases walk and stand in every day life
4017	The Sensing Cane
4019	Analysis of the Extraction of Proteins from Under Utilized Resources and Their Nutrient and Bioavailability Values
4020	Peer Pressure and Robots
4023	Wind Power: How the Shape of the Blade Affects the amount of Power Produced.
4024	A New Type of Energy in Cars
4028	Does your shirt have your back: A study of clothing features that protect against UV light
4029	Incorporating the Flutter Effect in Flags to Produce Energy
4033	BabyBot: Creating a Robot to Soothe a Crying Infant
5001	BOBS (Baby on Board) System
5008	Crossing the Gap... But With What?
5012	Die sensitized solar cell
5014	Can The Weight of a Car be Accurately Weighed by Using an Air Pressure Gauge and a Ruler?
5022	Cu at the Bottom
5023	Which Variables Affect The Flight Of A Rocket?
5030	Opening a Garage Door with Raspberry Pi
5036	The Amount of Critical Mass Needed to Make a Sustainable Chain Reaction
5039	Wrap the Apple Save the Apple
5042	Drone for Science
5043	A Matter of Facts: Designing a Math App to Help Kids Learn Their Math Facts

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Applied Technology

Project Number	Title
5046	The Effect of Different Temperatures on the Strength of a Magnet
5054	Development of a technique to detect explosive residue for use in avoiding terrorism threats.
5055	How Do Environmental Conditions Affect the Performance of Duct Tape?
5501	Fired UP!!!
5502	Water Filtration and Flocculation Methods
5504	Green Energy Ferris Wheel
5506	Effect of Blade Angle and Wind Angle on Rotation Speed of a Home-Built Wind Turbine
5507	Music Metrics and Fractals: Analyzing Different Genres of Digitized Music to Identify Input Metrics for Programming Fractal Representations of the Music with Mathematica
5509	The Effect of Using Foam to Create a More Sophisticated Highway Barrier on Lessening the Spike of G-forces During an Impact
5510	Hovercraft
5511	What Materials can block a Wifi Signal
5512	Design, build and program a robot using an Arduino Mega 2560 R3 through an Android app to cheer up or relax children at a hospital
5515	Measurement of Tensile Strength of Various Wet & Dry Woods
5516	Home-Made Particle Accelerator
5518	Strength Of An Electromagnet
5519	Instrument Science: Bell Flares
5521	Zap That Zit
5523	Power Wind
5526	Do expensive basketball sneakers outperform inexpensive basketball sneakers?
5528	Efficiency of Piezoelectric Materials for Electric Production
5531	Gauss Launcher Efficiency
5541	Spot On! The Use of the Visible Electromagnetic Spectrum to Determine the Effectiveness of Stain Removers
5549	The Effect of Catapult Arm Length on the Distance the Projectile Travels
5551	UV-C Lighting As A Supplemental Method Of Preservation In Refrigerators To Reduce Energy Consumption
5555	Powerful Propellers
5560	Energy Scavenging--Proving the Seebeck Effect with a Homemade Thermoelectric Generator: A Source of Free, Sustainable, Low-Voltage Power
5562	Shrouded Wind Turbine and the Venturi Effect
6001	Drone-based, Tropospheric Gas Collection for use in Air Quality Monitoring
6003	Boiling Water with Nano Particles.
6005	An Optically Self-Healing Metallo-Supramolecular Polymer Encapsulated UV-NIR Organic Solar Cell for Transparent Energy-Harvesting and Electronic Skin Applications
6009	An app to assimilate information during a presentation without note taking
6010	Wax On, Wax Off
6011	Application of the near-IR Luminescence Property of Egyptian Blue and related Alkaline Earth Metal Copper Silicate (MCuSi4O10 -BaCuSi2O6) in Infrared Technology (IR)
6012	Robots in the Classroom: The Effect of Social Robots on Student Memorization and Participation
6020	Printlet (combination between a printer and a tablet)
6023	A Comparative Analysis of Rotating Solar Cubes vs. Horizontal Solar Arrays
6025	Program your Diet
6030	Electrically Independent, Low Cost, Self-Filling Water Bottle for use in Water Locked Regions
6036	Using Peltier and Thermoelectric Principles for Humanitarian Applications
6041	Using a Hydraulic System and a Heat-Induced Magnetic Adhesive to Create a Manipulatable Array that Increases the Efficiency of Piezoelectric Generators

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Applied Technology

Project Number	Title
6043	Physical and Cost Optimization of a Human Powered Axial Flux Generator for use in Electrically Isolated Environments.
6045	Graphene Solar Cell
6047	The Effect of Different Checkerboard Sizes on Steady State Visually Evoked Potentials
6048	Is The Money Worth It?
6051	Revolutionizing A 16th Century Product For The Modern World: A Thermoelectric Chair That Creates Energy From The Human Touch
6053	The Derivation of Habitable Zones around Binary Star Systems: Is Planetary Stability Possible?
6055	A Novel Method of Controlling Size of Carbon Nanotubes
6057	The Fire-fighting robot based on artificial intelligence
6058	Move Over Opec/Oil from Biomass
6062	Ferromagnetism: Using ferromagnetic fluid to control prosthetics
6063	Testing the Effectiveness of an improved French Trench.
6064	Power generation via downdraft of humidified dry air
6065	Low-Cost Solid-State Cosmic Ray Observatory
6066	Biochar Electrodes Incorporated with Cuprous Oxide Substrates to Optimize Solar Cells' Efficiency
6067	Efficient Soundproofing: Design of a System using Multiple Technologies
6068	Evaluation of Several Resonant Power Electronic Converters in Capacitively Coupled Wireless Energy Transmitters
6070	InMoov: An Independent Study in Mechanical and Electrical Engineering and Computer Science
6071	Designing a Braille E-Book For the Visually Impaired and Blind People
6072	Omni-Directional Maglev Cableless Elevator
6073	Chef NAO: The Humanoid Cooking Robot
6077	A Novel Solar Powered Photobioreactor Design for Waste Water Treatment and Producing Biofuel From Micro-Algae
6079	The Application of Sub-undulatory Locomotion Principles Utilized by Sub-carangiform Swimmers to Increase Submersible Efficiency
6080	A Water-Resistant, Piezoelectric Precipitation Generator; A comparative analysis of mobile v. stationary systems
6081	Reverse Osmosis Water Desalination Via the Harnessing of Perpetual Wave Energy
6082	Creating a Semantic Search Engine with Voice Integration
6084	Determination of Illicit Drug Residues on Currency Using LC-MS/MS
6085	Creation of a Fresnel Lens Array for use in Water Purification
6087	Application of Manganese-Based Ionic Liquid for Optimized Performance of Non-aqueous / Aqueous Redox Flow Batteries
6089	Cybersecurity Using Distributed Cryptography and Biometrics
6090	The effect of application of a solenoid on the magnetic properties of gadolinium at varying temperatures and current levels.
6100	Exploring the Optical Audio Link
6101	Low Grade Waste Heat Recovery and Carbon Sequestration using an Innovative Reverse Electrodialysis (RED) and Pressure Retarded Osmosis (PRO) System
6104	Investigating the Benefits of Receiving Information Through Video
6504	An investigation on the effects of radiation emitted from the three most popular mobile phone operating systems.
6508	What Is "Good Music?"
6510	3D Animation and Ebola
6511	A Feasibility Study of Portable, Ground-Based Ice-Penetrating Radar to Resolve Cartography Deficiencies.
6513	Designing an Efficient Method of Collecting and Recycling Ocean Debris through the Use of Uniquely Shaped Containment Booms.
6516	The Use of Carbon Nanotubes for the Filtration of Heavy Metal Ions From Water

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Behavioral and Social Sciences

Project Number	Title
1003	Do you see what I see?
1006	So You Think You Can Multitask? A Study of Multitasking: Help or Hinderance to Learning and Recall
1011	How Languages Affect Cognitive Ability
1018	The relationship between font style and peoples' ability to remember typed information.
1021	The relation of time that was spent studying compared to the amount of preformed accuracy on a quiz.
1024	The Effect of Different Heating Sources on How Fast Water Can Reach Boiling Point
2016	Music and Memory
2019	The Stroop Effect
2036	Does Music Affect Running Pace?
2502	Toxic Chemicals Found In Detergents
2504	The Cocktail Party Effect: An Inside Look at Multitasking
2520	Effects of Mnemonic Methods on Memory
2529	Indirect measurement of the pliability of vocal folds and singer comfort after direct steam inhalation.
2533	Food & Texture: Does seeing the food affect your liking a food that has changed from its original texture?
2534	Reaction Time
2543	Which Side Are You On?
2546	The Effect of Brain Dominance on Memory
3006	Awareness and Knowledge of HPV Among High School Students
3019	Pollutants and there Detrimental Effects on Shrimp
3022	Determining the Most Effective Tick Repellent in Replace of DEET Based Products
3025	Suicide Reportings in New England
3036	Does the Color of a Classroom Effect Learning Comprehension?
3050	Poetic Mind
3057	Do Color Words Affect The Stroop Effect?
3066	Calories consumed during lunch by students from the Joel Barlow HS cafeteria compared to their GPA
3074	The Stroop Effect
3085	Applying the Friendship Paradox to Trends within the High School Population
3086	How Music Affects Concentration
3094	The Effect of Cinnamaldehyde on the Chemical Memory of Dugesia Tigrina
3097	The Correlation of Written and Spoken Language Development With Reading Cognition
3104	The Laws of Attraction
3117	Stroop Effect
3134	Ambiguous Beats: Using EEG to measure how movement influences rhythmic processing in young infants
3511	The Behavioral Effect of Molting Patterns in Hermit Crabs
3512	The Influence of Time Consistency and Processing Speed on Multimodal Perceptual Experience
3523	The Thermal Stress Of A Coenbita Clypeatus(Land Hermit Crab)
4020	Peer Pressure and Robots
5532	Can Humans Distinguish What an Object is Just by Feel?
5533	How Fast Can A Human Solve the Rubik's Cube
5544	Does highlighting facts in a paper help people comprehend better
5568	Can you walk longer with or without music?
6012	Robots in the Classroom: The Effect of Social Robots on Student Memorization and Participation
6104	Investigating the Benefits of Receiving Information Through Video
6501	"Are Your Eyes Playing Tricks on You?"

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Behavioral and Social Sciences

**Project
Number**

Title

6508 What Is "Good Music?"

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Biochemistry

Project Number	Title
1008	Analysis of Moisture and Retention of Body Lotions and Correlation to Microbial Growth
1010	Which Liquid Prevents Oxidation?
1013	Gas Released by Yeast
1016	Analysis of Silicon's Effect On Bone Health, "Cell" Bioavailability, and "Skin" Absorption.
1020	Got White?-Which toothpaste will whiten the best on stained limestone tiles?
1026	Got Gas?
2003	The Effect of pH Level on the Growth of Algae
2004	Diffusion Confusion: Which Liquid Does Blue Food Coloring Diffuse The Fastest In
2013	What is TDS? Are you drinking it?!
2015	Troublesome Turf
2020	How sweet is it really? Tracking down hidden sugar in drinks.
2032	Weed Control: Walnuts to the Rescue!
2038	Smoking Wars
2039	Novel Bioluminescent Display using <i>Aliivibrio fischeri</i> for efficiency and low cost
2501	Does a Person's Eye Color Affect Their Ability to Identify Colors in Dim Light?
2507	Aqua-Life
2511	Analysis of Increased CO ₂ levels in Ocean water and Effect on Crustaceans' and Bivalves' Growth
2513	Which is the Most Effective Antacid?
2522	Microwave Radiation
2526	One Sticky Situation
2527	Viral Protein 35 Inhibition: A Novel Treatment for Ebola Virus Disease
2528	Electrolyte Challenge
2536	Regenerative Nano Particle Films
2540	Effects of Common Over-the-Counter (OTC) Medications on the Growth of Intestinal Bacteria Often Used as Probiotics
2542	Think Before You Drink Analysis of the impact of drinking popular soft drinks on our body.
3001	A Natural Fighter Against E. Coli
3005	Investigating Inhibitors of Dihydrofolate Reductase Enzymes of <i>Streptococcus pyogenes</i> and <i>Staphylococcus aureus</i>
3008	Accuracy of DNA Barcoding in the Plant Kingdom
3018	Exploring strategies for improved calcium and phosphate compatibilities in parenteral nutrition.
3020	Effective Optimization of Biogas Production through Alpha-Amylase Utilization
3022	Determining the Most Effective Tick Repellent in Replace of DEET Based Products
3024	Effect of Brin Concentration on Gettability in Atomisticly Smooth Surfaces
3027	MiRNA Target Sites in the 3' Untranslated Region of West Nile Virus
3029	How Different Rates of Metabolism Can be Used to Differentiate Cancerous Cells From Normal Cells
3030	The Effects of GMO vs Non-GMO Bananas on the Life Span of Fruit Flies
3031	Chocolate's Theobromine, and not Caffeine, significantly reduces sleep in <i>Drosophila</i>
3034	The Effect of alcoholic, nicotinized, caffeinated, and adrenergic solutions on Arrhythmias
3037	The Effect of Iron Levels on Marine Algal Growth
3040	Utilizing Piscivorous Birds as Low-Impact Primary Biological Indicators
3042	Design and Use of Primers for Investigation of Bone Resorption
3051	Exploring the Tunicate <i>Ascidia callosa</i> and its Associated Bacteria for Antimicrobial Compounds and other Marine Natural Products
3060	Biochemical Changes in Corneal Collagen Cross-linking: Nondestructive Analysis by Raman Spectroscopy
3069	Elucidating the Ethylene Signal Pathway in Arabidopsis

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Biochemistry

Project Number	Title
3071	The Effect of the non-caloric intense sweetener Neotame on lifespan and pharyngeal pumping rate of daf-2(e1370) mutant <i>Caenorhabditis elegans</i> .
3075	Elevated Levels Of Interleukin-8 in Non-Small Cell Lung Cancers induce Cell Survival During Chemotherapy
3077	Exploration into the Effects of Anti-PAR2 Antibody on the Expression of CUX-1 Related Metabolic Pathways and Apoptosis of Mouse Breast Cancer Cells
3078	Neurochemical signature of cerebral vasospasm in patients with subarachnoid hemorrhage
3080	Stabilization of CXCR4 for Crystallization by Tyrosine Sulfation of the N-Terminus
3081	The Effect of Gut Denitrification of <i>Dressina polymorpha</i> on the Nitrate and Nitrite Availability in the Freshwater System of Eichler's Cove, Newtown
3082	The Effect of Elevated Glucose Levels on the Maternal-Fetal Interface
3092	Enhancement of antibiotic effects on various species of bacterium via infusion of silver nanoparticles
3095	How Grey Oyster Mushrooms Can Be Used To Break Down Oil And Reduce Waste In The Environment.
3102	Telomerase Activity in Squamous Cell Carcinoma Patients and the Potential Reduction of Telomerase Levels by Usage of Intensive Meditation Training and Psychological Mediators
3109	DNA Barcoding in "Health Bars"
3112	The Effect of Brain-Derived Neurotrophic Factor on Retinoic Acid Differentiated SH-SY5Y Cells: A Model for Striatal-Enriched Protein Tyrosine Phosphatase in Parkinson's Disease
3113	Endothelial miR-1 slows the growth of lung cancer cells through angiocrine regulation
3114	A Novel Antibody-Functionalized Graphene Transistor Lab-On-A-Chip for Selective Detection of Malaria Pathogens
3118	Development of Non-toxic Photostabilized Phycoerythrin for Application in Dye Sensitized Solar Cells
3120	Isolation and Use of Antimicrobial Polypeptides found in Grains to Inhibit the Growth of Gram-Positive and Gram-Negative Bacteria
3123	miRNA Analysis of Exosomes from Osteosarcoma Cells
3124	The Optimization of Conditions for an Enzymatic Bio-Battery
3126	Phytoplankton's Effect on Ocean Acidification
3132	CHANGING CONSTRUCTION FACTORS TO CREATE DIFFERENT MORPHOLOGIES OF PHOSPHOLIPID AGGREGATES
3505	DNA Barcoding to Detect Mislabeling and Endangered Species in Turtle Meat
3507	Use of <i>Saccharomyces Cerevisiae</i> and Biosorption in the Purification of Industrially Polluted Waters
3508	Target Identification: Frequency of the PV92 Alu Insertion within a Given Population
3514	The Effect of Vitamin C on Echinoderm Leg Regeneration
3515	Manure to Methane
3517	DNA Barcoding of Invasive Species on a Suburban Campus
3520	A Natural Way to Keep Insects Away by Using Various Essential Plant Oils as an Organic Insect Repellent
3524	Fish Finders: DNA to Expose Fish Fraud
4007	Is density a quality?: Density Intensity
5045	Can Biomass be used as a Renewable Energy Source
5048	Let's Beet Slippery Roads
5053	Which Wheat Flour Has the Most Gluten?
5556	Is your lipstick toxic?
5564	Can you change the rate of a chemical reaction by changing the particle size of the reactants?
6030	Electrically Independent, Low Cost, Self-Filling Water Bottle for use in Water Locked Regions
6037	The Effect of 2-dimyristoyl-sn-glycero-3-phosphocholine (DMPC) Dilutions on Nanoparticle Radius Using Small Angle Neutron Scattering (SANS)
6049	Recovering carbon nanotube fluorescence through conformational change of side chains
6054	A field study on the widespread effect of three viruses on the domesticated honeybee, the <i>Apis mellifera</i>
6097	Biodegradable Plastics using a variety of fruits and vegetables

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Biochemistry

Project Number	Title
6098	The Development of an Immunosorbant Assay (ELISA) for detection of IgG and IgA antibodies against Tissue Transglutaminase for the diagnosis of Celiac disease.
6505	Determining the Effects of Different Products on Desalination
6506	Validating the Effectiveness of Biosensor Imaging of Redundant Deviation in Shifts
6516	The Use of Carbon Nanotubes for the Filtration of Heavy Metal Ions From Water

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Cellular and Molecular Biology

Project Number	Title
1012	Bacterial Invasion
1013	Gas Released by Yeast
2503	The Effect of Caffeine on the Heart Rate of Daphnia Magna
2505	Brine Shrimp Hatching
2509	The Effects of Honey on the Healing and Regeneration of Lumbriculus variegatus
2525	How Different Milk Fat Concentrations Affect Bacterial Growth
2535	Optimizing Methane Oxidation by Methanotrophs Through the Engineering Application of Different Environments
3004	A Comparison of the Efficacy of Genomic Loci and Oligonucleotide Systems in the DNA Barcoding of Vitis Labrusca
3011	Bioremediation of Low Density Polyethylene with S. griseus Bacteria and A. niger Fungi in Sterilized Soil
3012	Improving the extraction DNA from fruit using household items.
3014	Antimicrobial Properties of Various Plant Leaf Extracts on Escherichia Coli
3024	Effect of Brin Concentration on Gettability in Atomisticly Smooth Surfaces
3029	How Different Rates of Metabolism Can be Used to Differentiate Cancerous Cells From Normal Cells
3038	Inhibiting the Growth of Triple-Negative Breast Cancer by Targeting the Autocrine Expression of Proinflammatory Cytokines Interleukin-6 and Interleukin-8
3039	The Effect of Zeolite on the Proliferation Rate of Cancer Cells
3042	Design and Use of Primers for Investigation of Bone Resorption
3044	The Effect of Supplemental Beta Carotene and Vitamin A on the Proliferation of Mouse Mammary Carcinoma
3046	Correlation of frequency of cancer stem cells to patient outcome in osteosarcoma
3047	The Effect of Cold Stress on the Frequency of CD8+ T Cells in Aged Mice
3048	The Effect of Salicylic Acid on Growth of Spirochaeta aurantia Colonies
3058	The Role of the Genetic Transfer of Mobile Genetic Elements in the Evolution of Microbial Populations
3059	Honey as an Antibacterial Agent
3062	The Effect of Osmotic Pressure on Gram-Positive and Gram-Negative Bacteria
3063	Restricting the Growth of Lactamase-producing Bacterial Strains of Enterobacter aerogenes through Minimum Inhibitory Concentrations of Essential Oil Extracts
3064	The Effectiveness of Homeopathic Antibiotics Versus Pharmaceutical Antibodies on the eradication of E. Coli.
3066	Calories consumed during lunch by students from the Joel Barlow HS cafeteria compared to their GPA
3067	An Investigation of an alternate treatment method, bacteriophage, for bacterial infections and the use of bacteriophages for an antibiotic
3069	Elucidating the Ethylene Signal Pathway in Arabidopsis
3070	The Effects of TBBPA and HBCD Brominated Flame Retardants on Zebrafish Embryonic Development
3071	The Effect of the non-caloric intense sweetener Neotame on lifespan and pharyngeal pumping rate of daf-2(e1370) mutant Caenorhabditis elegans.
3075	Elevated Levels Of Interleukin-8 in Non-Small Cell Lung Cancers induce Cell Survival During Chemotherapy
3076	The Effect of FGF2 on Hypoxia in the Mouse DG: A Model for Human Perinatal Hypoxia
3077	Exploration into the Effects of Anti-PAR2 Antibody on the Expression of CUX-1 Related Metabolic Pathways and Apoptosis of Mouse Breast Cancer Cells
3078	Neurochemical signature of cerebral vasospasm in patients with subarachnoid hemorrhage
3079	Accumulation and Biomagnification of Microplastics in Marine Bivalves and Gastropods
3080	Stabilization of CXCR4 for Crystallization by Tyrosine Sulfation of the N-Terminus
3082	The Effect of Elevated Glucose Levels on the Maternal-Fetal Interface
3084	An Evaluation of Machine Learning Methods for Genetic Variant Error Detection
3086	How Music Affects Concentration
3087	Natural Dye Treatments of Gossypium hirsutum using several Naturopathic sources in combination with the mordant of Aluminum Potassium Sulfate
3089	Inverstigation of Bioremediation and Alkane-degrading Qualities of Alcanivorax Borkumensis

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Cellular and Molecular Biology

Project Number	Title
3091	An Investigation of Drone Downdraft as a Viable Alternative for Insect Pollination of Essential Crops
3094	The Effect of Cinnamaldehyde on the Chemical Memory of <i>Dugesia Tigrina</i>
3100	Determining the Ras-like Structure of the Gai2 Protein
3101	The Effects of Curcumin and Eucalyptus Oil on the Growth and Apoptotic Properties of Breast Cancer Cells
3102	Telomerase Activity in Squamous Cell Carcinoma Patients and the Potential Reduction of Telomerase Levels by Usage of Intensive Meditation Training and Psychological Mediators
3103	Natural vs. Chemical Cleaners
3106	Differences in the measurements and numbers of nuclear pores and nuclear pore complexes in wildtype stem cell lines and Huntington's Disease stem cell lines
3107	The Effect of Triclosan on the Proliferation of the Breast Cancer Cells
3111	The Effect of Zinc Oxide Nanoparticles on the Growth of Bacterial Infections
3112	The Effect of Brain-Derived Neurotrophic Factor on Retinoic Acid Differentiated SH-SY5Y Cells: A Model for Striatal-Enriched Protein Tyrosine Phosphatase in Parkinson's Disease
3113	Endothelial miR-1 slows the growth of lung cancer cells through angiocrine regulation
3115	The Viability of Planarian as an In Vivo Model for Cancer Research
3117	Stroop Effect
3121	Comparative Modeling of Signal Peptidase I (Spase I) from <i>Mycobacterium tuberculosis</i> Genome
3123	miRNA Analysis of Exosomes from Osteosarcoma Cells
3125	The effect of Hsp 70 on the survival of <i>Anopheles gambiae</i> when exposed to extreme temperatures and its relevance to the proliferation of infectious diseases.
3128	The Effects of Pollution On the Regenerative Process of the <i>Nematostella</i> Organism
3129	The Internal Effects of Amino Acids (Leucine and Taurine) on Cardiovascular Zebrafish Embryonic Development
3130	Ultraviolet Bacterial Eradication Using Low Cost Light Emitting Diodes
3508	Target Identification: Frequency of the PV92 Alu Insertion within a Given Population
3509	The Effects of Seed Priming
3510	The Designing and Application of the Single-Cell Immunoplex Device
3514	The Effect of Vitamin C on Echinoderm Leg Regeneration
3521	The Effect of pH Levels in Presoaking Liquids on Fruit Dehydration Duration
4005	Growing Gummy Bears Using Osmosis
5013	Build a raft powered by surface tension
6082	Creating a Semantic Search Engine with Voice Integration
6501	"Are Your Eyes Playing Tricks on You?"

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Chemistry

Project Number	Title
1015	Softening Sweets
1020	Got White?-Which toothpaste will whiten the best on stained limestone tiles?
2004	Diffusion Confusion: Which Liquid Does Blue Food Coloring Diffuse The Fastest In
2013	What is TDS? Are you drinking it?!
2025	Have Your Bread and Eat it Too
2029	That Is The Reason Why Your Teeth Are Stained
2030	A Photosynthesis Lab: The Effect of Light Intensity, Water Temperature, Colored Lights, and Contaminated Water on the Rate of Photosynthesis of the Aquatic Plant, Elodea Densa
2035	As Temperature Goes, Yeast Grows
2513	Which is the Most Effective Antacid?
2515	The Impact of Acid Rain on the Flora of the Environment
2518	Nutrient Comparison of Lettuce Grown Hydroponically and in Soil
2519	Who's Got The Biggest Bubbles?
2526	One Sticky Situation
2527	Viral Protein 35 Inhibition: A Novel Treatment for Ebola Virus Disease
2536	Regenerative Nano Particle Films
2538	The Effect of Household Acids and Bases on the pH of dirt.
2541	Inexpensive Treatments for Plants Affected from Contaminated Soil by Oil Spills
2542	Think Before You Drink Analysis of the impact of drinking popular soft drinks on our body.
2545	Finding the Most Efficient Anti-fungal Food Using a Baking Yeast Solution
3012	Improving the extraction DNA from fruit using household items.
3018	Exploring strategies for improved calcium and phosphate compatibilities in parenteral nutrition.
3031	Chocolate's Theobromine, and not Caffeine, significantly reduces sleep in Drosophila
3049	Targeted Release of Moringa oleifera Cationic Proteins from Starch-g-poly (sodium acrylate-co-HEMA) Hydrogels for the Remediation of Aqueous Polychlorinated Biphenyls
3051	Exploring the Tunicate Ascidia callosa and its Associated Bacteria for Antimicrobial Compounds and other Marine Natural Products
3065	The Effectiveness of Plant Material as Metal Chelators
3088	Unprecedented Glycerol-Free Biodiesel Production using Enzyme Catalysis
3093	The Affect of Ocean Acidification on Nannochloropsis sp.
3110	Hybridized Manganese Dioxide & Gold-Iron Oxide Nanoparticle Inhibition of Tumor Growth via Radiosensitization and Tumor Microenvironment Control
3122	Disinfection By-Products in Water
3125	The effect of Hsp 70 on the survival of Anopheles gambiae when exposed to extreme temperatures and its relevance to the proliferation of infectious diseases.
3132	CHANGING CONSTRUCTION FACTORS TO CREATE DIFFERENT MORPHOLOGIES OF PHOSPHOLIPID AGGREGATES
3133	Zostera marina's Effect on Carbon Dioxide Levels in Long Island Sound and Predicted Effects
4001	The Hard Truth About Water Hardness: Which body of water is the healthiest (in Water Hardness)?
4004	Snow Melting
4005	Growing Gummy Bears Using Osmosis
4006	Meltdown
4008	Investigating Novel Methods to Harvest Solar Energy for Generation of Solar Steam from Salt Water and Snow Using Graphene and Carbon Foam
4010	Analysis of Nature's Digestive Enzymes and Effect of Inhibitors and Enhancers on Nutrition and Cell Absorption.
4018	Raining Rust Causing Corrosion
4019	Analysis of the Extraction of Proteins from Under Utilized Resources and Their Nutrient and Bioavailability Values

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Chemistry

Project Number	Title
4032	Sugar Rainbow
5004	The Effects of Boiling on the pH and nitrite Levels of Water
5010	Which is Better for the Garden? Aspirin vs. Super Thrive
5011	Let There Be Light!
5017	Foam Dissolving Methods
5019	Baking with Fantastic Flours
5020	Self-Inflating Balloons
5021	Rust A Bunch
5027	How common acidic solutions affect the rate of corrosion of brass.
5028	Which Metal Will Corrode the Fastest?
5038	Frozen
5040	Effectiveness of Fertilizer Application Techniques in Reducing Fertilizer Runoff and Pollution
5044	What is the most effective treatment for melting ice?
5045	Can Biomass be used as a Renewable Energy Source
5049	Self-Inflating Balloons
5054	Development of a technique to detect explosive residue for use in avoiding terrorism threats.
5057	What's in this water?
5059	Relinquishing Rust
5060	Ice Matters
5061	Bubble Blowing
5062	Paper Chromatography: The Science of Color Separation
5064	Cooling Mints
5501	Fired UP!!!
5503	Evaporation Rate Of An Ice Cube In Liquids With Varying Densities
5521	Zap That Zit
5527	Hot Vs. Cold
5534	Are Popular Beverages Destroying Teeth?
5536	Tap Water vs Bottled Water- Is There a Difference?
5537	The Effect of Processing on the Vitamin C Content of Orange Juice
5538	Burning The Pie
5540	How Does the pH Level of Liquids Used to Take Medication Pills Affect Dissolvability?
5541	Spot On! The Use of the Visible Electromagnetic Spectrum to Determine the Effectiveness of Stain Removers
5542	Measuring The Amount of Acid in Vinegar By Using Titration
5547	How Everyday Substances Affect the Freezing Point of Water
5554	How Substances Affect Tonic Water Glow
5556	Is your lipstick toxic?
5558	The Effects of Acid Rain on Magnetism
5564	Can you change the rate of a chemical reaction by changing the particle size of the reactants?
5566	Can Common Household Cleaning Products Be Used As Makeshift Stain Removers?
5567	Super Suds
6006	Low Temperature Thermal Cracking of High-Density Polyethylene via Zeolite and Pillared Clay Catalysts
6007	The effect of snow and ice thickness on the winter respiration Carbon Dioxide output
6010	Wax On, Wax Off

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Chemistry

Project Number	Title
6011	Application of the near-IR Luminescence Property of Egyptian Blue and related Alkaline Earth Metal Copper Silicate (MCuSi ₄ O ₁₀ -BaCuSi ₂ O ₆) in Infrared Technology (IR)
6013	Chemical Looping Combustion: A Zero CO ₂ Footprint Energy Conversion Process
6015	Synthesis of an Electromagnetically-Controlled Corn-Starch/PVA Biopolymer Microstructure for Extended and Targeted Drug Delivery
6022	The Effect of Electric Charge on the pH of a Magnesium Sulfate Solution
6024	The effects of highly reflective material to be use for housing and their ability to mitigate global climate change.
6039	Optimization of Reflectivity of GaN for Solar Applications
6045	Graphene Solar Cell
6046	Sequestration of Carbon Dioxide by Lithium Orthosilicate in a Clay Body in Ambient Air
6049	Recovering carbon nanotube fluorescence through conformational change of side chains
6052	Enhanced Organic Solar Cells Using 3m Micro Prismatic Technology
6060	Hydrogen Fuel Cells: How Electrode Material Affects Them
6064	Power generation via downdraft of humidified dry air
6083	Engineering of ZnO Tapered Pillar Nanostructures as Antireflection Coatings on Silicon Solar Cells
6084	Determination of Illicit Drug Residues on Currency Using LC-MS/MS
6087	Application of Manganese-Based Ionic Liquid for Optimized Performance of Non-aqueous / Aqueous Redox Flow Batteries
6088	Impact of the manipulation of the viscosity of ethanol on the particulate matter output and the efficiency of combustion.
6102	In-Situ and Impregantion Synthesis of Cobalt-Doped Cerium Oxide (CeO ₂): Structure/Property Relationships

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Computer Science

Project Number	Title
1018	The relationship between font style and peoples' ability to remember typed information.
3058	The Role of the Genetic Transfer of Mobile Genetic Elements in the Evolution of Microbial Populations
3084	An Evaluation of Machine Learning Methods for Genetic Variant Error Detection
3121	Comparative Modeling of Signal Peptidase I (Spase I) from Mycobacterium tuberculosis Genome
3135	Impact of Geometrical Structure on the Durability of Stereolithographic Sea Turtle Shell Prototypes
4017	The Sensing Cane
4020	Peer Pressure and Robots
4033	BabyBot: Creating a Robot to Soothe a Crying Infant
5030	Opening a Garage Door with Raspberry Pi
5042	Drone for Science
5507	Music Metrics and Fractals: Analyzing Different Genres of Digitized Music to Identify Input Metrics for Programming Fractal Representations of the Music with Mathematica
5511	What Materials can block a Wifi Signal
5512	Design, build and program a robot using an Arduino Mega 2560 R3 through an Android app to cheer up or relax children at a hospital
5522	Thermodynamics of the Stirling Cycle: Testing the Effects of the Relative Temperature Difference on Stirling Engine Output
6009	An app to assimilate information during a presentation without note taking
6012	Robots in the Classroom: The Effect of Social Robots on Student Memorization and Participation
6014	The physics of the space elevator construction.
6020	Printlet (combination between a printer and a tablet)
6025	Program your Diet
6028	An analysis of particle-driven physics simulations when compared with entity-driven simulations
6029	Creating An Algorithm Based Off of The Quantum Turing Machine To Predict The Efficiency of Quantum Computational Operating Methods Using Benchmarked Simulated Environments
6033	Harvesting Energy Through Key-Strikes Absorbed by Piezoelectric Sensors
6034	The Synchronous Rotation of the Eris/Dysnomia Binary System
6044	Creation of a Predictive Model of Climate Change Impact Through Ensembling of a Variety of Artificial Neural Netowrks
6047	The Effect of Different Checkerboard Sizes on Steady State Visually Evoked Potentials
6053	The Derivation of Habitable Zones around Binary Star Systems: Is Planetary Stability Possible?
6057	The Fire-fighting robot based on artificial intelligence
6070	InMoov: An Independent Study in Mechanical and Electrical Engineering and Computer Science
6071	Designing a Braille E-Book For the Visually Impaired and Blind People
6073	Chef NAO: The Humanoid Cooking Robot
6076	Novel Approches of Making Human to Robot Interaction Possible for the Handicapped.
6082	Creating a Semantic Search Engine with Voice Integration
6089	Cybersecurity Using Distributed Cryptography and Biometrics
6091	Smoking Gun in the Milky Way Galaxy: Open Clusters and Dwarf Galaxies
6104	Investigating the Benefits of Receiving Information Through Video
6509	Echocardiogram-Based Wireless Left Ventricular Assist Device (LVAD) with Mobile Application Monitoring and Control
6510	3D Animation and Ebola

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Earth Science

Project Number	Title
1019	Pill Bugs On Mars?
2517	Aquaponics: The impact of combining agriculture and aquaculture techniques on plant germination and growth.
2531	Water Types and Plant Growth
3023	Ocean Acidification and Its Varying Effects Regarding Predatory Response of Coralline Algae
3501	The Turbidity of Water Affects the Health of Aquatic Ecosystems
3518	Using Fall Foliage as an Alternative for Paper Production to Reduce Deforestation
3519	The Effect of Reduced pH on Submerged Aquatic Vegetation
4001	The Hard Truth About Water Hardness: Which body of water is the healthiest (in Water Hardness)?
5005	Parachutes: Does Size Matter?
5016	The Effect of Water Depth and Beach Surface on the Onshore Height of a Tsunami
5022	Cu at the Bottom
5063	How Accurate can your Local Weather Applications Be?
5503	Evaporation Rate Of An Ice Cube In Liquids With Varying Densities
5505	Does temperature matter?
5530	What's Shaking? - A Study of Soil Liquefaction
5539	Weather Conditions And Its Effect On Football Pressure.
5550	Evaporation Situation Part II: A Study of the Evaporation Rate of Water
5553	Effect of different soil types on Hyacinth plants.
6001	Drone-based, Tropospheric Gas Collection for use in Air Quality Monitoring
6007	The effect of snow and ice thickness on the winter respiration Carbon Dioxide output
6019	Maximizing the Efficiency of Passive Solar Energy
6034	The Synchronous Rotation of the Eris/Dysnomia Binary System
6035	The European Centre for Medium Range Forecasts verses the Global Forecasting System
6061	The Effect of Sunspot Number on Radio Propagation
6078	Exoplanet Discovery: The Transit Method
6085	Creation of a Fresnel Lens Array for use in Water Purification
6096	The Rate of Meteors
6097	Biodegradable Plastics using a variety of fruits and vegetables
6099	Algae Balls
6103	Hardening of electronics and satellite communication systems from sunspots and coronal mass ejections
6505	Determining the Effects of Different Products on Desalination
6514	The Existence of a Volcanic Season

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Energy & Transportation

Project Number	Title
1009	Bridge Strength
1025	Survive with Salt Water
2512	A Battery That Makes Cents
3020	Effective Optimization of Biogas Production through Alpha-Amylase Utilization
3088	Unprecedented Glycerol-Free Biodiesel Production using Enzyme Catalysis
3118	Development of Non-toxic Photostabilized Phycoerythrin for Application in Dye Sensitized Solar Cells
3515	Manure to Methane
4011	Fore!
4014	Hydroelectric Energy
4015	Ramps, Textures, and Cars, Oh My!
4024	A New Type of Energy in Cars
4027	Shape Affects Speed
4029	Incorporating the Flutter Effect in Flags to Produce Energy
4030	To Melt or Not To Melt: Using Natural Materials As Insulators
4034	The Designing and Testing of a Self-Constructed Aircraft
5006	A Test of Batteries
5013	Build a raft powered by surface tension
5018	Heat Output
5026	The Power of Wind
5031	Design and Build a working Hovercraft
5032	Maximizing the Energy Output of a Wind Turbine
5035	Keepin' Warm
5041	Free Energy
5045	Can Biomass be used as a Renewable Energy Source
5052	Does the Number of Fins on a Rocket Effect How Long It Stays in the Air?
5056	Electromagnetic Energy and Innovative Applications
5058	The Voltage Changes from Different Wavelength Radiations on a Solar Panel
5504	Green Energy Ferris Wheel
5506	Effect of Blade Angle and Wind Angle on Rotation Speed of a Home-Built Wind Turbine
5510	Hovercraft
5513	HOW TO INSULATE YOUR HOUSE AND REDUCE YOUR FUEL BILLS
5514	Substitution of Metals in a Salt-Water Engine to Increase Energy-Efficiency
5517	Burning Biofuels: An Alternate Form of Energy
5522	Thermodynamics of the Stirling Cycle: Testing the Effects of the Relative Temperature Difference on Stirling Engine Output
5524	Are soccer balls affected by air pressure?
5528	Efficiency of Piezoelectric Materials for Electric Production
5531	Gauss Launcher Efficiency
5535	Thermoelectricity Phenomenon
5539	Weather Conditions And Its Effect On Football Pressure.
5545	Using Induced Wind Force to Increase the Efficiency of an Electric Vehicle Battery
5550	Evaporation Situation Part II: A Study of the Evaporation Rate of Water
5551	UV-C Lighting As A Supplemental Method Of Preservation In Refrigerators To Reduce Energy Consumption
5555	Powerful Propellers

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Energy & Transportation

Project Number	Title
5560	Energy Scavenging--Proving the Seebeck Effect with a Homemade Thermoelectric Generator: A Source of Free, Sustainable, Low-Voltage Power
5561	Fireplaces - To Heat Or Not To Heat, That Is The Question!
5562	Shrouded Wind Turbine and the Venturi Effect
5569	Spandex: Speedy or Spendy?
6005	An Optically Self-Healing Metallo-Supramolecular Polymer Encapsulated UV-NIR Organic Solar Cell for Transparent Energy-Harvesting and Electronic Skin Applications
6006	Low Temperature Thermal Cracking of High-Density Polyethylene via Zeolite and Pillared Clay Catalyts
6016	More Holes More Goals
6018	A Novel Approach to Increase the Power Efficiency of a Wind Turbine with a Shroud and Diffuser Design
6019	Maximizing the Efficiency of Passive Solar Energy
6024	The effects of highly reflective material to be use for housing and their ability to mitigate global climate change.
6026	Investigation of a Bacteriorhodopsin-Pt/TiO ₂ Hybrid System for Enhanced Nanophotocatalytic Production of Hydrogen
6027	Financially Superior Energy Source for Subterranean Inhabitants
6031	Biodiesel: The Fuel of the Future
6033	Harvesting Energy Through Key-Strikes Absorbed by Piezoelectric Sensors
6036	Using Peltier and Thermoelectric Principles for Humanitarian Applications
6041	Using a Hydraulic System and a Heat-Induced Magnetic Adhesive to Create a Manipulatable Array that Increases the Efficiency of Piezoelectric Generators
6042	Biomimicry of Whale Fins
6050	Using wastewater to reclaim energy
6051	Revolutionizing A 16th Century Product For The Modern World: A Thermoelectric Chair That Creates Energy From The Human Touch
6052	Enhanced Organic Solar Cells Using 3m Micro Prismatic Technology
6056	A Field Study Analysis of Carbon Fiber Electrode Weaves and Conductors in the Design of Sedimentary Microbial Fuel Cells
6058	Move Over Opec/Oil from Biomass
6060	Hydrogen Fuel Cells: How Electrode Material Affects Them
6066	Biochar Electrodes Incorporated with Cuprous Oxide Substrates to Optimize Solar Cells' Efficiency
6068	Evaluation of Several Resonant Power Electronic Converters in Capacitively Coupled Wireless Energy Transmitters
6069	A prototype system for moving cars around around a track using electromagnetics
6072	Omni-Directional Maglev Cableless Elevator
6075	Energy Transfer Using Laser Power Beaming
6080	A Water-Resistant, Piezoelectric Precipitation Generator; A comparative analysis of mobile v. stationary systems
6081	Reverse Osmosis Water Desalination Via the Harnessing of Perpetual Wave Energy
6083	Engineering of ZnO Tapered Pillar Nanostructures as Antireflection Coatings on Silicon Solar Cells
6088	Impact of the manipulation of the viscosity of ethanol on the particulate matter output and the efficiency of combustion.
6093	How does the weight of a wind turbine's blade affect energy production?
6094	The refinement and production of bio-diesel derived from laboratory grown nannochloropsis algae
6095	Novel Creation of a versatile, low-cost water purification system via a graphene oxide-TiO ₂ composite membrane with incorporated electrified nanostructures
6101	Low Grade Waste Heat Recovery and Carbon Sequestration using an Innovative Reverse Electrodialysis (RED) and Pressure Retarded Osmosis (PRO) System
6503	Designing a High Efficiency and Low Cost Wind Turbines bu Utilizing Organic Solar Panels made from Rosa Canina
6504	An investigation on the effects of radiation emitted from the three most popular mobile phone operating systems.
6507	Environmentally Friendly and Low Cost Usage of Naturally Extracted Dyes from Organic Materials to Produce Renewable Energy at Efficient Rates

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Engineering: Electrical & Mechanical

Project Number	Title
2512	A Battery That Makes Cents
2516	Effects of different levels of electromagnetic fields on a variety of grasses and their nutrient content
3060	Biochemical Changes in Corneal Collagen Cross-linking: Nondestructive Analysis by Raman Spectroscopy
3098	A Self-Sustaining Electrical Shoe Insert for Treatment of Diabetic Neuropathy
3099	3D Printer for Creating Cement Domestic Utilities for Developing Countries
4003	Analysis of Safer Electroplating Metals and Electrolyte solutions with their Environmental Impact
4013	Power Brace: A leg brace designed to help the victims of Duchenne Muscular Dystrophy and other diseases walk and stand in every day life
4014	Hydroelectric Energy
4022	A science fair project on how a trebuchets arm length affects the projectile distance.
4023	Wind Power: How the Shape of the Blade Affects the amount of Power Produced.
4024	A New Type of Energy in Cars
4025	Installing a Wind-gust Turbine to generate energy to power highway lighting or to see the Power Grids.
4029	Incorporating the Flutter Effect in Flags to Produce Energy
4033	BabyBot: Creating a Robot to Soothe a Crying Infant
4034	The Designing and Testing of a Self-Constructed Aircraft
5002	How much air is needed to allow a weighted structure to rise?
5003	Do Wheels Increase Distance On a Trebuchet?
5006	A Test of Batteries
5007	Changing the Water Content in Soil to Generate Electricity in form of an Earth Battery
5008	Crossing the Gap... But With What?
5009	The Impact of Turbine Blades on Power Output
5012	Die sensitized solar cell
5018	Heat Output
5022	Cu at the Bottom
5023	Which Variables Affect The Flight Of A Rocket?
5026	The Power of Wind
5029	Sound Barriers: How does the type of material affect the amount of sound that carries through a surface?
5030	Opening a Garage Door with Raspberry Pi
5031	Design and Build a working Hovercraft
5032	Maximizing the Energy Output of a Wind Turbine
5033	Changing the pH of Soil to Generate Electricity in the Form of a Microbial Fuel Cell
5041	Free Energy
5042	Drone for Science
5043	A Matter of Facts: Designing a Math App to Help Kids Learn Their Math Facts
5046	The Effect of Different Temperatures on the Strength of a Magnet
5051	Which Bridge Design Is Best?
5052	Does the Number of Fins on a Rocket Effect How Long It Stays in the Air?
5054	Development of a technique to detect explosive residue for use in avoiding terrorism threats.
5055	How Do Environmental Conditions Affect the Performance of Duct Tape?
5056	Electromagnetic Energy and Innovative Applications
5058	The Voltage Changes from Different Wavelength Radiations on a Solar Panel
5504	Green Energy Ferris Wheel
5506	Effect of Blade Angle and Wind Angle on Rotation Speed of a Home-Built Wind Turbine

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Engineering: Electrical & Mechanical

Project Number	Title
5508	The effects of cloud coverage on the out put of solar panels
5509	The Effect of Using Foam to Create a More Sophisticated Highway Barrier on Lessening the Spike of G-forces During an Impact
5512	Design, build and program a robot using an Arduino Mega 2560 R3 through an Android app to cheer up or relax children at a hospital
5513	HOW TO INSULATE YOUR HOUSE AND REDUCE YOUR FUEL BILLS
5516	Home-Made Particle Accelerator
5518	Strength Of An Electromagnet
5519	Instrument Science: Bell Flares
5522	Thermodynamics of the Stirling Cycle: Testing the Effects of the Relative Temperature Difference on Stirling Engine Output
5523	Power Wind
5525	Solid Ground?
5528	Efficiency of Piezoelectric Materials for Electric Production
5535	Thermoelectricity Phenomenon
5543	The Performance of Greener Alternatives vs. Standard Hydraulics Fluid
5545	Using Induced Wind Force to Increase the Efficiency of an Electric Vehicle Battery
5549	The Effect of Catapult Arm Length on the Distance the Projectile Travels
5555	Powerful Propellers
5560	Energy Scavenging--Proving the Seebeck Effect with a Homemade Thermoelectric Generator: A Source of Free, Sustainable, Low-Voltage Power
5563	Conduction Junction
5565	The Universal Soccer Shoe
5569	Spandex: Speedy or Spendy?
6003	Boiling Water with Nano Particles.
6004	The Effects of Thickness of Steel, Ball Bearing Size, and Drop Height of Ball Bearing During Dent Resistance Testing on Galvanized Steel versus Aluminum-Alloy.
6018	A Novel Approach to Increase the Power Efficiency of a Wind Turbine with a Shroud and Diffuser Design
6020	Printlet (combination between a printer and a tablet)
6021	Measuring the Feasibility of an In-Home In Situ Carbonation Device Utilizing Calcium Rich Basalt
6023	A Comparative Analysis of Rotating Solar Cubes vs. Horizontal Solar Arrays
6027	Financially Superior Energy Source for Subterranean Inhabitants
6030	Electrically Independent, Low Cost, Self-Filling Water Bottle for use in Water Locked Regions
6033	Harvesting Energy Through Key-Strikes Absorbed by Piezoelectric Sensors
6036	Using Peltier and Thermoelectric Principles for Humanitarian Applications
6038	Uses and Application of thermocouple in space exploration
6039	Optimization of Reflectivity of GaN for Solar Applications
6041	Using a Hydraulic System and a Heat-Induced Magnetic Adhesive to Create a Manipulatable Array that Increases the Efficiency of Piezoelectric Generators
6042	Biomimicry of Whale Fins
6043	Physical and Cost Optimization of a Human Powered Axial Flux Generator for use in Electrically Isolated Environments.
6045	Graphene Solar Cell
6047	The Effect of Different Checkerboard Sizes on Steady State Visually Evoked Potentials
6050	Using wastewater to reclaim energy
6051	Revolutionizing A 16th Century Product For The Modern World: A Thermoelectric Chair That Creates Energy From The Human Touch
6057	The Fire-fighting robot based on artificial intelligence

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Engineering: Electrical & Mechanical

Project Number	Title
6058	Move Over Opec/Oil from Biomass
6060	Hydrogen Fuel Cells: How Electrode Material Affects Them
6062	Ferromagnetism: Using ferromagnetic fluid to control prosthetics
6064	Power generation via downdraft of humidified dry air
6065	Low-Cost Solid-State Cosmic Ray Obserbatory
6066	Biochar Electrodes Incorporated with Cuprous Oxide Substrates to Optimize Solar Cells' Efficiency
6067	Efficient Soundproofing: Design of a System using Multiple Technologies
6068	Evaluation of Several Resonant Power Electronic Converters in Capacitively Coupled Wireless Energy Transmitters
6069	A prototype system for moving cars around around a track using electromagnetics
6070	InMoov: An Independent Study in Mechanical and Electrical Engineering and Computer Science
6071	Designing a Braille E-Book For the Visually Impaired and Blind People
6072	Omni-Directional Maglev Cableless Elevator
6073	Chef NAO: The Humanoid Cooking Robot
6074	Converting Ambient Water Vapor to Potable Drinking Water Inspired by the Shorebird beak
6075	Energy Transfer Using Laser Power Beaming
6076	Novel Approches of Making Human to Robot Interaction Possible for the Handicapped.
6079	The Application of Sub-undulatory Locomotion Principles Utilized by Sub-carangiform Swimmers to Increase Submersible Efficiency
6080	A Water-Resistant, Piezoelectric Precipitation Generator; A comparative analysis of mobile v. stationary systems
6081	Reverse Osmosis Water Desalination Via the Harnessing of Perpetual Wave Energy
6087	Application of Manganese-Based Ionic Liquid for Optimized Performance of Non-aqueous / Aqueous Redox Flow Batteries
6090	The effect of application of a solenoid on the magnetic properties of gadolinium at varying temperatures and current levels.
6092	Developing a tool to repeatably extract cartilage samples: An application of 3-D printing
6093	How does the weight of a wind turbine's blade affect energy production?
6100	Exploring the Optical Audio Link
6101	Low Grade Waste Heat Recovery and Carbon Sequestration using an Innovative Reverse Electrodialysis (RED) and Pressure Retarded Osmosis (PRO) System
6103	Hardening of electronics and satellite communication systems from sunspots and coronal mass ejections
6503	Designing a High Efficiency and Low Cost Wind Turbines bu Utilizing Organic Solar Panels made from Rosa Canina
6504	An investigation on the effects of radiation emitted from the three most popular mobile phone operating systems.
6507	Environmentally Friendly and Low Cost Usage of Naturally Extracted Dyes from Organic Materials to Produce Renewable Energy at Efficient Rates
6509	Echocardiogram-Based Wireless Left Ventricular Assist Device (LVAD) with Mobile Application Monitoring and Control
6511	A Feasibility Study of Portable, Ground-Based Ice-Penetrating Radar to Resolve Cartography Deficiencies.
6515	Exploring the Effects of Ammonia on the Electrical Resistivity of Graphene

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Engineering: Materials & Bioengineering

Project Number	Title
1009	Bridge Strength
1025	Survive with Salt Water
2010	"Pore" My Way to Cleaner Water: The use of flocculants and porous ceramic pots for purifying drinking water in developing countries
2018	Curious Cuttings
2022	Which insulated bag lasts the longest?
2031	Hypoxia in Long Island Sound
2039	Novel Bioluminescent Display using <i>Aliivibrio fischeri</i> for efficiency and low cost
2519	Who's Got The Biggest Bubbles?
3009	Novel Ultrasonic-Induced Antibiotic Deterioration of <i>Borrelia</i> Biofilms for the Treatment of Chronic Lyme Disease
3017	Clinical application of 3D printing technology in cancer radiation therapy: A novel method to improve dose conformity with patient specific treatment aid device
3020	Effective Optimization of Biogas Production through Alpha-Amylase Utilization
3028	acid rain prevention
3049	Targeted Release of <i>Moringa oleifera</i> Cationic Proteins from Starch-g-poly (sodium acrylate-co-HEMA) Hydrogels for the Remediation of Aqueous Polychlorinated Biphenyls
3054	Preparation and Comparison of EGCG-Loaded PLGA and Cellulose Acetate Microparticles for Osteoarthritis Treatment
3056	Analysis of Transport of Nitrogen Species through Right-of-way-Bioswales
3075	Elevated Levels Of Interleukin-8 in Non-Small Cell Lung Cancers induce Cell Survival During Chemotherapy
3090	Analyzing Cathode Placement in a Simple Single Vessel Microbial Fuel Cell: Potential Implications for Efficiency and Practical Applications
3096	Temperature-Independent, Portable, and Rapid Field Detection of Ebola via a Silk-Derived Lateral-Flow System
3098	A Self-Sustaining Electrical Shoe Insert for Treatment of Diabetic Neuropathy
3099	3D Printer for Creating Cement Domestic Utilities for Developing Countries
3110	Hybridized Manganese Dioxide & Gold-Iron Oxide Nanoparticle Inhibition of Tumor Growth via Radiosensitization and Tumor Microenvironment Control
3114	A Novel Antibody-Functionalized Graphene Transistor Lab-On-A-Chip for Selective Detection of Malaria Pathogens
3116	An Investigation of Superparamagnetic Iron Nanoparticle Hyperthermia to Inhibit Growth of <i>Agrobacterium tumefaciens</i>
3118	Development of Non-toxic Photostabilized Phycoerythrin for Application in Dye Sensitized Solar Cells
3124	The Optimization of Conditions for an Enzymatic Bio-Battery
3127	Making a Portable, Low Cost Hydroponics System
3135	Impact of Geometrical Structure on the Durability of Stereolithographic Sea Turtle Shell Prototypes
3510	The Designing and Application of the Single-Cell Immunoplex Device
4008	Investigating Novel Methods to Harvest Solar Energy for Generation of Solar Steam from Salt Water and Snow Using Graphene and Carbon Foam
4011	Fore!
4013	Power Brace: A leg brace designed to help the victims of Duchenne Muscular Dystrophy and other diseases walk and stand in every day life
4017	The Sensing Cane
4021	Keep Out! : An Animal Proof Garden Enclosure.
4025	Installing a Wind-gust Turbine to generate energy to power highway lighting or to see the Power Grids.
4026	Structure Vs Nature: The Effect of Landslide Duration on Different House Structures
4027	Shape Affects Speed
4028	Does your shirt have your back: A study of clothing features that protect against UV light
4030	To Melt or Not To Melt: Using Natural Materials As Insulators
5001	BOBS (Baby on Board) System
5008	Crossing the Gap... But With What?

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Engineering: Materials & Bioengineering

Project Number	Title
5009	The Impact of Turbine Blades on Power Output
5013	Build a raft powered by surface tension
5014	Can The Weight of a Car be Accurately Weighed by Using an Air Pressure Gauge and a Ruler?
5015	Salt Water Floating Food Production using low cost desalination techniques.
5034	Wood Toughness
5035	Keepin' Warm
5038	Frozen
5055	How Do Environmental Conditions Affect the Performance of Duct Tape?
5501	Fired UP!!!
5515	Measurement of Tensile Strength of Various Wet & Dry Woods
5525	Solid Ground?
5526	Do expensive basketball sneakers outperform inexpensive basketball sneakers?
5530	What's Shaking? - A Study of Soil Liquefaction
5548	Making Music Louder Without Electricity
5552	How can I make my own rubber pointe shoes?
5557	Injury Reducing Characteristics of Running Shoes Using Innovation and Design
5565	The Universal Soccer Shoe
6002	Developing an Alternative Technique of Mechanically Exfoliating Topological Insulator Bismuth Telluride
6004	The Effects of Thickness of Steel, Ball Bearing Size, and Drop Height of Ball Bearing During Dent Resistance Testing on Galvanized Steel versus Aluminum-Alloy.
6005	An Optically Self-Healing Metallo-Supramolecular Polymer Encapsulated UV-NIR Organic Solar Cell for Transparent Energy-Harvesting and Electronic Skin Applications
6008	Study to Improve the Constraint of Ultra-High Performance Concrete Double-T Bridge Girders by Adjusting the Architecture of Steel Fibers in the Web
6011	Application of the near-IR Luminescence Property of Egyptian Blue and related Alkaline Earth Metal Copper Silicate (MCuSi ₄ O ₁₀ -BaCuSi ₂ O ₆) in Infrared Technology (IR)
6013	Chemical Looping Combustion: A Zero CO ₂ Footprint Energy Conversion Process
6015	Synthesis of an Electromagnetically-Controlled Corn-Starch/PVA Biopolymer Microstructure for Extended and Targeted Drug Delivery
6026	Investigation of a Bacteriorhodopsin-Pt/TiO ₂ Hybrid System for Enhanced Nanophotocatalytic Production of Hydrogen
6031	Biodiesel: The Fuel of the Future
6037	The Effect of 2-dimyristoyl-sn-glycero-3-phosphocholine (DMPC) Dilutions on Nanoparticle Radius Using Small Angle Neutron Scattering (SANS)
6039	Optimization of Reflectivity of GaN for Solar Applications
6046	Sequestration of Carbon Dioxide by Lithium Orthosilicate in a Clay Body in Ambient Air
6048	Is The Money Worth It?
6052	Enhanced Organic Solar Cells Using 3m Micro Prismatic Technology
6055	A Novel Method of Controlling Size of Carbon Nanotubes
6056	A Field Study Analysis of Carbon Fiber Electrode Weaves and Conductors in the Design of Sedimentary Microbial Fuel Cells
6059	A Statistical Analysis on the Effects of Volcanic Sulfate Emissions on Precipitation Patterns as Analogue for Geoengineering
6062	Ferromagnetism: Using ferromagnetic fluid to control prosthetics
6063	Testing the Effectiveness of an improved French Trench.
6074	Converting Ambient Water Vapor to Potable Drinking Water Inspired by the Shorebird beak
6079	The Application of Sub-undulatory Locomotion Principles Utilized by Sub-carangiform Swimmers to Increase Submersible Efficiency
6083	Engineering of ZnO Tapered Pillar Nanostructures as Antireflection Coatings on Silicon Solar Cells

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Engineering: Materials & Bioengineering

Project Number	Title
6094	The refinement and production of bio-diesel derived from laboratory grown nanochloropsis algae
6098	The Development of an Immunosorbant Assay (ELISA) for detection of IgG and IgA antibodies against Tissue Transglutaminase for the diagnosis of Celiac disease.
6502	Heat Retention
6506	Validating the Effectiveness of Biosensor Imaging of Redundant Deviation in Shifts
6513	Designing an Efficient Method of Collecting and Recycling Ocean Debris through the Use of Uniquely Shaped Containment Booms.
6515	Exploring the Effects of Ammonia on the Electrical Resistivity of Graphene

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Environmental Management

Project Number	Title
1001	The Effect of Different Liquids on Plant Growth
1019	Pill Bugs On Mars?
1024	The Effect of Different Heating Sources on How Fast Water Can Reach Boiling Point
2007	Do different sources of light affect the rate a plant transpires?
2011	The Effect of Acid Rain on the Growth of Tennessee Green Pod Bean Plants
2021	Nothing but algae and duckweed
2026	Killing Blackspot: An Organic Struggle
2031	Hypoxia in Long Island Sound
2034	All About That Bait
2507	Aqua-Life
2511	Analysis of Increased CO ₂ levels in Ocean water and Effect on Crustaceans' and Bivalves' Growth
2514	Contemporary Bioremediation
2521	Electric Energy Production In A Bio-fuel Cell For Varying Electrogenic Bacterial Samples
3002	The Effects of Atypical PH on Bay Scallops (<i>Argopecten irradians</i>)
3013	The Effects of Organic and Chemical Fertilizers on Snails of the Long Island Sound
3015	The Effects of Sulfur Dioxide on <i>Solanum lycopersicum</i> subsp. Tiny Tim and Soil pH in Varying Temperatures
3016	The Carbon Dioxide Sequestration of Lawn Plants
3040	Utilizing Piscivorous Birds as Low-Impact Primary Biological Indicators
3043	The Effect of the Invasiveness of the Zebra Mussels in Lake Lillinonah
3049	Targeted Release of <i>Moringa oleifera</i> Cationic Proteins from Starch-g-poly (sodium acrylate-co-HEMA) Hydrogels for the Remediation of Aqueous Polychlorinated Biphenyls
3052	The Analysis of Clay Flocculation's Effect on the Benthic Zone Used as a Mitigation Technique for Harmful Algal Blooms (HABs)
3053	The Efficiency of Bivalve Mollusk Filter Feeding in the Long Island Sound
3055	The Effects of Grey Water on the Germination Rate and Growth of a Variety of Grass Species.
3056	Analysis of Transport of Nitrogen Species through Right-of-way-Bioswales
3068	A Study of the Removal of Pollutants by Rain Gardens, a Type of Low-Impact Development Drainage System
3073	Determining the Effect of Biofouling on a Restocking System for <i>Homarus americanus</i>
3081	The Effect of Gut Denitrification of <i>Dressina polymorpha</i> on the Nitrate and Nitrite Availability in the Freshwater System of Eichler's Cove, Newtown
3090	Analyzing Cathode Placement in a Simple Single Vessel Microbial Fuel Cell: Potential Implications for Efficiency and Practical Applications
3093	The Affect of Ocean Acidification on <i>Nannochloropsis</i> sp.
3105	The effect of nitrate uptake in aquatic plants with varying nitrate exposure.
3119	Investigating the Growth Rate of <i>Procambarus clarkii</i> under different Environmental Stressors
3122	Disinfection By-Products in Water
3127	Making a Portable, Low Cost Hydroponics System
3504	Maintaining a Better Society by Decreasing CO ₂ Levels Through the Growth of Large Trees and Plants
3507	Use of <i>Saccharomyces Cerevisiae</i> and Biosorption in the Purification of Industrially Polluted Waters
3513	The Effect of Prescribed Burns on Soil Nutrients
3516	The Effect of Soil Alkalinity on the <i>Lycopersicon Esculenta</i> (plum tomato)
3520	A Natural Way to Keep Insects Away by Using Various Essential Plant Oils as an Organic Insect Repellent
3522	Desalination by <i>Portulaca oleracea</i> : Maintaining and stabilizing overall growth and production of Omega-3 Fatty Acids
4003	Analysis of Safer Electroplating Metals and Electrolyte solutions with their Environmental Impact
4006	Meltdown

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Environmental Management

Project Number	Title
4008	Investigating Novel Methods to Harvest Solar Energy for Generation of Solar Steam from Salt Water and Snow Using Graphene and Carbon Foam
4016	What is the Best Ice Insulator?
4021	Keep Out! : An Animal Proof Garden Enclosure.
4025	Installing a Wind-gust Turbine to generate energy to power highway lighting or to see the Power Grids.
4026	Structure Vs Nature: The Effect of Landslide Duration on Different House Structures
5007	Changing the Water Content in Soil to Generate Electricity in form of an Earth Battery
5015	Salt Water Floating Food Production using low cost desalination techniques.
5033	Changing the pH of Soil to Generate Electricity in the Form of a Microbial Fuel Cell
5040	Effectiveness of Fertilizer Application Techniques in Reducing Fertilizer Runoff and Pollution
5502	Water Filtration and Flocculation Methods
5517	Burning Biofuels: An Alternate Form of Energy
5536	Tap Water vs Bottled Water- Is There a Difference?
5559	Soaking it Up?
6004	The Effects of Thickness of Steel, Ball Bearing Size, and Drop Height of Ball Bearing During Dent Resistance Testing on Galvanized Steel versus Aluminum-Alloy.
6006	Low Temperature Thermal Cracking of High-Density Polyethylene via Zeolite and Pillared Clay Catalyts
6021	Measuring the Feasibility of an In-Home In Situ Carbonation Device Utilizing Calcium Rich Basalt
6024	The effects of highly reflective material to be use for housing and their ability to mitigate global climate change.
6059	A Statistical Analysis on the Effects of Volcanic Sulfate Emissions on Precipitation Patterns as Analogue for Geoengineering
6095	Novel Creation of a versatile, low-cost water purification system via a graphene oxide-TiO ₂ composite membrane with incorporated electrified nanostructures
6514	The Existence of a Volcanic Season

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Environmental Sciences

Project Number	Title
1001	The Effect of Different Liquids on Plant Growth
1005	The effect of organic and non-organic compost produced by vermicomposting with eisenia foetida on the growth of lycopersicon lycopersicum.
1007	Do different water types affect plant growth?
1014	To Hatch or Not to Hatch: Brine Shrimp & Pollution
1017	The Impact of Acidic Water on Germinating Mung Beans.
1022	Acid Rain in Wilton, CT
1023	The Trilogy of Light: Fluorescent, LED, Incandescent
1024	The Effect of Different Heating Sources on How Fast Water Can Reach Boiling Point
2001	The Effects of Wi-fi on Plant Growth
2003	The Effect of pH Level on the Growth of Algae
2005	Endomycorrhizal and Ectomycorrhizal Fungi and the Effect on Plant Communication Through the Common Mycelial Network
2007	Do different sources of light affect the rate a plant transpires?
2009	What liquid germinates seeds the fastest?
2010	"Pore" My Way to Cleaner Water: The use of flocculants and porous ceramic pots for purifying drinking water in developing countries
2011	The Effect of Acid Rain on the Growth of Tennessee Green Pod Bean Plants
2013	What is TDS? Are you drinking it?!
2014	Operation Jason
2018	Curious Cuttings
2021	Nothing but algae and duckweed
2024	The Effects of Cell Phones on Narcissus Papyraceus Growth and Color
2027	How Does Water Impact Plant Growth?
2028	Lets help plants grow!!!
2031	Hypoxia in Long Island Sound
2032	Weed Control: Walnuts to the Rescue!
2034	All About That Bait
2502	Toxic Chemicals Found In Detergents
2505	Brine Shrimp Hatching
2507	Aqua-Life
2511	Analysis of Increased CO2 levels in Ocean water and Effect on Crustaceans' and Bivalves' Growth
2514	Contemporary Bioremediation
2515	The Impact of Acid Rain on the Flora of the Environment
2516	Effects of different levels of electromagnetic fields on a variety of grasses and their nutrient content
2517	Aquaponics: The impact of combining agriculture and aquaculture techniques on plant germination and growth.
2519	Who's Got The Biggest Bubbles?
2522	Microwave Radiation
2523	Not Organic? Don't Panic!
2524	An Investigation of the Ingestion of Microscopic Plastic Particles by the Blue Mussel, Mytilus edulis
2531	Water Types and Plant Growth
2532	How Much Organic Material Can Earthworms Decompose?
2535	Optimizing Methane Oxidation by Methanotrophs Through the Engineering Application of Different Environments
2538	The Effect of Household Acids and Bases on the pH of dirt.
2539	The Impact of Different Water Pollutants on Biological Health Indices

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Environmental Sciences

Project Number	Title
2541	Inexpensive Treatments for Plants Affected from Contaminated Soil by Oil Spills
2544	Fruit Fly Fatality
3002	The Effects of Atypical PH on Bay Scallops (<i>Argopecten irradians</i>)
3003	Antimicrobial Activity of Lichen Extracts
3008	Accuracy of DNA Barcoding in the Plant Kingdom
3011	Bioremediation of Low Density Polyethylene with <i>S. griseus</i> Bacteria and <i>A. niger</i> Fungi in Sterilized Soil
3013	The Effects of Organic and Chemical Fertilizers on Snails of the Long Island Sound
3015	The Effects of Sulfur Dioxide on <i>Solanum lycopersicum</i> subsp. Tiny Tim and Soil pH in Varying Temperatures
3016	The Carbon Dioxide Sequestration of Lawn Plants
3019	Pollutants and there Detrimental Effects on Shrimp
3023	Ocean Acidification and Its Varying Effects Regarding Predatory Response of Coraline Algae
3024	Effect of Brin Concentration on Gettability in Atomisticly Smooth Surfaces
3026	Does seed spacing affect plant height?
3028	acid rain prevention
3032	Enhancing the Collagen Yield from <i>Aurelia aurita</i> through Bio Encapsulated Highly Saturated Fatty Acid Feed
3033	Is it possible to graft the scion of Non-Leguminous Plant (tomato) to the root stock of a Leguminous Plants (soybeans)?
3035	Global Climate Change Affects the Ecosystem by Elevating Carbon and Nitrogen Emissions which Increases Allergies
3037	The Effect of Iron Levels on Marine Algal Growth
3041	Remediating Rivalry?
3053	The Efficiency of Bivalve Mollusk Filter Feeding in the Long Island Sound
3055	The Effects of Grey Water on the Germination Rate and Growth of a Variety of Grass Species.
3056	Analysis of Transport of Nitrogen Species through Right-of-way-Bioswales
3065	The Effectiveness of Plant Material as Metal Chelators
3068	A Study of the Removal of Pollutants by Rain Gardens, a Type of Low-Impact Development Drainage System
3070	The Effects of TBBPA and HBCD Brominated Flame Retardants on Zebrafish Embryonic Development
3072	Identification of Risk Factors for Incidences of Infectious Diseases in Refugee Populations
3079	Accumulation and Biomagnification of Microplastics in Marine Bivalves and Gastropods
3081	The Effect of Gut Denitrification of <i>Dressina polymorpha</i> on the Nitrate and Nitrite Availability in the Freshwater System of Eichler's Cove, Newtown
3083	Magic Magnets
3087	Natural Dye Treatments of <i>Gossypium hirsutum</i> using several Naturopathic sources in combination with the mordant of Aluminum Potassium Sulfate
3089	Inverstigation of Bioremediation and Alkane-degrading Qualities of <i>Alcanivorax Borkumensis</i>
3093	The Affect of Ocean Acidification on <i>Nannochloropsis</i> sp.
3095	How Grey Oyster Mushrooms Can Be Used To Break Down Oil And Reduce Waste In The Environment.
3103	Natural vs. Chemical Cleaners
3105	The effect of nitrate uptake in aquatic plants with varying nitrate exposure.
3108	The Effects of Different Environments on the Germination of Radish Seeds
3119	Investigating the Growth Rate of <i>Procambarus clarkii</i> under different Environmental Stressors
3122	Disinfection By-Products in Water
3126	Phytoplankton's Effect on Ocean Acidification
3133	<i>Zostera marina</i> 's Effect on Carbon Dioxide Levels in Long Island Sound and Predicted Effects
3501	The Turbidity of Water Affects the Health of Aquatic Ecosystems
3502	Temperature Rising: Exhausted Efforts
3503	The Effect of the Angle of Solar Radiation on Plant Growth

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Environmental Sciences

Project Number	Title
3504	Maintaining a Better Society by Decreasing CO2 Levels Through the Growth of Large Trees and Plants
3505	DNA Barcoding to Detect Mislabeling and Endangered Species in Turtle Meat
3506	Plant Growth Research
3507	Use of Saccharomyces Cerevisiae and Biosorption in the Purification of Industrially Polluted Waters
3509	The Effects of Seed Priming
3513	The Effect of Prescribed Burns on Soil Nutrients
3516	The Effect of Soil Alkalinity on the Lycopersicon Esculentum (plum tomato)
3517	DNA Barcoding of Invasive Species on a Suburban Campus
3518	Using Fall Foliage as an Alternative for Paper Production to Reduce Deforestation
3519	The Effect of Reduced pH on Submerged Aquatic Vegetation
3521	The Effect of pH Levels in Presoaking Liquids on Fruit Dehydration Duration
3522	Desalination by Portulaca oleracea: Maintaining and stabilizing overall growth and production of Omega-3 Fatty Acids
3523	The Thermal Stress Of A Coenbita Clypeatus(Land Hermit Crab)
4001	The Hard Truth About Water Hardness: Which body of water is the healthiest (in Water Hardness)?
4006	Meltdown
4014	Hydroelectric Energy
4016	What is the Best Ice Insulator?
4019	Analysis of the Extraction of Proteins from Under Utilized Resources and Their Nutrient and Bioavailability Values
4023	Wind Power: How the Shape of the Blade Affects the amount of Power Produced.
4026	Structure Vs Nature: The Effect of Landslide Duration on Different House Structures
4030	To Melt or Not To Melt: Using Natural Materials As Insulators
5004	The Effects of Boiling on the pH and nitrite Levels of Water
5007	Changing the Water Content in Soil to Generate Electricity in form of an Earth Battery
5015	Salt Water Floating Food Production using low cost desalination techniques.
5016	The Effect of Water Depth and Beach Surface on the Onshore Height of a Tsunami
5021	Rust A Bunch
5025	Can You Taste the Difference Between tap and spring water?
5028	Which Metal Will Corrode the Fastest?
5032	Maximizing the Energy Output of a Wind Turbine
5033	Changing the pH of Soil to Generate Electricity in the Form of a Microbial Fuel Cell
5037	Using Different Plant Xylem to Filter Phosphates
5038	Frozen
5040	Effectiveness of Fertilizer Application Techniques in Reducing Fertilizer Runoff and Pollution
5044	What is the most effective treatment for melting ice?
5048	Let's Beet Slippery Roads
5057	What's in this water?
5060	Ice Matters
5063	How Accurate can your Local Weather Applications Be?
5502	Water Filtration and Flocculation Methods
5503	Evaporation Rate Of An Ice Cube In Liquids With Varying Densities
5505	Does temperature matter?
5514	Substitution of Metals in a Salt-Water Engine to Increase Energy-Efficiency
5517	Burning Biofuels: An Alternate Form of Energy
5523	Power Wind

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Environmental Sciences

Project Number	Title
5541	Spot On! The Use of the Visible Electromagnetic Spectrum to Determine the Effectiveness of Stain Removers
5543	The Performance of Greener Alternatives vs. Standard Hydraulics Fluid
5545	Using Induced Wind Force to Increase the Efficiency of an Electric Vehicle Battery
5546	Is Your House Radioactive?
5550	Evaporation Situation Part II: A Study of the Evaporation Rate of Water
5553	Effect of different soil types on Hyacinth plants.
5559	Soaking it Up?
5561	Fireplaces - To Heat Or Not To Heat, That Is The Question!
5562	Shrouded Wind Turbine and the Venturi Effect
5567	Super Suds
6001	Drone-based, Tropospheric Gas Collection for use in Air Quality Monitoring
6007	The effect of snow and ice thickness on the winter respiration Carbon Dioxide output
6013	Chemical Looping Combustion: A Zero CO2 Footprint Energy Conversion Process
6017	Size Variation In Ichthyornis from Humeral Articulation Measurement
6019	Maximizing the Efficiency of Passive Solar Energy
6021	Measuring the Feasibility of an In-Home In Situ Carbonation Device Utilizing Calcium Rich Basalt
6023	A Comparative Analysis of Rotating Solar Cubes vs. Horizontal Solar Arrays
6026	Investigation of a Bacteriorhodopsin-Pt/TiO2 Hybrid System for Enhanced Nanophotocatalytic Production of Hydrogen
6035	The European Centre for Medium Range Forecasts verses the Global Forecasting System
6040	Gender-Specific Copepod Susceptibility to Phytoplankton Neurotoxins at Various Concentrations
6044	Creation of a Predictive Model of Climate Change Impact Through Ensembling of a Variety of Artificial Neural Networks
6046	Sequestration of Carbon Dioxide by Lithium Orthosilicate in a Clay Body in Ambient Air
6054	A field study on the widespread effect of three viruses on the domesticated honeybee, the Apis mellifera
6056	A Field Study Analysis of Carbon Fiber Electrode Weaves and Conductors in the Design of Sedimentary Microbial Fuel Cells
6063	Testing the Effectiveness of an improved French Trench.
6069	A prototype system for moving cars around around a track using electromagnetics
6077	A Novel Solar Powered Photobioreactor Design for Waste Water Treatment and Producing Biofuel From Micro-Algae
6085	Creation of a Fresnel Lens Array for use in Water Purification
6095	Novel Creation of a versatile, low-cost water purification system via a graphene oxide-TiO2 composite membrane with incorporated electrified nanostructures
6096	The Rate of Meteors
6097	Biodegradable Plastics using a variety of fruits and vegetables
6099	Algae Balls
6503	Designing a High Efficiency and Low Cost Wind Turbines bu Utilizing Organic Solar Panels made from Rosa Canina
6505	Determining the Effects of Different Products on Desalination
6507	Environmentally Friendly and Low Cost Usage of Naturally Extracted Dyes from Organic Materials to Produce Renewable Energy at Efficient Rates
6511	A Feasibility Study of Portable, Ground-Based Ice-Penetrating Radar to Resolve Cartography Deficiencies.
6512	Using Plants to Reduce Atmospheric Carbon Dioxide
6513	Designing an Efficient Method of Collecting and Recycling Ocean Debris through the Use of Uniquely Shaped Containment Booms.
6514	The Existence of a Volcanic Season
6516	The Use of Carbon Nanotubes for the Filtration of Heavy Metal Ions From Water

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Mathematical Sciences

Project Number	Title
1009	Bridge Strength
3004	A Comparison of the Efficacy of Genomic Loci and Oligonucleotide Systems in the DNA Barcoding of Vitis Labrusca
3050	Poetic Mind
3072	Identification of Risk Factors for Incidences of Infectious Diseases in Refugee Populations
3084	An Evaluation of Machine Learning Methods for Genetic Variant Error Detection
3104	The Laws of Attraction
4002	Temperature effects on a basketball
5014	Can The Weight of a Car be Accurately Weighed by Using an Air Pressure Gauge and a Ruler?
5043	A Matter of Facts: Designing a Math App to Help Kids Learn Their Math Facts
5063	How Accurate can your Local Weather Applications Be?
5507	Music Metrics and Fractals: Analyzing Different Genres of Digitized Music to Identify Input Metrics for Programming Fractal Representations of the Music with Mathematica
5524	Are soccer balls affected by air pressure?
5538	Burning The Pie
5548	Making Music Louder Without Electricity
5549	The Effect of Catapult Arm Length on the Distance the Projectile Travels
6014	The physics of the space elevator construction.
6018	A Novel Approach to Increase the Power Efficiency of a Wind Turbine with a Shroud and Diffuser Design
6028	An analysis of particle-driven physics simulations when compared with entity-driven simulations
6029	Creating An Algorithm Based Off of The Quantum Turing Machine To Predict The Efficiency of Quantum Computational Operating Methods Using Benchmarked Simulated Environments
6037	The Effect of 2-dimyristoyl-sn-glycero-3-phosphocholine (DMPC) Dillutions on Nanoparticle Radius Using Small Angle Neutron Scattering (SANS)
6044	Creation of a Predictive Model of Climate Change Impact Through Ensembling of a Variety of Artificial Neural Netowrks
6048	Is The Money Worth It?
6059	A Statistcal Analysis on the Effects of Volcanic Sulfate Emissions on Precipitation Patterns as Analogue for Geoengineering
6076	Novel Approches of Making Human to Robot Interaction Possible for the Handicapped.
6086	Maximization of the Profit of a Large, Prestigious University in the Presence of a State University
6091	Smoking Gun in the Milky Way Galaxy: Open Clusters and Dwarf Galaxies
6508	What Is "Good Music?"
6512	Using Plants to Reduce Atmospheric Carbon Dioxide

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Medicine and Health Sciences

Project Number	Title
1002	Which cleanser will make a fresh-faced student?
1003	Do you see what I see?
1008	Analysis of Moisture and Retention of Body Lotions and Correlation to Microbial Growth
1012	Bacterial Invasion
1015	Softening Sweets
1016	Analysis of Silicon's Effect On Bone Health, "Cell" Bioavailability, and "Skin" Absorption.
1020	Got White?-Which toothpaste will whiten the best on stained limestone tiles?
1021	The relation of time that was spent studying compared to the amount of preformed accuracy on a quiz.
2010	"Pore" My Way to Cleaner Water: The use of flocculants and porous ceramic pots for purifying drinking water in developing countries
2012	Frozen vs. Fresh
2015	Troublesome Turf
2016	Music and Memory
2020	How sweet is it really? Tracking down hidden sugar in drinks.
2022	Which insulated bag lasts the longest?
2023	The Microwave: Is It Safe For Life?
2038	Smoking Wars
2041	A Study of the Relationship between Apple Price and Vitamin C
2501	Does a Person's Eye Color Affect Their Ability to Identify Colors in Dim Light?
2503	The Effect of Caffeine on the Heart Rate of Daphnia Magna
2506	The Effect of Dextrose and Fructose on Daphnia.
2508	Hand Hygiene Effectiveness in Reducing the Number of Bacterial Colonies.
2509	The Effects of Honey on the Healing and Regeneration of Lumbriculus variegatus
2510	Viscosity and Nutritional Value
2520	Effects of Mnemonic Methods on Memory
2524	An Investigation of the Ingestion of Microscopic Plastic Particles by the Blue Mussel, Mytilus edulis
2527	Viral Protein 35 Inhibition: A Novel Treatment for Ebola Virus Disease
2528	Electrolyte Challenge
2529	Indirect measurement of the pliability of vocal folds and singer comfort after direct steam inhalation.
2530	How the Cookie Crumbles
2534	Reaction Time
2536	Regenerative Nano Particle Films
2537	The Antimicrobial Properties of Papaya
2540	Effects of Common Over-the-Counter (OTC) Medications on the Growth of Intestinal Bacteria Often Used as Probiotics
2543	Which Side Are You On?
3001	A Natural Fighter Against E. Coli
3003	Antimicrobial Activity of Lichen Extracts
3005	Investigating Inhibitors of Dihydrofolate Reductase Enzymes of Streptococcus pyogenes and Staphylococcus aureus
3006	Awareness and Knowledge of HPV Among High School Students
3009	Novel Ultrasonic-Induced Antibiotic Deterioration of Borrelia Biofilms for the Treatment of Chronic Lyme Disease
3010	Deciphering the effects of aerobic glycolysis of tumor cells on host anti-tumor immunity
3017	Clinical application of 3D printing technology in cancer radiation therapy: A novel method to improve dose conformity with patient specific treatment aid device
3018	Exploring strategies for improved calcium and phosphate compatibilities in parenteral nutrition.
3025	Suicide Reportings in New England

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Medicine and Health Sciences

Project Number	Title
3027	MiRNA Target Sites in the 3' Untranslated Region of West Nile Virus
3029	How Different Rates of Metabolism Can be Used to Differentiate Cancerous Cells From Normal Cells
3030	The Effects of GMO vs Non-GMO Bananas on the Life Span of Fruit Flies
3031	Chocolate's Theobromine, and not Caffeine, significantly reduces sleep in <i>Drosophila</i>
3032	Enhancing the Collagen Yield from <i>Aurelia aurita</i> through Bio Encapsulated Highly Saturated Fatty Acid Feed
3034	The Effect of alcoholic, nicotinized, caffeinated, and adrenergic solutions on Arrhythmias
3035	Global Climate Change Affects the Ecosystem by Elevating Carbon and Nitrogen Emissions which Increases Allergies
3038	Inhibiting the Growth of Triple-Negative Breast Cancer by Targeting the Autocrine Expression of Proinflammatory Cytokines Interleukin-6 and Interleukin-8
3039	The Effect of Zeolite on the Proliferation Rate of Cancer Cells
3044	The Effect of Supplemental Beta Carotene and Vitamin A on the Proliferation of Mouse Mammary Carcinoma
3045	A cheap, accurate, and rapid test for identifying ESKAPE bacterial pathogens in urban and rural environments.
3046	Correlation of frequency of cancer stem cells to patient outcome in osteosarcoma
3047	The Effect of Cold Stress on the Frequency of CD8+ T Cells in Aged Mice
3048	The Effect of Salicylic Acid on Growth of <i>Spirochaeta aurantia</i> Colonies
3050	Poetic Mind
3054	Preparation and Comparison of EGCG-Loaded PLGA and Cellulose Acetate Microparticles for Osteoarthritis Treatment
3057	Do Color Words Affect The Stroop Effect?
3060	Biochemical Changes in Corneal Collagen Cross-linking: Nondestructive Analysis by Raman Spectroscopy
3062	The Effect of Osmotic Pressure on Gram-Positive and Gram-Negative Bacteria
3063	Restricting the Growth of Lactamase-producing Bacterial Strains of <i>Enterobacter aerogenes</i> through Minimum Inhibitory Concentrations of Essential Oil Extracts
3066	Calories consumed during lunch by students from the Joel Barlow HS cafeteria compared to their GPA
3067	An Investigation of an alternate treatment method, bacteriophage, for bacterial infections and the use of bacteriophages for an antibiotic
3072	Identification of Risk Factors for Incidences of Infectious Diseases in Refugee Populations
3076	The Effect of FGF2 on Hypoxia in the Mouse DG: A Model for Human Perinatal Hypoxia
3078	Neurochemical signature of cerebral vasospasm in patients with subarachnoid hemorrhage
3080	Stabilization of CXCR4 for Crystallization by Tyrosine Sulfation of the N-Terminus
3082	The Effect of Elevated Glucose Levels on the Maternal-Fetal Interface
3086	How Music Affects Concentration
3092	Enhancement of antibiotic effects on various species of bacterium via infusion of silver nanoparticles
3096	Temperature-Independent, Portable, and Rapid Field Detection of Ebola via a Silk-Derived Lateral-Flow System
3098	A Self-Sustaining Electrical Shoe Insert for Treatment of Diabetic Neuropathy
3100	Determining the Ras-like Structure of the Gai2 Protein
3101	The Effects of Curcumin and Eucalyptus Oil on the Growth and Apoptotic Properties of Breast Cancer Cells
3102	Telomerase Activity in Squamous Cell Carcinoma Patients and the Potential Reduction of Telomerase Levels by Usage of Intensive Meditation Training and Psychological Mediators
3104	The Laws of Attraction
3106	Differences in the measurements and numbers of nuclear pores and nuclear pore complexes in wildtype stem cell lines and Huntington's Disease stem cell lines
3109	DNA Barcoding in "Health Bars"
3110	Hybridized Manganese Dioxide & Gold-Iron Oxide Nanoparticle Inhibition of Tumor Growth via Radiosensitization and Tumor Microenvironment Control
3113	Endothelial miR-1 slows the growth of lung cancer cells through angiocrine regulation
3114	A Novel Antibody-Functionalized Graphene Transistor Lab-On-A-Chip for Selective Detection of Malaria Pathogens
3115	The Viability of Planarian as an In Vivo Model for Cancer Research

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Medicine and Health Sciences

Project Number	Title
3116	An Investigation of Superparamagnetic Iron Nanoparticle Hyperthermia to Inhibit Growth of <i>Agrobacterium tumefaciens</i>
3117	Stroop Effect
3123	miRNA Analysis of Exosomes from Osteosarcoma Cells
3125	The effect of Hsp 70 on the survival of <i>Anopheles gambiae</i> when exposed to extreme temperatures and its relevance to the proliferation of infectious diseases.
3129	The Internal Effects of Amino Acids (Leucine and Taurine) on Cardiovascular Zebrafish Embryonic Development
3508	Target Identification: Frequency of the PV92 Alu Insertion within a Given Population
3510	The Designing and Application of the Single-Cell Immunoplex Device
3512	The Influence of Time Consistency and Processing Speed on Multimodal Perceptual Experience
3524	Fish Finders: DNA to Expose Fish Fraud
3525	The Effects of Aspirin on <i>Pisum sativum</i> var. <i>saccharatum</i>
4007	Is density a quality?: Density Intensity
4010	Analysis of Nature's Digestive Enzymes and Effect of Inhibitors and Enhancers on Nutrition and Cell Absorption.
4028	Does your shirt have your back: A study of clothing features that protect against UV light
5001	BOBS (Baby on Board) System
5019	Baking with Fantastic Flours
5050	I'm Dye-ing To Find Out What Dyes Are Used In My Favorite Candies: A Candy Chromatography Experiment
5057	What's in this water?
5536	Tap Water vs Bottled Water- Is There a Difference?
5540	How Does the pH Level of Liquids Used to Take Medication Pills Affect Dissolvability?
5542	Measuring The Amount of Acid in Vinegar By Using Titration
5546	Is Your House Radioactive?
5556	Is your lipstick toxic?
5557	Injury Reducing Characteristics of Running Shoes Using Innovation and Design
6009	An app to assimilate information during a presentation without note taking
6015	Synthesis of an Electromagnetically-Controlled Corn-Starch/PVA Biopolymer Microstructure for Extended and Targeted Drug Delivery
6025	Program your Diet
6049	Recovering carbon nanotube fluorescence through conformational change of side chains
6098	The Development of an Immunosorbant Assay (ELISA) for detection of IgG and IgA antibodies against Tissue Transglutaminase for the diagnosis of Celiac disease.
6501	"Are Your Eyes Playing Tricks on You?"
6506	Validating the Effectiveness of Biosensor Imaging of Redundant Deviation in Shifts
6509	Echocardiogram-Based Wireless Left Ventricular Assist Device (LVAD) with Mobile Application Monitoring and Control
6510	3D Animation and Ebola
6515	Exploring the Effects of Ammonia on the Electrical Resistivity of Graphene

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Microbiology

Project Number	Title
1008	Analysis of Moisture and Retention of Body Lotions and Correlation to Microbial Growth
1012	Bacterial Invasion
1013	Gas Released by Yeast
1016	Analysis of Silicon's Effect On Bone Health, "Cell" Bioavailability, and "Skin" Absorption.
2005	Endomycorrhizal and Ectomycorrhizal Fungi and the Effect on Plant Communication Through the Common Mycelial Network
2022	Which insulated bag lasts the longest?
2023	The Microwave: Is It Safe For Life?
2025	Have Your Bread and Eat it Too
2026	Killing Blackspot: An Organic Struggle
2037	The Effect of Sugar on Yeast Cells
2508	Hand Hygiene Effectiveness in Reducing the Number of Bacterial Colonies.
2521	Electric Energy Production In A Bio-fuel Cell For Varying Electrogenic Bacterial Samples
2525	How Different Milk Fat Concentrations Affect Bacterial Growth
2530	How the Cookie Crumbles
2535	Optimizing Methane Oxidation by Methanotrophs Through the Engineering Application of Different Environments
2537	The Antimicrobial Properties of Papaya
2540	Effects of Common Over-the-Counter (OTC) Medications on the Growth of Intestinal Bacteria Often Used as Probiotics
2544	Fruit Fly Fatality
3001	A Natural Fighter Against E. Coli
3005	Investigating Inhibitors of Dihydrofolate Reductase Enzymes of Streptococcus pyogenes and Staphylococcus aureus
3009	Novel Ultrasonic-Induced Antibiotic Deterioration of Borrelia Biofilms for the Treatment of Chronic Lyme Disease
3010	Deciphering the effects of aerobic glycolysis of tumor cells on host anti-tumor immunity
3011	Bioremediation of Low Density Polyethylene with S. griseus Bacteria and A. niger Fungi in Sterilized Soil
3014	Antimicrobial Properties of Various Plant Leaf Extracts on Escherichia Coli
3039	The Effect of Zeolite on the Proliferation Rate of Cancer Cells
3041	Remediating Rivalry?
3043	The Effect of the Invasiveness of the Zebra Mussels in Lake Lillionah
3045	A cheap, accurate, and rapid test for identifying ESKAPE bacterial pathogens in urban and rural environments.
3048	The Effect of Salicylic Acid on Growth of Spirochaeta aurantia Colonies
3058	The Role of the Genetic Transfer of Mobile Genetic Elements in the Evolution of Microbial Populations
3059	Honey as an Antibacterial Agent
3062	The Effect of Osmotic Pressure on Gram-Positive and Gram-Negative Bacteria
3063	Restricting the Growth of Lactamase-producing Bacterial Strains of Enterobacter aerogenes through Minimum Inhibitory Concentrations of Essential Oil Extracts
3064	The Effectiveness of Homeopathic Antibiotics Versus Pharmaceutical Antibodies on the eradication of E. Coli.
3067	An Investigation of an alternate treatment method, bacteriophage, for bacterial infections and the use of bacteriophages for an antibiotic
3071	The Effect of the non-caloric intense sweetener Neotame on lifespan and pharyngeal pumping rate of daf-2(e1370) mutant Caenorhabditis elegans.
3077	Exploration into the Effects of Anti-PAR2 Antibody on the Expression of CUX-1 Related Metabolic Pathways and Apoptosis of Mouse Breast Cancer Cells
3089	Inverstigation of Bioremediation and Alkane-degrading Qualities of Alcanivorax Borkumensis
3101	The Effects of Curcumin and Eucalyptus Oil on the Growth and Apoptotic Properties of Breast Cancer Cells
3103	Natural vs. Chemical Cleaners
3109	DNA Barcoding in "Health Bars"

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Microbiology

Project Number	Title
3111	The Effect of Zinc Oxide Nanoparticles on the Growth of Bacterial Infections
3116	An Investigation of Superparamagnetic Iron Nanoparticle Hyperthermia to Inhibit Growth of <i>Agrobacterium tumefaciens</i>
3120	Isolation and Use of Antimicrobial Polypeptides found in Grains to Inhibit the Growth of Gram-Positive and Gram-Negative Bacteria
3121	Comparative Modeling of Signal Peptidase I (Spase I) from <i>Mycobacterium tuberculosis</i> Genome
3130	Ultraviolet Bacterial Eradication Using Low Cost Light Emitting Diodes
3524	Fish Finders: DNA to Expose Fish Fraud
5551	UV-C Lighting As A Supplemental Method Of Preservation In Refrigerators To Reduce Energy Consumption
6040	Gender-Specific Copepod Susceptibility to Phytoplankton Neurotoxins at Various Concentrations

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Physics and Astronomy

Project Number	Title
2024	The Effects of Cell Phones on Narcissus Papyraceus Growth and Color
4002	Temperature effects on a basketball
4009	Surface Tension
4011	Fore!
4012	What it takes to clear the loop.
4015	Ramps, Textures, and Cars, Oh My!
4027	Shape Affects Speed
4031	Radiation Stopper
4034	The Designing and Testing of a Self-Constructed Aircraft
5003	Do Wheels Increase Distance On a Trebuchet?
5006	A Test of Batteries
5011	Let There Be Light!
5018	Heat Output
5023	Which Variables Affect The Flight Of A Rocket?
5024	Measuring Acceleration on an Inclined Plane
5029	Sound Barriers: How does the type of material affect the amount of sound that carries through a surface?
5034	Wood Toughness
5036	The Amount of Critical Mass Needed to Make a Sustainable Chain Reaction
5039	Wrap the Apple Save the Apple
5041	Free Energy
5046	The Effect of Different Temperatures on the Strength of a Magnet
5047	Now You're Cooking with Sunlight!
5051	Which Bridge Design Is Best?
5052	Does the Number of Fins on a Rocket Effect How Long It Stays in the Air?
5058	The Voltage Changes from Different Wavelength Radiations on a Solar Panel
5060	Ice Matters
5509	The Effect of Using Foam to Create a More Sophisticated Highway Barrier on Lessening the Spike of G-forces During an Impact
5510	Hovercraft
5513	HOW TO INSULATE YOUR HOUSE AND REDUCE YOUR FUEL BILLS
5516	Home-Made Particle Accelerator
5518	Strength Of An Electromagnet
5519	Instrument Science: Bell Flares
5520	The Heat is On
5524	Are soccer balls affected by air pressure?
5526	Do expensive basketball sneakers outperform inexpensive basketball sneakers?
5529	Impact of Angular Positions for Basketball Bank Shots
5530	What's Shaking? - A Study of Soil Liquefaction
5531	Gauss Launcher Efficiency
5538	Burning The Pie
5543	The Performance of Greener Alternatives vs. Standard Hydraulics Fluid
5548	Making Music Louder Without Electricity
5557	Injury Reducing Characteristics of Running Shoes Using Innovation and Design
5558	The Effects of Acid Rain on Magnetism

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Physics and Astronomy

Project Number	Title
5569	Spandex: Speedy or Spendy?
6002	Developing an Alternative Technique of Mechanically Exfoliating Topological Insulator Bismuth Telluride
6003	Boiling Water with Nano Particles.
6014	The physics of the space elevator construction.
6016	More Holes More Goals
6028	An analysis of particle-driven physics simulations when compared with entity-driven simulations
6029	Creating An Algorithm Based Off of The Quantum Turing Machine To Predict The Efficiency of Quantum Computational Operating Methods Using Benchmarked Simulated Environments
6032	Effect of dark matter halo on merging
6034	The Synchronous Rotation of the Eris/Dysnomia Binary System
6038	Uses and Application of thermocouple in space exploration
6042	Biomimicry of Whale Fins
6053	The Derivation of Habitable Zones around Binary Star Systems: Is Planetary Stability Possible?
6055	A Novel Method of Controlling Size of Carbon Nanotubes
6061	The Effect of Sunspot Number on Radio Propagation
6065	Low-Cost Solid-State Cosmic Ray Observatory
6067	Efficient Soundproofing: Design of a System using Multiple Technologies
6075	Energy Transfer Using Laser Power Beaming
6078	Exoplanet Discovery: The Transit Method
6090	The effect of application of a solenoid on the magnetic properties of gadolinium at varying temperatures and current levels.
6091	Smoking Gun in the Milky Way Galaxy: Open Clusters and Dwarf Galaxies
6093	How does the weight of a wind turbine's blade affect energy production?
6096	The Rate of Meteors
6103	Hardening of electronics and satellite communication systems from sunspots and coronal mass ejections

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Plant Sciences

Project Number	Title
1001	The Effect of Different Liquids on Plant Growth
1004	Vitamin H2Grow
1005	The effect of organic and non-organic compost produced by vermicomposting with eisenia foetida on the growth of lycopersicon lycopersicum.
1007	Do different water types affect plant growth?
1017	The Impact of Acidic Water on Germinating Mung Beans.
1023	The Trilogy of Light: Fluorescent, LED, Incandescent
2001	The Effects of Wi-fi on Plant Growth
2002	How does Caffeine affect the growth of plants?
2003	The Effect of pH Level on the Growth of Algae
2005	Endomycorrhizal and Ectomycorrhizal Fungi and the Effect on Plant Communication Through the Common Mycelial Network
2006	Water The Power of Life Hydroponics vs. Aquaponics
2007	Do different sources of light affect the rate a plant transpires?
2008	Can different categories of leaves contain similar tints
2009	What liquid germinates seeds the fastest?
2011	The Effect of Acid Rain on the Growth of Tennessee Green Pod Bean Plants
2014	Operation Jason
2018	Curious Cuttings
2021	Nothing but algae and duckweed
2023	The Microwave: Is It Safe For Life?
2024	The Effects of Cell Phones on Narcissus Papyraceus Growth and Color
2026	Killing Blackspot: An Organic Struggle
2027	How Does Water Impact Plant Growth?
2028	Lets help plants grow!!!
2030	A Photosynthesis Lab: The Effect of Light Intensity, Water Temperature, Colored Lights, and Contaminated Water on the Rate of Photosynthesis of the Aquatic Plant, Elodea Densa
2032	Weed Control: Walnuts to the Rescue!
2040	Hydroponics
2041	A Study of the Relationship between Apple Price and Vitamin C
2514	Contemporary Bioremediation
2515	The Impact of Acid Rain on the Flora of the Environment
2516	Effects of different levels of electromagnetic fields on a variety of grasses and their nutrient content
2517	Aquaponics: The impact of combining agriculture and aquaculture techniques on plant germination and growth.
2518	Nutrient Comparison of Lettuce Grown Hydroponically and in Soil
2522	Microwave Radiation
2523	Not Organic? Don't Panic!
2531	Water Types and Plant Growth
2537	The Antimicrobial Properties of Papaya
2538	The Effect of Household Acids and Bases on the pH of dirt.
2541	Inexpensive Treatments for Plants Affected from Contaminated Soil by Oil Spills
3004	A Comparison of the Efficacy of Genomic Loci and Oligonucleotide Systems in the DNA Barcoding of Vitis Labrusca
3008	Accuracy of DNA Barcoding in the Plant Kingdom
3012	Improving the extraction DNA from fruit using household items.
3014	Antimicrobial Properties of Various Plant Leaf Extracts on Escherichia Coli

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Plant Sciences

Project Number	Title
3015	The Effects of Sulfur Dioxide on Solanum lycopersicum subsp. Tiny Tim and Soil pH in Varying Temperatures
3016	The Carbon Dioxide Sequestration of Lawn Plants
3023	Ocean Acidification and Its Varying Effects Regarding Predatory Response of Coraline Algae
3026	Does seed spacing affect plant height?
3033	Is it possible to graft the scion of Non-Leguminous Plant (tomato) to the root stock of a Leguminous Plants (soybeans)?
3035	Global Climate Change Affects the Ecosystem by Elevating Carbon and Nitrogen Emissions which Increases Allergies
3037	The Effect of Iron Levels on Marine Algal Growth
3052	The Analysis of Clay Flocculation's Effect on the Benthic Zone Used as a Mitigation Technique for Harmful Algal Blooms (HABs)
3055	The Effects of Grey Water on the Germination Rate and Growth of a Variety of Grass Species.
3061	The Relationship Of Major Vein Density on Leaf Shape and Size in the Plant Genus Pelargonium
3065	The Effectiveness of Plant Material as Metal Chelators
3068	A Study of the Removal of Pollutants by Rain Gardens, a Type of Low-Impact Development Drainage System
3069	Elucidating the Ethylene Signal Pathway in Arabidopsis
3083	Magic Magnets
3087	Natural Dye Treatments of Gossypium hirsutum using several Naturopathic sources in combination with the mordant of Aluminum Potassium Sulfate
3091	An Investigation of Drone Downdraft as a Viable Alternative for Insect Pollination of Essential Crops
3095	How Grey Oyster Mushrooms Can Be Used To Break Down Oil And Reduce Waste In The Environment.
3105	The effect of nitrate uptake in aquatic plants with varying nitrate exposure.
3108	The Effects of Different Environments on the Germination of Radish Seeds
3120	Isolation and Use of Antimicrobial Polypeptides found in Grains to Inhibit the Growth of Gram-Positive and Gram-Negative Bacteria
3126	Phytoplankton's Effect on Ocean Acidification
3127	Making a Portable, Low Cost Hydroponics System
3131	What is the Best Way to Deliver Light to Plants?
3133	Zostera marina's Effect on Carbon Dioxide Levels in Long Island Sound and Predicted Effects
3501	The Turbidity of Water Affects the Health of Aquatic Ecosystems
3503	The Effect of the Angle of Solar Radiation on Plant Growth
3504	Maintaining a Better Society by Decreasing CO2 Levels Through the Growth of Large Trees and Plants
3506	Plant Growth Research
3509	The Effects of Seed Priming
3513	The Effect of Prescribed Burns on Soil Nutrients
3516	The Effect of Soil Alkalinity on the Lycopersicon Esculenta (plum tomato)
3517	DNA Barcoding of Invasive Species on a Suburban Campus
3518	Using Fall Foliage as an Alternative for Paper Production to Reduce Deforestation
3520	A Natural Way to Keep Insects Away by Using Various Essential Plant Oils as an Organic Insect Repellent
3521	The Effect of pH Levels in Presoaking Liquids on Fruit Dehydration Duration
3522	Desalination by Portulaca oleracea: Maintaining and stabilizing overall growth and production of Omega-3 Fatty Acids
3525	The Effects of Aspirin on Pisum sativum var. saccharatum
5010	Which is Better for the Garden? Aspirin vs. Super Thrive
5019	Baking with Fantastic Flours
5037	Using Different Plant Xylem to Filter Phosphates
5515	Measurement of Tensile Strength of Various Wet & Dry Woods
5537	The Effect of Processing on the Vitamin C Content of Orange Juice

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Plant Sciences

Project Number	Title
5546	Is Your House Radioactive?
5553	Effect of different soil types on Hyacinth plants.
6077	A Novel Solar Powered Photobioreactor Design for Waste Water Treatment and Producing Biofuel From Micro-Algae
6094	The refinement and production of bio-diesel derived from laboratory grown nanochloropsis algae
6099	Algae Balls

Composite Technical Disciplines

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Biotechnology

Project Number	Title
1001	The Effect of Different Liquids on Plant Growth
1002	Which cleanser will make a fresh-faced student?
1003	Do you see what I see?
1004	Vitamin H2Grow
1005	The effect of organic and non-organic compost produced by vermicomposting with eisenia foetida on the growth of lycopersicon lycopersicum.
1007	Do different water types affect plant growth?
1008	Analysis of Moisture and Retention of Body Lotions and Correlation to Microbial Growth
1009	Bridge Strength
1010	Which Liquid Prevents Oxidation?
1012	Bacterial Invasion
1013	Gas Released by Yeast
1014	To Hatch or Not to Hatch: Brine Shrimp & Pollution
1015	Softening Sweets
1016	Analysis of Silicon's Effect On Bone Health, "Cell" Bioavailability, and "Skin" Absorption.
1017	The Impact of Acidic Water on Germinating Mung Beans.
1019	Pill Bugs On Mars?
1020	Got White?-Which toothpaste will whiten the best on stained limestone tiles?
1021	The relation of time that was spent studying compared to the amount of preformed accuracy on a quiz.
1023	The Trilogy of Light: Fluorescent, LED, Incandescent
1025	Survive with Salt Water
1026	Got Gas?
2001	The Effects of Wi-fi on Plant Growth
2002	How does Caffeine affect the growth of plants?
2003	The Effect of pH Level on the Growth of Algae
2004	Diffusion Confusion: Which Liquid Does Blue Food Coloring Diffuse The Fastest In
2005	Endomycorrhizal and Ectomycorrhizal Fungi and the Effect on Plant Communication Through the Common Mycelial Network
2006	Water The Power of Life Hydroponics vs. Aquaponics
2007	Do different sources of light affect the rate a plant transpires?
2008	Can different categories of leaves contain similar tints
2009	What liquid germinates seeds the fastest?
2010	"Pore" My Way to Cleaner Water: The use of flocculants and porous ceramic pots for purifying drinking water in developing countries
2011	The Effect of Acid Rain on the Growth of Tennessee Green Pod Bean Plants
2012	Frozen vs. Fresh
2013	What is TDS? Are you drinking it?!
2014	Operation Jason
2015	Troublesome Turf
2016	Music and Memory
2018	Curious Cuttings
2020	How sweet is it really? Tracking down hidden sugar in drinks.
2021	Nothing but algae and duckweed
2022	Which insulated bag lasts the longest?
2023	The Microwave: Is It Safe For Life?

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Biotechnology

Project Number	Title
2024	The Effects of Cell Phones on Narcissus Papyraceus Growth and Color
2025	Have Your Bread and Eat it Too
2026	Killing Blackspot: An Organic Struggle
2027	How Does Water Impact Plant Growth?
2028	Lets help plants grow!!!
2030	A Photosynthesis Lab: The Effect of Light Intensity, Water Temperature, Colored Lights, and Contaminated Water on the Rate of Photosynthesis of the Aquatic Plant, Elodea Densa
2031	Hypoxia in Long Island Sound
2032	Weed Control: Walnuts to the Rescue!
2033	Why Did The chicken Cross The Road?
2034	All About That Bait
2037	The Effect of Sugar on Yeast Cells
2038	Smoking Wars
2039	Novel Bioluminescent Display using Aliivibrio fischeri for efficiency and low cost
2040	Hydroponics
2041	A Study of the Relationship between Apple Price and Vitamin C
2501	Does a Person's Eye Color Affect Their Ability to Identify Colors in Dim Light?
2502	Toxic Chemicals Found In Detergents
2503	The Effect of Caffeine on the Heart Rate of Daphnia Magna
2505	Brine Shrimp Hatching
2506	The Effect of Dextrose and Fructose on Daphnia.
2507	Aqua-Life
2508	Hand Hygiene Effectiveness in Reducing the Number of Bacterial Colonies.
2509	The Effects of Honey on the Healing and Regeneration of Lumbriculus variegatus
2510	Viscosity and Nutritional Value
2511	Analysis of Increased CO2 levels in Ocean water and Effect on Crustaceans' and Bivalves' Growth
2513	Which is the Most Effective Antacid?
2514	Contemporary Bioremediation
2515	The Impact of Acid Rain on the Flora of the Environment
2516	Effects of different levels of electromagnetic fields on a variety of grasses and their nutrient content
2517	Aquaponics: The impact of combining agriculture and aquaculture techniques on plant germination and growth.
2518	Nutrient Comparison of Lettuce Grown Hydroponically and in Soil
2519	Who's Got The Biggest Bubbles?
2520	Effects of Mnemonic Methods on Memory
2521	Electric Energy Production In A Bio-fuel Cell For Varying Electrogenic Bacterial Samples
2522	Microwave Radiation
2523	Not Organic? Don't Panic!
2524	An Investigation of the Ingestion of Microscopic Plastic Particles by the Blue Mussel, Mytilus edulis
2525	How Different Milk Fat Concentrations Affect Bacterial Growth
2526	One Sticky Situation
2527	Viral Protein 35 Inhibition: A Novel Treatment for Ebola Virus Disease
2528	Electrolyte Challenge
2529	Indirect measurement of the pliability of vocal folds and singer comfort after direct steam inhalation.
2530	How the Cookie Crumbles

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Biotechnology

Project Number	Title
2531	Water Types and Plant Growth
2532	How Much Organic Material Can Earthworms Decompose?
2534	Reaction Time
2535	Optimizing Methane Oxidation by Methanotrophs Through the Engineering Application of Different Environments
2536	Regenerative Nano Particle Films
2537	The Antimicrobial Properties of Papaya
2538	The Effect of Household Acids and Bases on the pH of dirt.
2540	Effects of Common Over-the-Counter (OTC) Medications on the Growth of Intestinal Bacteria Often Used as Probiotics
2541	Inexpensive Treatments for Plants Affected from Contaminated Soil by Oil Spills
2542	Think Before You Drink Analysis of the impact of drinking popular soft drinks on our body.
2543	Which Side Are You On?
2544	Fruit Fly Fatality
3001	A Natural Fighter Against E. Coli
3002	The Effects of Atypical PH on Bay Scallops (<i>Argopecten irradians</i>)
3003	Antimicrobial Activity of Lichen Extracts
3004	A Comparison of the Efficacy of Genomic Loci and Oligonucleotide Systems in the DNA Barcoding of <i>Vitis Labrusca</i>
3005	Investigating Inhibitors of Dihydrofolate Reductase Enzymes of <i>Streptococcus pyogenes</i> and <i>Staphylococcus aureus</i>
3006	Awareness and Knowledge of HPV Among High School Students
3007	Quantitation of Regeneration in Planaria
3008	Accuracy of DNA Barcoding in the Plant Kingdom
3009	Novel Ultrasonic-Induced Antibiotic Deterioration of <i>Borrelia</i> Biofilms for the Treatment of Chronic Lyme Disease
3010	Deciphering the effects of aerobic glycolysis of tumor cells on host anti-tumor immunity
3011	Bioremediation of Low Density Polyethylene with <i>S. griseus</i> Bacteria and <i>A. niger</i> Fungi in Sterilized Soil
3012	Improving the extraction DNA from fruit using household items.
3013	The Effects of Organic and Chemical Fertilizers on Snails of the Long Island Sound
3014	Antimicrobial Properties of Various Plant Leaf Extracts on <i>Escherichia Coli</i>
3015	The Effects of Sulfur Dioxide on <i>Solanum lycopersicum</i> subsp. <i>Tiny Tim</i> and Soil pH in Varying Temperatures
3016	The Carbon Dioxide Sequestration of Lawn Plants
3017	Clinical application of 3D printing technology in cancer radiation therapy: A novel method to improve dose conformity with patient specific treatment aid device
3018	Exploring strategies for improved calcium and phosphate compatibilities in parenteral nutrition.
3019	Pollutants and there Detrimental Effects on Shrimp
3020	Effective Optimization of Biogas Production through Alpha-Amylase Utilization
3021	Side Effects of Frequent Propofol Use on Canines and Felines
3022	Determining the Most Effective Tick Repellent in Replace of DEET Based Products
3023	Ocean Acidification and Its Varying Effects Regarding Predatory Response of Coralline Algae
3024	Effect of Brin Concentration on Gettability in Atomisticly Smooth Surfaces
3025	Suicide Reportings in New England
3026	Does seed spacing affect plant height?
3027	MiRNA Target Sites in the 3' Untranslated Region of West Nile Virus
3028	acid rain prevention
3029	How Different Rates of Metabolism Can be Used to Differentiate Cancerous Cells From Normal Cells
3030	The Effects of GMO vs Non-GMO Bananas on the Life Span of Fruit Flies
3031	Chocolate's Theobromine, and not Caffeine, significantly reduces sleep in <i>Drosophila</i>

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Biotechnology

Project Number	Title
3032	Enhancing the Collagen Yield from <i>Aurelia aurita</i> through Bio Encapsulated Highly Saturated Fatty Acid Feed
3033	Is it possible to graft the scion of Non-Leguminous Plant (tomato) to the root stock of a Leguminous Plants (soybeans)?
3034	The Effect of alcoholic, nicotinized, caffeinated, and adrenergic solutions on Arrhythmias
3035	Global Climate Change Affects the Ecosystem by Elevating Carbon and Nitrogen Emissions which Increases Allergies
3037	The Effect of Iron Levels on Marine Algal Growth
3038	Inhibiting the Growth of Triple-Negative Breast Cancer by Targeting the Autocrine Expression of Proinflammatory Cytokines Interleukin-6 and Interleukin-8
3039	The Effect of Zeolite on the Proliferation Rate of Cancer Cells
3040	Utilizing Piscivorous Birds as Low-Impact Primary Biological Indicators
3041	Remediating Rivalry?
3042	Design and Use of Primers for Investigation of Bone Resorption
3043	The Effect of the Invasiveness of the Zebra Mussels in Lake Lillinonah
3044	The Effect of Supplemental Beta Carotene and Vitamin A on the Proliferation of Mouse Mammary Carcinoma
3045	A cheap, accurate, and rapid test for identifying ESKAPE bacterial pathogens in urban and rural environments.
3046	Correlation of frequency of cancer stem cells to patient outcome in osteosarcoma
3047	The Effect of Cold Stress on the Frequency of CD8+ T Cells in Aged Mice
3048	The Effect of Salicylic Acid on Growth of <i>Spirochaeta aurantia</i> Colonies
3049	Targeted Release of <i>Moringa oleifera</i> Cationic Proteins from Starch-g-poly (sodium acrylate-co-HEMA) Hydrogels for the Remediation of Aqueous Polychlorinated Biphenyls
3050	Poetic Mind
3051	Exploring the Tunicate <i>Ascidia callosa</i> and its Associated Bacteria for Antimicrobial Compounds and other Marine Natural Products
3052	The Analysis of Clay Flocculation's Effect on the Benthic Zone Used as a Mitigation Technique for Harmful Algal Blooms (HABs)
3053	The Efficiency of Bivalve Mollusk Filter Feeding in the Long Island Sound
3054	Preparation and Comparison of EGCG-Loaded PLGA and Cellulose Acetate Microparticles for Osteoarthritis Treatment
3055	The Effects of Grey Water on the Germination Rate and Growth of a Variety of Grass Species.
3056	Analysis of Transport of Nitrogen Species through Right-of-way-Bioswales
3057	Do Color Words Affect The Stroop Effect?
3058	The Role of the Genetic Transfer of Mobile Genetic Elements in the Evolution of Microbial Populations
3059	Honey as an Antibacterial Agent
3060	Biochemical Changes in Corneal Collagen Cross-linking: Nondestructive Analysis by Raman Spectroscopy
3061	The Relationship Of Major Vein Density on Leaf Shape and Size in the Plant Genus <i>Pelargonium</i>
3062	The Effect of Osmotic Pressure on Gram-Positive and Gram-Negative Bacteria
3063	Restricting the Growth of Lactamase-producing Bacterial Strains of <i>Enterobacter aerogenes</i> through Minimum Inhibitory Concentrations of Essential Oil Extracts
3064	The Effectiveness of Homeopathic Antibiotics Versus Pharmaceutical Antibodies on the eradication of <i>E. Coli</i> .
3065	The Effectiveness of Plant Material as Metal Chelators
3066	Calories consumed during lunch by students from the Joel Barlow HS cafeteria compared to their GPA
3067	An Investigation of an alternate treatment method, bacteriophage, for bacterial infections and the use of bacteriophages for an antibiotic
3068	A Study of the Removal of Pollutants by Rain Gardens, a Type of Low-Impact Development Drainage System
3069	Elucidating the Ethylene Signal Pathway in <i>Arabidopsis</i>
3070	The Effects of TBBPA and HBCD Brominated Flame Retardants on Zebrafish Embryonic Development
3071	The Effect of the non-caloric intense sweetener Neotame on lifespan and pharyngeal pumping rate of <i>daf-2(e1370)</i> mutant <i>Caenorhabditis elegans</i> .
3072	Identification of Risk Factors for Incidences of Infectious Diseases in Refugee Populations

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Biotechnology

Project Number	Title
3073	Determining the Effect of Biofouling on a Restocking System for <i>Homarus americanus</i>
3075	Elevated Levels Of Interleukin-8 in Non-Small Cell Lung Cancers induce Cell Survival During Chemotherapy
3076	The Effect of FGF2 on Hypoxia in the Mouse DG: A Model for Human Perinatal Hypoxia
3077	Exploration into the Effects of Anti-PAR2 Antibody on the Expression of CUX-1 Related Metabolic Pathways and Apoptosis of Mouse Breast Cancer Cells
3078	Neurochemical signature of cerebral vasospasm in patients with subarachnoid hemorrhage
3079	Accumulation and Biomagnification of Microplastics in Marine Bivalves and Gastropods
3080	Stabilization of CXCR4 for Crystallization by Tyrosine Sulfation of the N-Terminus
3081	The Effect of Gut Denitrification of <i>Dressina polymorpha</i> on the Nitrate and Nitrite Availability in the Freshwater System of Eichler's Cove, Newtown
3082	The Effect of Elevated Glucose Levels on the Maternal-Fetal Interface
3083	Magic Magnets
3084	An Evaluation of Machine Learning Methods for Genetic Variant Error Detection
3086	How Music Affects Concentration
3087	Natural Dye Treatments of <i>Gossypium hirsutum</i> using several Naturopathic sources in combination with the mordant of Aluminum Potassium Sulfate
3089	Investigation of Bioremediation and Alkane-degrading Qualities of <i>Alcanivorax Borkumensis</i>
3090	Analyzing Cathode Placement in a Simple Single Vessel Microbial Fuel Cell: Potential Implications for Efficiency and Practical Applications
3091	An Investigation of Drone Downdraft as a Viable Alternative for Insect Pollination of Essential Crops
3092	Enhancement of antibiotic effects on various species of bacterium via infusion of silver nanoparticles
3094	The Effect of Cinnamaldehyde on the Chemical Memory of <i>Dugesia Tigrina</i>
3095	How Grey Oyster Mushrooms Can Be Used To Break Down Oil And Reduce Waste In The Environment.
3096	Temperature-Independent, Portable, and Rapid Field Detection of Ebola via a Silk-Derived Lateral-Flow System
3098	A Self-Sustaining Electrical Shoe Insert for Treatment of Diabetic Neuropathy
3099	3D Printer for Creating Cement Domestic Utilities for Developing Countries
3100	Determining the Ras-like Structure of the Gai2 Protein
3101	The Effects of Curcumin and Eucalyptus Oil on the Growth and Apoptotic Properties of Breast Cancer Cells
3102	Telomerase Activity in Squamous Cell Carcinoma Patients and the Potential Reduction of Telomerase Levels by Usage of Intensive Meditation Training and Psychological Mediators
3103	Natural vs. Chemical Cleaners
3104	The Laws of Attraction
3105	The effect of nitrate uptake in aquatic plants with varying nitrate exposure.
3106	Differences in the measurements and numbers of nuclear pores and nuclear pore complexes in wildtype stem cell lines and Huntington's Disease stem cell lines
3107	The Effect of Triclosan on the Proliferation of the Breast Cancer Cells
3108	The Effects of Different Environments on the Germination of Radish Seeds
3109	DNA Barcoding in "Health Bars"
3110	Hybridized Manganese Dioxide & Gold-Iron Oxide Nanoparticle Inhibition of Tumor Growth via Radiosensitization and Tumor Microenvironment Control
3111	The Effect of Zinc Oxide Nanoparticles on the Growth of Bacterial Infections
3112	The Effect of Brain-Derived Neurotrophic Factor on Retinoic Acid Differentiated SH-SY5Y Cells: A Model for Striatal-Enriched Protein Tyrosine Phosphatase in Parkinson's Disease
3113	Endothelial miR-1 slows the growth of lung cancer cells through angiocrine regulation
3114	A Novel Antibody-Functionalized Graphene Transistor Lab-On-A-Chip for Selective Detection of Malaria Pathogens
3115	The Viability of Planarian as an In Vivo Model for Cancer Research
3116	An Investigation of Superparamagnetic Iron Nanoparticle Hyperthermia to Inhibit Growth of <i>Agrobacterium tumefaciens</i>
3117	Stroop Effect

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Biotechnology

Project Number	Title
3118	Development of Non-toxic Photostabilized Phycoerythrin for Application in Dye Sensitized Solar Cells
3119	Investigating the Growth Rate of <i>Procambarus clarkii</i> under different Environmental Stressors
3120	Isolation and Use of Antimicrobial Polypeptides found in Grains to Inhibit the Growth of Gram-Positive and Gram-Negative Bacteria
3121	Comparative Modeling of Signal Peptidase I (Spase I) from <i>Mycobacterium tuberculosis</i> Genome
3123	miRNA Analysis of Exosomes from Osteosarcoma Cells
3124	The Optimization of Conditions for an Enzymatic Bio-Battery
3125	The effect of Hsp 70 on the survival of <i>Anopheles gambiae</i> when exposed to extreme temperatures and its relevance to the proliferation of infectious diseases.
3126	Phytoplankton's Effect on Ocean Acidification
3127	Making a Portable, Low Cost Hydroponics System
3128	The Effects of Pollution On the Regenerative Process of the <i>Nematostella</i> Organism
3129	The Internal Effects of Amino Acids (Leucine and Taurine) on Cardiovascular Zebrafish Embryonic Development
3130	Ultraviolet Bacterial Eradication Using Low Cost Light Emitting Diodes
3131	What is the Best Way to Deliver Light to Plants?
3132	CHANGING CONSTRUCTION FACTORS TO CREATE DIFFERENT MORPHOLOGIES OF PHOSPHOLIPID AGGREGATES
3133	<i>Zostera marina</i> 's Effect on Carbon Dioxide Levels in Long Island Sound and Predicted Effects
3135	Impact of Geometrical Structure on the Durability of Stereolithographic Sea Turtle Shell Prototypes
3501	The Turbidity of Water Affects the Health of Aquatic Ecosystems
3503	The Effect of the Angle of Solar Radiation on Plant Growth
3504	Maintaining a Better Society by Decreasing CO ₂ Levels Through the Growth of Large Trees and Plants
3505	DNA Barcoding to Detect Mislabeling and Endangered Species in Turtle Meat
3506	Plant Growth Research
3507	Use of <i>Saccharomyces Cerevisiae</i> and Biosorption in the Purification of Industrially Polluted Waters
3508	Target Identification: Frequency of the PV92 Alu Insertion within a Given Population
3509	The Effects of Seed Priming
3510	The Designing and Application of the Single-Cell Immunoplex Device
3511	The Behavioral Effect of Molting Patterns in Hermit Crabs
3512	The Influence of Time Consistency and Processing Speed on Multimodal Perceptual Experience
3513	The Effect of Prescribed Burns on Soil Nutrients
3514	The Effect of Vitamin C on Echinoderm Leg Regeneration
3515	Manure to Methane
3516	The Effect of Soil Alkalinity on the <i>Lycopersicon Esculentum</i> (plum tomato)
3517	DNA Barcoding of Invasive Species on a Suburban Campus
3518	Using Fall Foliage as an Alternative for Paper Production to Reduce Deforestation
3520	A Natural Way to Keep Insects Away by Using Various Essential Plant Oils as an Organic Insect Repellent
3521	The Effect of pH Levels in Presoaking Liquids on Fruit Dehydration Duration
3522	Desalination by <i>Portulaca oleracea</i> : Maintaining and stabilizing overall growth and production of Omega-3 Fatty Acids
3523	The Thermal Stress Of <i>Acoenobita Clypeatus</i> (Land Hermit Crab)
3524	Fish Finders: DNA to Expose Fish Fraud
3525	The Effects of Aspirin on <i>Pisum sativum</i> var. <i>saccharatum</i>
4005	Growing Gummy Bears Using Osmosis
4007	Is density a quality?: Density Intensity
4008	Investigating Novel Methods to Harvest Solar Energy for Generation of Solar Steam from Salt Water and Snow Using Graphene and Carbon Foam

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Biotechnology

Project Number	Title
4010	Analysis of Nature's Digestive Enzymes and Effect of Inhibitors and Enhancers on Nutrition and Cell Absorption.
4011	Fore!
4013	Power Brace: A leg brace designed to help the victims of Duchenne Muscular Dystrophy and other diseases walk and stand in every day life
4017	The Sensing Cane
4021	Keep Out! : An Animal Proof Garden Enclosure.
4025	Installing a Wind-gust Turbine to generate energy to power highway lighting or to see the Power Grids.
4026	Structure Vs Nature: The Effect of Landslide Duration on Different House Structures
4027	Shape Affects Speed
4028	Does your shirt have your back: A study of clothing features that protect against UV light
4030	To Melt or Not To Melt: Using Natural Materials As Insulators
5001	BOBS (Baby on Board) System
5008	Crossing the Gap... But With What?
5009	The Impact of Turbine Blades on Power Output
5010	Which is Better for the Garden? Aspirin vs. Super Thrive
5013	Build a raft powered by surface tension
5014	Can The Weight of a Car be Accurately Weighed by Using an Air Pressure Gauge and a Ruler?
5015	Salt Water Floating Food Production using low cost desalination techniques.
5019	Baking with Fantastic Flours
5034	Wood Toughness
5035	Keepin' Warm
5037	Using Different Plant Xylem to Filter Phosphates
5038	Frozen
5045	Can Biomass be used as a Renewable Energy Source
5048	Let's Beet Slippery Roads
5050	I'm Dye-ing To Find Out What Dyes Are Used In My Favorite Candies: A Candy Chromatography Experiment
5053	Which Wheat Flour Has the Most Gluten?
5055	How Do Environmental Conditions Affect the Performance of Duct Tape?
5057	What's in this water?
5501	Fired UP!!!
5515	Measurement of Tensile Strength of Various Wet & Dry Woods
5525	Solid Ground?
5526	Do expensive basketball sneakers outperform inexpensive basketball sneakers?
5530	What's Shaking? - A Study of Soil Liquefaction
5536	Tap Water vs Bottled Water- Is There a Difference?
5537	The Effect of Processing on the Vitamin C Content of Orange Juice
5540	How Does the pH Level of Liquids Used to Take Medication Pills Affect Dissolvability?
5542	Measuring The Amount of Acid in Vinegar By Using Titration
5546	Is Your House Radioactive?
5548	Making Music Louder Without Electricity
5551	UV-C Lighting As A Supplemental Method Of Preservation In Refrigerators To Reduce Energy Consumption
5552	How can I make my own rubber pointe shoes?
5553	Effect of different soil types on Hyacinth plants.
5556	Is your lipstick toxic?

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Biotechnology

Project Number	Title
5557	Injury Reducing Characteristics of Running Shoes Using Innovation and Design
5564	Can you change the rate of a chemical reaction by changing the particle size of the reactants?
5565	The Universal Soccer Shoe
6002	Developing an Alternative Technique of Mechanically Exfoliating Topological Insulator Bismuth Telluride
6004	The Effects of Thickness of Steel, Ball Bearing Size, and Drop Height of Ball Bearing During Dent Resistance Testing on Galvanized Steel versus Aluminum-Alloy.
6005	An Optically Self-Healing Metallo-Supramolecular Polymer Encapsulated UV-NIR Organic Solar Cell for Transparent Energy-Harvesting and Electronic Skin Applications
6008	Study to Improve the Constraint of Ultra-High Performance Concrete Double-T Bridge Girders by Adjusting the Architecture of Steel Fibers in the Web
6009	An app to assimilate information during a presentation without note taking
6011	Application of the near-IR Luminescence Property of Egyptian Blue and related Alkaline Earth Metal Copper Silicate (MCuSi ₄ O ₁₀ -BaCuSi ₂ O ₆) in Infrared Technology (IR)
6013	Chemical Looping Combustion: A Zero CO ₂ Footprint Energy Conversion Process
6015	Synthesis of an Electromagnetically-Controlled Corn-Starch/PVA Biopolymer Microstructure for Extended and Targeted Drug Delivery
6017	Size Variation In Ichthyornis from Humeral Articulation Measurement
6025	Program your Diet
6026	Investigation of a Bacteriorhodopsin-Pt/TiO ₂ Hybrid System for Enhanced Nanophotocatalytic Production of Hydrogen
6030	Electrically Independent, Low Cost, Self-Filling Water Bottle for use in Water Locked Regions
6031	Biodiesel: The Fuel of the Future
6037	The Effect of 2-dimyristoyl-sn-glycero-3-phosphocholine (DMPC) Dilutions on Nanoparticle Radius Using Small Angle Neutron Scattering (SANS)
6039	Optimization of Reflectivity of GaN for Solar Applications
6040	Gender-Specific Copepod Susceptibility to Phytoplankton Neurotoxins at Various Concentrations
6046	Sequestration of Carbon Dioxide by Lithium Orthosilicate in a Clay Body in Ambient Air
6048	Is The Money Worth It?
6049	Recovering carbon nanotube fluorescence through conformational change of side chains
6052	Enhanced Organic Solar Cells Using 3m Micro Prismatic Technology
6054	A field study on the widespread effect of three viruses on the domesticated honeybee, the <i>Apis mellifera</i>
6055	A Novel Method of Controlling Size of Carbon Nanotubes
6056	A Field Study Analysis of Carbon Fiber Electrode Weaves and Conductors in the Design of Sedimentary Microbial Fuel Cells
6059	A Statistical Analysis on the Effects of Volcanic Sulfate Emissions on Precipitation Patterns as Analogue for Geoengineering
6062	Ferromagnetism: Using ferromagnetic fluid to control prosthetics
6063	Testing the Effectiveness of an improved French Trench.
6074	Converting Ambient Water Vapor to Potable Drinking Water Inspired by the Shorebird beak
6077	A Novel Solar Powered Photobioreactor Design for Waste Water Treatment and Producing Biofuel From Micro-Algae
6079	The Application of Sub-undulatory Locomotion Principles Utilized by Sub-carangiform Swimmers to Increase Submersible Efficiency
6082	Creating a Semantic Search Engine with Voice Integration
6083	Engineering of ZnO Tapered Pillar Nanostructures as Antireflection Coatings on Silicon Solar Cells
6094	The refinement and production of bio-diesel derived from laboratory grown nanochloropsis algae
6097	Biodegradable Plastics using a variety of fruits and vegetables
6098	The Development of an Immunosorbant Assay (ELISA) for detection of IgG and IgA antibodies against Tissue Transglutaminase for the diagnosis of Celiac disease.
6099	Algae Balls
6501	"Are Your Eyes Playing Tricks on You?"

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Biotechnology

Project Number	Title
6502	Heat Retention
6505	Determining the Effects of Different Products on Desalination
6506	Validating the Effectiveness of Biosensor Imaging of Redundant Deviation in Shifts
6509	Echocardiogram-Based Wireless Left Ventricular Assist Device (LVAD) with Mobile Application Monitoring and Control
6510	3D Animation and Ebola
6513	Designing an Efficient Method of Collecting and Recycling Ocean Debris through the Use of Uniquely Shaped Containment Booms.
6515	Exploring the Effects of Ammonia on the Electrical Resistivity of Graphene
6516	The Use of Carbon Nanotubes for the Filtration of Heavy Metal Ions From Water

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Engineering

Project Number	Title
1009	Bridge Strength
1025	Survive with Salt Water
2010	"Pore" My Way to Cleaner Water: The use of flocculants and porous ceramic pots for purifying drinking water in developing countries
2018	Curious Cuttings
2022	Which insulated bag lasts the longest?
2031	Hypoxia in Long Island Sound
2039	Novel Bioluminescent Display using <i>Aliivibrio fischeri</i> for efficiency and low cost
2512	A Battery That Makes Cents
2516	Effects of different levels of electromagnetic fields on a variety of grasses and their nutrient content
2519	Who's Got The Biggest Bubbles?
3009	Novel Ultrasonic-Induced Antibiotic Deterioration of <i>Borrelia</i> Biofilms for the Treatment of Chronic Lyme Disease
3017	Clinical application of 3D printing technology in cancer radiation therapy: A novel method to improve dose conformity with patient specific treatment aid device
3020	Effective Optimization of Biogas Production through Alpha-Amylase Utilization
3028	acid rain prevention
3049	Targeted Release of <i>Moringa oleifera</i> Cationic Proteins from Starch-g-poly (sodium acrylate-co-HEMA) Hydrogels for the Remediation of Aqueous Polychlorinated Biphenyls
3054	Preparation and Comparison of EGCG-Loaded PLGA and Cellulose Acetate Microparticles for Osteoarthritis Treatment
3056	Analysis of Transport of Nitrogen Species through Right-of-way-Bioswales
3060	Biochemical Changes in Corneal Collagen Cross-linking: Nondestructive Analysis by Raman Spectroscopy
3075	Elevated Levels Of Interleukin-8 in Non-Small Cell Lung Cancers induce Cell Survival During Chemotherapy
3090	Analyzing Cathode Placement in a Simple Single Vessel Microbial Fuel Cell: Potential Implications for Efficiency and Practical Applications
3096	Temperature-Independent, Portable, and Rapid Field Detection of Ebola via a Silk-Derived Lateral-Flow System
3098	A Self-Sustaining Electrical Shoe Insert for Treatment of Diabetic Neuropathy
3099	3D Printer for Creating Cement Domestic Utilities for Developing Countries
3110	Hybridized Manganese Dioxide & Gold-Iron Oxide Nanoparticle Inhibition of Tumor Growth via Radiosensitization and Tumor Microenvironment Control
3114	A Novel Antibody-Functionalized Graphene Transistor Lab-On-A-Chip for Selective Detection of Malaria Pathogens
3116	An Investigation of Superparamagnetic Iron Nanoparticle Hyperthermia to Inhibit Growth of <i>Agrobacterium tumefaciens</i>
3118	Development of Non-toxic Photostabilized Phycoerythrin for Application in Dye Sensitized Solar Cells
3124	The Optimization of Conditions for an Enzymatic Bio-Battery
3127	Making a Portable, Low Cost Hydroponics System
3135	Impact of Geometrical Structure on the Durability of Stereolithographic Sea Turtle Shell Prototypes
3510	The Designing and Application of the Single-Cell Immunoplex Device
4003	Analysis of Safer Electroplating Metals and Electrolyte solutions with their Environmental Impact
4008	Investigating Novel Methods to Harvest Solar Energy for Generation of Solar Steam from Salt Water and Snow Using Graphene and Carbon Foam
4011	Fore!
4013	Power Brace: A leg brace designed to help the victims of Duchenne Muscular Dystrophy and other diseases walk and stand in every day life
4014	Hydroelectric Energy
4017	The Sensing Cane
4021	Keep Out! : An Animal Proof Garden Enclosure.
4022	A science fair project on how a trebuchets arm length affects the projectile distance.
4023	Wind Power: How the Shape of the Blade Affects the amount of Power Produced.

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Engineering

Project Number	Title
4024	A New Type of Energy in Cars
4025	Installing a Wind-gust Turbine to generate energy to power highway lighting or to see the Power Grids.
4026	Structure Vs Nature: The Effect of Landslide Duration on Different House Structures
4027	Shape Affects Speed
4028	Does your shirt have your back: A study of clothing features that protect against UV light
4029	Incorporating the Flutter Effect in Flags to Produce Energy
4030	To Melt or Not To Melt: Using Natural Materials As Insulators
4033	BabyBot: Creating a Robot to Soothe a Crying Infant
4034	The Designing and Testing of a Self-Constructed Aircraft
5001	BOBS (Baby on Board) System
5002	How much air is needed to allow a weighted structure to rise?
5003	Do Wheels Increase Distance On a Trebuchet?
5006	A Test of Batteries
5007	Changing the Water Content in Soil to Generate Electricity in form of an Earth Battery
5008	Crossing the Gap... But With What?
5009	The Impact of Turbine Blades on Power Output
5012	Die sensitized solar cell
5013	Build a raft powered by surface tension
5014	Can The Weight of a Car be Accurately Weighed by Using an Air Pressure Gauge and a Ruler?
5015	Salt Water Floating Food Production using low cost desalination techniques.
5018	Heat Output
5022	Cu at the Bottom
5023	Which Variables Affect The Flight Of A Rocket?
5026	The Power of Wind
5029	Sound Barriers: How does the type of material affect the amount of sound that carries through a surface?
5030	Opening a Garage Door with Raspberry Pi
5031	Design and Build a working Hovercraft
5032	Maximizing the Energy Output of a Wind Turbine
5033	Changing the pH of Soil to Generate Electricity in the Form of a Microbial Fuel Cell
5034	Wood Toughness
5035	Keepin' Warm
5038	Frozen
5041	Free Energy
5042	Drone for Science
5043	A Matter of Facts: Designing a Math App to Help Kids Learn Their Math Facts
5046	The Effect of Different Temperatures on the Strength of a Magnet
5051	Which Bridge Design Is Best?
5052	Does the Number of Fins on a Rocket Effect How Long It Stays in the Air?
5054	Development of a technique to detect explosive residue for use in avoiding terrorism threats.
5055	How Do Environmental Conditions Affect the Performance of Duct Tape?
5056	Electromagnetic Energy and Innovative Applications
5058	The Voltage Changes from Different Wavelength Radiations on a Solar Panel
5501	Fired UP!!!
5504	Green Energy Ferris Wheel

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Engineering

Project Number	Title
5506	Effect of Blade Angle and Wind Angle on Rotation Speed of a Home-Built Wind Turbine
5508	The effects of cloud coverage on the out put of solar panels
5509	The Effect of Using Foam to Create a More Sophisticated Highway Barrier on Lessening the Spike of G-forces During an Impact
5512	Design, build and program a robot using an Arduino Mega 2560 R3 through an Android app to cheer up or relax children at a hospital
5513	HOW TO INSULATE YOUR HOUSE AND REDUCE YOUR FUEL BILLS
5515	Measurement of Tensile Strength of Various Wet & Dry Woods
5516	Home-Made Particle Accelerator
5518	Strength Of An Electromagnet
5519	Instrument Science: Bell Flares
5522	Thermodynamics of the Stirling Cycle: Testing the Effects of the Relative Temperature Difference on Stirling Engine Output
5523	Power Wind
5525	Solid Ground?
5526	Do expensive basketball sneakers outperform inexpensive basketball sneakers?
5528	Efficiency of Piezoelectric Materials for Electric Production
5530	What's Shaking? - A Study of Soil Liquefaction
5535	Thermoelectricity Phenomenon
5543	The Performance of Greener Alternatives vs. Standard Hydraulics Fluid
5545	Using Induced Wind Force to Increase the Efficiency of an Electric Vehicle Battery
5548	Making Music Louder Without Electricity
5549	The Effect of Catapult Arm Length on the Distance the Projectile Travels
5552	How can I make my own rubber pointe shoes?
5555	Powerful Propellers
5557	Injury Reducing Characteristics of Running Shoes Using Innovation and Design
5560	Energy Scavenging--Proving the Seebeck Effect with a Homemade Thermoelectric Generator: A Source of Free, Sustainable, Low-Voltage Power
5563	Conduction Junction
5565	The Universal Soccer Shoe
5569	Spandex: Speedy or Spendy?
6002	Developing an Alternative Technique of Mechanically Exfoliating Topological Insulator Bismuth Telluride
6003	Boiling Water with Nano Particles.
6004	The Effects of Thickness of Steel, Ball Bearing Size, and Drop Height of Ball Bearing During Dent Resistance Testing on Galvanized Steel versus Aluminum-Alloy.
6005	An Optically Self-Healing Metallo-Supramolecular Polymer Encapsulated UV-NIR Organic Solar Cell for Transparent Energy-Harvesting and Electronic Skin Applications
6008	Study to Improve the Constraint of Ultra-High Performance Concrete Double-T Bridge Girders by Adjusting the Architecture of Steel Fibers in the Web
6011	Application of the near-IR Luminescence Property of Egyptian Blue and related Alkaline Earth Metal Copper Silicate (MCuSi ₄ O ₁₀ -BaCuSi ₂ O ₆) in Infrared Technology (IR)
6013	Chemical Looping Combustion: A Zero CO ₂ Footprint Energy Conversion Process
6015	Synthesis of an Electromagnetically-Controlled Corn-Starch/PVA Biopolymer Microstructure for Extended and Targeted Drug Delivery
6018	A Novel Approach to Increase the Power Efficiency of a Wind Turbine with a Shroud and Diffuser Design
6020	Printlet (combination between a printer and a tablet)
6021	Measuring the Feasibility of an In-Home In Situ Carbonation Device Utilizing Calcium Rich Basalt
6023	A Comparative Analysis of Rotating Solar Cubes vs. Horizontal Solar Arrays

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Engineering

Project Number	Title
6026	Investigation of a Bacteriorhodopsin-Pt/TiO ₂ Hybrid System for Enhanced Nanophotocatalytic Production of Hydrogen
6027	Financially Superior Energy Source for Subterranean Inhabitants
6030	Electrically Independent, Low Cost, Self-Filling Water Bottle for use in Water Locked Regions
6031	Biodiesel: The Fuel of the Future
6033	Harvesting Energy Through Key-Strikes Absorbed by Piezoelectric Sensors
6036	Using Peltier and Thermoelectric Principles for Humanitarian Applications
6037	The Effect of 2-dimyristoyl-sn-glycero-3-phosphocholine (DMPC) Dillutions on Nanoparticle Radius Using Small Angle Neutron Scattering (SANS)
6038	Uses and Application of thermocouple in space exploration
6039	Optimization of Reflectivity of GaN for Solar Applications
6041	Using a Hydraulic System and a Heat-Induced Magnetic Adhesive to Create a Manipulatable Array that Increases the Efficiency of Piezoelectric Generators
6042	Biomimicry of Whale Fins
6043	Physical and Cost Optimization of a Human Powered Axial Flux Generator for use in Electrically Isolated Environments.
6045	Graphene Solar Cell
6046	Sequestration of Carbon Dioxide by Lithium Orthosilicate in a Clay Body in Ambient Air
6047	The Effect of Different Checkerboard Sizes on Steady State Visually Evoked Potentials
6048	Is The Money Worth It?
6050	Using wastewater to reclaim energy
6051	Revolutionizing A 16th Century Product For The Modern World: A Thermoelectric Chair That Creates Energy From The Human Touch
6052	Enhanced Organic Solar Cells Using 3m Micro Prismatic Technology
6055	A Novel Method of Controlling Size of Carbon Nanotubes
6056	A Field Study Analysis of Carbon Fiber Electrode Weaves and Conductors in the Design of Sedimentary Microbial Fuel Cells
6057	The Fire-fighting robot based on artificial intelligence
6058	Move Over Opec/Oil from Biomass
6059	A Statistical Analysis on the Effects of Volcanic Sulfate Emissions on Precipitation Patterns as Analogue for Geoengineering
6060	Hydrogen Fuel Cells: How Electrode Material Affects Them
6062	Ferromagnetism: Using ferromagnetic fluid to control prosthetics
6063	Testing the Effectiveness of an improved French Trench.
6064	Power generation via downdraft of humidified dry air
6065	Low-Cost Solid-State Cosmic Ray Obserbatory
6066	Biochar Electrodes Incorporated with Cuprous Oxide Substrates to Optimize Solar Cells' Efficiency
6067	Efficient Soundproofing: Design of a System using Multiple Technologies
6068	Evaluation of Several Resonant Power Electronic Converters in Capacitively Coupled Wireless Energy Transmitters
6069	A prototype system for moving cars around around a track using electromagnetics
6070	InMoov: An Independent Study in Mechanical and Electrical Engineering and Computer Science
6071	Designing a Braille E-Book For the Visually Impaired and Blind People
6072	Omni-Directional Maglev Cableless Elevator
6073	Chef NAO: The Humanoid Cooking Robot
6074	Converting Ambient Water Vapor to Potable Drinking Water Inspired by the Shorebird beak
6075	Energy Transfer Using Laser Power Beaming
6076	Novel Approches of Making Human to Robot Interaction Possible for the Handicapped.

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Engineering

Project Number	Title
6079	The Application of Sub-undulatory Locomotion Principles Utilized by Sub-carangiform Swimmers to Increase Submersible Efficiency
6080	A Water-Resistant, Piezoelectric Precipitation Generator; A comparative analysis of mobile v. stationary systems
6081	Reverse Osmosis Water Desalination Via the Harnessing of Perpetual Wave Energy
6083	Engineering of ZnO Tapered Pillar Nanostructures as Antireflection Coatings on Silicon Solar Cells
6087	Application of Manganese-Based Ionic Liquid for Optimized Performance of Non-aqueous / Aqueous Redox Flow Batteries
6090	The effect of application of a solenoid on the magnetic properties of gadolinium at varying temperatures and current levels.
6092	Developing a tool to repeatably extract cartilage samples: An application of 3-D printing
6093	How does the weight of a wind turbine's blade affect energy production?
6094	The refinement and production of bio-diesel derived from laboratory grown nannochloropsis algae
6098	The Development of an Immunosorbant Assay (ELISA) for detection of IgG and IgA antibodies against Tissue Transglutaminase for the diagnosis of Celiac disease.
6100	Exploring the Optical Audio Link
6101	Low Grade Waste Heat Recovery and Carbon Sequestration using an Innovative Reverse Electrodialysis (RED) and Pressure Retarded Osmosis (PRO) System
6103	Hardening of electronics and satellite communication systems from sunspots and coronal mass ejections
6502	Heat Retention
6503	Designing a High Efficiency and Low Cost Wind Turbines bu Utilizing Organic Solar Panels made from Rosa Canina
6504	An investigation on the effects of radiation emitted from the three most popular mobile phone operating systems.
6506	Validating the Effectiveness of Biosensor Imaging of Redundant Deviation in Shifts
6507	Environmentally Friendly and Low Cost Usage of Naturally Extracted Dyes from Organic Materials to Produce Renewable Energy at Efficient Rates
6509	Echocardiogram-Based Wireless Left Ventricular Assist Device (LVAD) with Mobile Application Monitoring and Control
6511	A Feasibility Study of Portable, Ground-Based Ice-Penetrating Radar to Resolve Cartography Deficiencies.
6513	Designing an Efficient Method of Collecting and Recycling Ocean Debris through the Use of Uniquely Shaped Containment Booms.
6515	Exploring the Effects of Ammonia on the Electrical Resistivity of Graphene

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Environmental

Env. Mgmt't & Env. Analysis

Project Number	Title
1001	The Effect of Different Liquids on Plant Growth
1005	The effect of organic and non-organic compost produced by vermicomposting with eisenia foetida on the growth of lycopersicon lycopersicum.
1007	Do different water types affect plant growth?
1014	To Hatch or Not to Hatch: Brine Shrimp & Pollution
1017	The Impact of Acidic Water on Germinating Mung Beans.
1019	Pill Bugs On Mars?
1022	Acid Rain in Wilton, CT
1023	The Trilogy of Light: Fluorescent, LED, Incandescent
1024	The Effect of Different Heating Sources on How Fast Water Can Reach Boiling Point
2001	The Effects of Wi-fi on Plant Growth
2003	The Effect of pH Level on the Growth of Algae
2005	Endomycorrhizal and Ectomycorrhizal Fungi and the Effect on Plant Communication Through the Common Mycelial Network
2007	Do different sources of light affect the rate a plant transpires?
2009	What liquid germinates seeds the fastest?
2010	"Pore" My Way to Cleaner Water: The use of flocculants and porous ceramic pots for purifying drinking water in developing countries
2011	The Effect of Acid Rain on the Growth of Tennessee Green Pod Bean Plants
2013	What is TDS? Are you drinking it?!
2014	Operation Jason
2018	Curious Cuttings
2021	Nothing but algae and duckweed
2024	The Effects of Cell Phones on Narcissus Papyraceus Growth and Color
2026	Killing Blackspot: An Organic Struggle
2027	How Does Water Impact Plant Growth?
2028	Lets help plants grow!!!
2031	Hypoxia in Long Island Sound
2032	Weed Control: Walnuts to the Rescue!
2034	All About That Bait
2502	Toxic Chemicals Found In Detergents
2505	Brine Shrimp Hatching
2507	Aqua-Life
2511	Analysis of Increased CO2 levels in Ocean water and Effect on Crustaceans' and Bivalves' Growth
2514	Contemporary Bioremediation
2515	The Impact of Acid Rain on the Flora of the Environment
2516	Effects of different levels of electromagnetic fields on a variety of grasses and their nutrient content
2517	Aquaponics: The impact of combining agriculture and aquaculture techniques on plant germination and growth.
2519	Who's Got The Biggest Bubbles?
2521	Electric Energy Production In A Bio-fuel Cell For Varying Electrogenic Bacterial Samples
2522	Microwave Radiation
2523	Not Organic? Don't Panic!
2524	An Investigation of the Ingestion of Microscopic Plastic Particles by the Blue Mussel, Mytilus edulis
2531	Water Types and Plant Growth
2532	How Much Organic Material Can Earthworms Decompose?

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Environmental

Env. Mgmt't & Env. Analysis

Project Number	Title
2535	Optimizing Methane Oxidation by Methanotrophs Through the Engineering Application of Different Environments
2538	The Effect of Household Acids and Bases on the pH of dirt.
2539	The Impact of Different Water Pollutants on Biological Health Indices
2541	Inexpensive Treatments for Plants Affected from Contaminated Soil by Oil Spills
2544	Fruit Fly Fatality
3002	The Effects of Atypical PH on Bay Scallops (<i>Argopecten irradians</i>)
3003	Antimicrobial Activity of Lichen Extracts
3008	Accuracy of DNA Barcoding in the Plant Kingdom
3011	Bioremediation of Low Density Polyethylene with <i>S. griseus</i> Bacteria and <i>A. niger</i> Fungi in Sterilized Soil
3013	The Effects of Organic and Chemical Fertilizers on Snails of the Long Island Sound
3015	The Effects of Sulfur Dioxide on <i>Solanum lycopersicum</i> subsp. Tiny Tim and Soil pH in Varying Temperatures
3016	The Carbon Dioxide Sequestration of Lawn Plants
3019	Pollutants and there Detrimental Effects on Shrimp
3023	Ocean Acidification and Its Varying Effects Regarding Predetary Response of Coraline Alagae
3024	Effect of Brin Concentration on Gettability in Atomisticly Smooth Surfaces
3026	Does seed spacing affect plant height?
3028	acid rain prevention
3032	Enhancing the Collagen Yield from <i>Aurelia aurita</i> through Bio Encapsulated Highly Saturated Fatty Acid Feed
3033	Is it possible to graft the scion of Non-Leguminous Plant (tomato) to the root stock of a Leguminous Plants (soybeans)?
3035	Global Climate Change Affects the Ecosystem by Elevating Carbon and Nitrogen Emissions which Increases Allergies
3037	The Effect of Iron Levels on Marine Algal Growth
3040	Utilizing Piscivorous Birds as Low-Impact Primary Biological Indicators
3041	Remediating Rivalry?
3043	The Effect of the Invasiveness of the Zebra Mussels in Lake Lillinonah
3049	Targeted Release of <i>Moringa oleifera</i> Cationic Proteins from Starch-g-poly (sodium acrylate-co-HEMA) Hydrogels for the Remediation of Aqueous Polychlorinated Biphenyls
3052	The Analysis of Clay Flocculation's Effect on the Benthic Zone Used as a Mitigation Technique for Harmful Algal Blooms (HABs)
3053	The Efficiency of Bivalve Mollusk Filter Feeding in the Long Island Sound
3055	The Effects of Grey Water on the Germination Rate and Growth of a Variety of Grass Species.
3056	Analysis of Transport of Nitrogen Species through Right-of-way-Bioswales
3065	The Effectiveness of Plant Material as Metal Chelators
3068	A Study of the Removal of Pollutants by Rain Gardens, a Type of Low-Impact Development Drainage System
3070	The Effects of TBBPA and HBCD Brominated Flame Retardants on Zebrafish Embryonic Development
3072	Identification of Risk Factors for Incidences of Infectious Diseases in Refugee Populations
3073	Determining the Effect of Biofouling on a Restocking System for <i>Homarus americanus</i>
3079	Accumulation and Biomagnification of Microplastics in Marine Bivalves and Gastropods
3081	The Effect of Gut Denitrification of <i>Dressina polymorpha</i> on the Nitrate and Nitrite Availability in the Freshwater System of Eichler's Cove, Newtown
3083	Magic Magnets
3087	Natural Dye Treatments of <i>Gossypium hirsutum</i> using several Naturopathic sources in combination with the mordant of Aluminum Potassium Sulfate
3089	Inverstigation of Bioremediation and Alkane-degrading Qualities of <i>Alcanivorax Borkumensis</i>
3090	Analyzing Cathode Placement in a Simple Single Vessel Microbial Fuel Cell: Potential Implications for Efficiency and Practical Applications
3093	The Affect of Ocean Acidification on <i>Nannochloropsis</i> sp.

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Environmental

Env. Mgmt't & Env. Analysis

Project Number	Title
3095	How Grey Oyster Mushrooms Can Be Used To Break Down Oil And Reduce Waste In The Environment.
3103	Natural vs. Chemical Cleaners
3105	The effect of nitrate uptake in aquatic plants with varying nitrate exposure.
3108	The Effects of Different Environments on the Germination of Radish Seeds
3119	Investigating the Growth Rate of <i>Procambarus clarkii</i> under different Environmental Stressors
3122	Disinfection By-Products in Water
3126	Phytoplankton's Effect on Ocean Acidification
3127	Making a Portable, Low Cost Hydroponics System
3133	<i>Zostera marina</i> 's Effect on Carbon Dioxide Levels in Long Island Sound and Predicted Effects
3501	The Turbidity of Water Affects the Health of Aquatic Ecosystems
3502	Temperature Rising: Exhausted Efforts
3503	The Effect of the Angle of Solar Radiation on Plant Growth
3504	Maintaining a Better Society by Decreasing CO ₂ Levels Through the Growth of Large Trees and Plants
3505	DNA Barcoding to Detect Mislabeling and Endangered Species in Turtle Meat
3506	Plant Growth Research
3507	Use of <i>Saccharomyces Cerevisiae</i> and Biosorption in the Purification of Industrially Polluted Waters
3509	The Effects of Seed Priming
3513	The Effect of Prescribed Burns on Soil Nutrients
3516	The Effect of Soil Alkalinity on the <i>Lycopersicon Esculentum</i> (plum tomato)
3517	DNA Barcoding of Invasive Species on a Suburban Campus
3518	Using Fall Foliage as an Alternative for Paper Production to Reduce Deforestation
3519	The Effect of Reduced pH on Submerged Aquatic Vegetation
3520	A Natural Way to Keep Insects Away by Using Various Essential Plant Oils as an Organic Insect Repellent
3521	The Effect of pH Levels in Presoaking Liquids on Fruit Dehydration Duration
3522	Desalination by <i>Portulaca oleracea</i> : Maintaining and stabilizing overall growth and production of Omega-3 Fatty Acids
3523	The Thermal Stress Of <i>Acoenobita Clypeatus</i> (Land Hermit Crab)
4001	The Hard Truth About Water Hardness: Which body of water is the healthiest (in Water Hardness)?
4003	Analysis of Safer Electroplating Metals and Electrolyte solutions with their Environmental Impact
4006	Meltdown
4008	Investigating Novel Methods to Harvest Solar Energy for Generation of Solar Steam from Salt Water and Snow Using Graphene and Carbon Foam
4014	Hydroelectric Energy
4016	What is the Best Ice Insulator?
4019	Analysis of the Extraction of Proteins from Under Utilized Resources and Their Nutrient and Bioavailability Values
4021	Keep Out! : An Animal Proof Garden Enclosure.
4023	Wind Power: How the Shape of the Blade Affects the amount of Power Produced.
4025	Installing a Wind-gust Turbine to generate energy to power highway lighting or to see the Power Grids.
4026	Structure Vs Nature: The Effect of Landslide Duration on Different House Structures
4030	To Melt or Not To Melt: Using Natural Materials As Insulators
5004	The Effects of Boiling on the pH and nitrite Levels of Water
5007	Changing the Water Content in Soil to Generate Electricity in form of an Earth Battery
5015	Salt Water Floating Food Production using low cost desalination techniques.
5016	The Effect of Water Depth and Beach Surface on the Onshore Height of a Tsunami
5021	Rust A Bunch

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Environmental

Env. Mgmt't & Env. Analysis

Project Number	Title
5025	Can You Taste the Difference Between tap and spring water?
5028	Which Metal Will Corrode the Fastest?
5032	Maximizing the Energy Output of a Wind Turbine
5033	Changing the pH of Soil to Generate Electricity in the Form of a Microbial Fuel Cell
5037	Using Different Plant Xylem to Filter Phosphates
5038	Frozen
5040	Effectiveness of Fertilizer Application Techniques in Reducing Fertilizer Runoff and Pollution
5044	What is the most effective treatment for melting ice?
5048	Let's Beet Slippery Roads
5057	What's in this water?
5060	Ice Matters
5063	How Accurate can your Local Weather Applications Be?
5502	Water Filtration and Flocculation Methods
5503	Evaporation Rate Of An Ice Cube In Liquids With Varying Densities
5505	Does temperature matter?
5514	Substitution of Metals in a Salt-Water Engine to Increase Energy-Efficiency
5517	Burning Biofuels: An Alternate Form of Energy
5523	Power Wind
5536	Tap Water vs Bottled Water- Is There a Difference?
5541	Spot On! The Use of the Visible Electromagnetic Spectrum to Determine the Effectiveness of Stain Removers
5543	The Performance of Greener Alternatives vs. Standard Hydraulics Fluid
5545	Using Induced Wind Force to Increase the Efficiency of an Electric Vehicle Battery
5546	Is Your House Radioactive?
5550	Evaporation Situation Part II: A Study of the Evaporation Rate of Water
5553	Effect of different soil types on Hyacinth plants.
5559	Soaking it Up?
5561	Fireplaces - To Heat Or Not To Heat, That Is The Question!
5562	Shrouded Wind Turbine and the Venturi Effect
5567	Super Suds
6001	Drone-based, Tropospheric Gas Collection for use in Air Quality Monitoring
6004	The Effects of Thickness of Steel, Ball Bearing Size, and Drop Height of Ball Bearing During Dent Resistance Testing on Galvanized Steel versus Aluminum-Alloy.
6006	Low Temperature Thermal Cracking of High-Density Polyethylene via Zeolite and Pillared Clay Catalysts
6007	The effect of snow and ice thickness on the winter respiration Carbon Dioxide output
6013	Chemical Looping Combustion: A Zero CO2 Footprint Energy Conversion Process
6017	Size Variation In Ichthyornis from Humeral Articulation Measurement
6019	Maximizing the Efficiency of Passive Solar Energy
6021	Measuring the Feasibility of an In-Home In Situ Carbonation Device Utilizing Calcium Rich Basalt
6023	A Comparative Analysis of Rotating Solar Cubes vs. Horizontal Solar Arrays
6024	The effects of highly reflective material to be use for housing and their ability to mitigate global climate change.
6026	Investigation of a Bacteriorhodopsin-Pt/TiO2 Hybrid System for Enhanced Nanophotocatalytic Production of Hydrogen
6035	The European Centre for Medium Range Forecasts verses the Global Forecasting System
6040	Gender-Specific Copepod Susceptibility to Phytoplankton Neurotoxins at Various Concentrations
6044	Creation of a Predictive Model of Climate Change Impact Through Ensembling of a Variety of Artificial Neural Netowrks

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Environmental

Env. Mgmt't & Env. Analysis

Project Number	Title
6046	Sequestration of Carbon Dioxide by Lithium Orthosilicate in a Clay Body in Ambient Air
6054	A field study on the widespread effect of three viruses on the domesticated honeybee, the <i>Apis mellifera</i>
6056	A Field Study Analysis of Carbon Fiber Electrode Weaves and Conductors in the Design of Sedimentary Microbial Fuel Cells
6059	A Statistical Analysis on the Effects of Volcanic Sulfate Emissions on Precipitation Patterns as Analogue for Geoengineering
6063	Testing the Effectiveness of an improved French Trench.
6069	A prototype system for moving cars around around a track using electromagnetics
6077	A Novel Solar Powered Photobioreactor Design for Waste Water Treatment and Producing Biofuel From Micro-Algae
6085	Creation of a Fresnel Lens Array for use in Water Purification
6095	Novel Creation of a versatile, low-cost water purification system via a graphene oxide-TiO ₂ composite membrane with incorporated electrified nanostructures
6096	The Rate of Meteors
6097	Biodegradable Plastics using a variety of fruits and vegetables
6099	Algae Balls
6503	Designing a High Efficiency and Low Cost Wind Turbines bu Utilizing Organic Solar Panels made from Rosa Canina
6505	Determining the Effects of Different Products on Desalination
6507	Environmentally Friendly and Low Cost Usage of Naturally Extracted Dyes from Organic Materials to Produce Renewable Energy at Efficient Rates
6511	A Feasibility Study of Portable, Ground-Based Ice-Penetrating Radar to Resolve Cartography Deficiencies.
6512	Using Plants to Reduce Atmospheric Carbon Dioxide
6513	Designing an Efficient Method of Collecting and Recycling Ocean Debris through the Use of Uniquely Shaped Containment Booms.
6514	The Existence of a Volcanic Season
6516	The Use of Carbon Nanotubes for the Filtration of Heavy Metal Ions From Water

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Sustainability

Project Number	Title
1001	The Effect of Different Liquids on Plant Growth
1005	The effect of organic and non-organic compost produced by vermicomposting with eisenia foetida on the growth of lycopersicon lycopersicum.
1007	Do different water types affect plant growth?
1009	Bridge Strength
1014	To Hatch or Not to Hatch: Brine Shrimp & Pollution
1017	The Impact of Acidic Water on Germinating Mung Beans.
1019	Pill Bugs On Mars?
1022	Acid Rain in Wilton, CT
1023	The Trilogy of Light: Fluorescent, LED, Incandescent
1024	The Effect of Different Heating Sources on How Fast Water Can Reach Boiling Point
1025	Survive with Salt Water
2001	The Effects of Wi-fi on Plant Growth
2003	The Effect of pH Level on the Growth of Algae
2005	Endomycorrhizal and Ectomycorrhizal Fungi and the Effect on Plant Communication Through the Common Mycelial Network
2007	Do different sources of light affect the rate a plant transpires?
2009	What liquid germinates seeds the fastest?
2010	"Pore" My Way to Cleaner Water: The use of flocculants and porous ceramic pots for purifying drinking water in developing countries
2011	The Effect of Acid Rain on the Growth of Tennessee Green Pod Bean Plants
2013	What is TDS? Are you drinking it?!
2014	Operation Jason
2018	Curious Cuttings
2021	Nothing but algae and duckweed
2022	Which insulated bag lasts the longest?
2024	The Effects of Cell Phones on Narcissus Papyraceus Growth and Color
2026	Killing Blackspot: An Organic Struggle
2027	How Does Water Impact Plant Growth?
2028	Lets help plants grow!!!
2031	Hypoxia in Long Island Sound
2032	Weed Control: Walnuts to the Rescue!
2034	All About That Bait
2039	Novel Bioluminescent Display using Aliivibrio fischeri for efficiency and low cost
2502	Toxic Chemicals Found In Detergents
2505	Brine Shrimp Hatching
2507	Aqua-Life
2511	Analysis of Increased CO2 levels in Ocean water and Effect on Crustaceans' and Bivalves' Growth
2512	A Battery That Makes Cents
2514	Contemporary Bioremediation
2515	The Impact of Acid Rain on the Flora of the Environment
2516	Effects of different levels of electromagnetic fields on a variety of grasses and their nutrient content
2517	Aquaponics: The impact of combining agriculture and aquaculture techniques on plant germination and growth.
2519	Who's Got The Biggest Bubbles?
2521	Electric Energy Production In A Bio-fuel Cell For Varying Electrogenic Bacterial Samples

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Sustainability

Project Number	Title
2522	Microwave Radiation
2523	Not Organic? Don't Panic!
2524	An Investigation of the Ingestion of Microscopic Plastic Particles by the Blue Mussel, <i>Mytilus edulis</i>
2531	Water Types and Plant Growth
2532	How Much Organic Material Can Earthworms Decompose?
2535	Optimizing Methane Oxidation by Methanotrophs Through the Engineering Application of Different Environments
2538	The Effect of Household Acids and Bases on the pH of dirt.
2539	The Impact of Different Water Pollutants on Biological Health Indices
2541	Inexpensive Treatments for Plants Affected from Contaminated Soil by Oil Spills
2544	Fruit Fly Fatality
3002	The Effects of Atypical PH on Bay Scallops (<i>Argopecten irradians</i>)
3003	Antimicrobial Activity of Lichen Extracts
3008	Accuracy of DNA Barcoding in the Plant Kingdom
3009	Novel Ultrasonic-Induced Antibiotic Deterioration of <i>Borrelia</i> Biofilms for the Treatment of Chronic Lyme Disease
3011	Bioremediation of Low Density Polyethylene with <i>S. griseus</i> Bacteria and <i>A. niger</i> Fungi in Sterilized Soil
3013	The Effects of Organic and Chemical Fertilizers on Snails of the Long Island Sound
3015	The Effects of Sulfur Dioxide on <i>Solanum lycopersicum</i> subsp. Tiny Tim and Soil pH in Varying Temperatures
3016	The Carbon Dioxide Sequestration of Lawn Plants
3017	Clinical application of 3D printing technology in cancer radiation therapy: A novel method to improve dose conformity with patient specific treatment aid device
3019	Pollutants and there Detrimental Effects on Shrimp
3020	Effective Optimization of Biogas Production through Alpha-Amylase Utilization
3023	Ocean Acidification and Its Varying Effects Regarding Predatory Response of Coraline Algae
3024	Effect of Brin Concentration on Gettability in Atomisticly Smooth Surfaces
3026	Does seed spacing affect plant height?
3028	acid rain prevention
3032	Enhancing the Collagen Yield from <i>Aurelia aurita</i> through Bio Encapsulated Highly Saturated Fatty Acid Feed
3033	Is it possible to graft the scion of Non-Leguminous Plant (tomato) to the root stock of a Leguminous Plants (soybeans)?
3035	Global Climate Change Affects the Ecosystem by Elevating Carbon and Nitrogen Emissions which Increases Allergies
3037	The Effect of Iron Levels on Marine Algal Growth
3040	Utilizing Piscivorous Birds as Low-Impact Primary Biological Indicators
3041	Remediating Rivalry?
3043	The Effect of the Invasiveness of the Zebra Mussels in Lake Lillinonah
3049	Targeted Release of <i>Moringa oleifera</i> Cationic Proteins from Starch-g-poly (sodium acrylate-co-HEMA) Hydrogels for the Remediation of Aqueous Polychlorinated Biphenyls
3052	The Analysis of Clay Flocculation's Effect on the Benthic Zone Used as a Mitigation Technique for Harmful Algal Blooms (HABs)
3053	The Efficiency of Bivalve Mollusk Filter Feeding in the Long Island Sound
3054	Preparation and Comparison of EGCG-Loaded PLGA and Cellulose Acetate Microparticles for Osteoarthritis Treatment
3055	The Effects of Grey Water on the Germination Rate and Growth of a Variety of Grass Species.
3056	Analysis of Transport of Nitrogen Species through Right-of-way-Bioswales
3060	Biochemical Changes in Corneal Collagen Cross-linking: Nondestructive Analysis by Raman Spectroscopy
3065	The Effectiveness of Plant Material as Metal Chelators
3068	A Study of the Removal of Pollutants by Rain Gardens, a Type of Low-Impact Development Drainage System
3070	The Effects of TBBPA and HBCD Brominated Flame Retardants on Zebrafish Embryonic Development

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Sustainability

Project Number	Title
3072	Identification of Risk Factors for Incidences of Infectious Diseases in Refugee Populations
3073	Determining the Effect of Biofouling on a Restocking System for <i>Homarus americanus</i>
3075	Elevated Levels Of Interleukin-8 in Non-Small Cell Lung Cancers induce Cell Survival During Chemotherapy
3079	Accumulation and Biomagnification of Microplastics in Marine Bivalves and Gastropods
3081	The Effect of Gut Denitrification of <i>Dressina polymorpha</i> on the Nitrate and Nitrite Availability in the Freshwater System of Eichler's Cove, Newtown
3083	Magic Magnets
3087	Natural Dye Treatments of <i>Gossypium hirsutum</i> using several Naturopathic sources in combination with the mordant of Aluminum Potassium Sulfate
3088	Unprecedented Glycerol-Free Biodiesel Production using Enzyme Catalysis
3089	Investigation of Bioremediation and Alkane-degrading Qualities of <i>Alcanivorax Borkumensis</i>
3090	Analyzing Cathode Placement in a Simple Single Vessel Microbial Fuel Cell: Potential Implications for Efficiency and Practical Applications
3093	The Affect of Ocean Acidification on <i>Nannochloropsis</i> sp.
3095	How Grey Oyster Mushrooms Can Be Used To Break Down Oil And Reduce Waste In The Environment.
3096	Temperature-Independent, Portable, and Rapid Field Detection of Ebola via a Silk-Derived Lateral-Flow System
3098	A Self-Sustaining Electrical Shoe Insert for Treatment of Diabetic Neuropathy
3099	3D Printer for Creating Cement Domestic Utilities for Developing Countries
3103	Natural vs. Chemical Cleaners
3105	The effect of nitrate uptake in aquatic plants with varying nitrate exposure.
3108	The Effects of Different Environments on the Germination of Radish Seeds
3110	Hybridized Manganese Dioxide & Gold-Iron Oxide Nanoparticle Inhibition of Tumor Growth via Radiosensitization and Tumor Microenvironment Control
3114	A Novel Antibody-Functionalized Graphene Transistor Lab-On-A-Chip for Selective Detection of Malaria Pathogens
3116	An Investigation of Superparamagnetic Iron Nanoparticle Hyperthermia to Inhibit Growth of <i>Agrobacterium tumefaciens</i>
3118	Development of Non-toxic Photostabilized Phycoerythrin for Application in Dye Sensitized Solar Cells
3119	Investigating the Growth Rate of <i>Procambarus clarkii</i> under different Environmental Stressors
3122	Disinfection By-Products in Water
3124	The Optimization of Conditions for an Enzymatic Bio-Battery
3126	Phytoplankton's Effect on Ocean Acidification
3127	Making a Portable, Low Cost Hydroponics System
3133	<i>Zostera marina</i> 's Effect on Carbon Dioxide Levels in Long Island Sound and Predicted Effects
3135	Impact of Geometrical Structure on the Durability of Stereolithographic Sea Turtle Shell Prototypes
3501	The Turbidity of Water Affects the Health of Aquatic Ecosystems
3502	Temperature Rising: Exhausted Efforts
3503	The Effect of the Angle of Solar Radiation on Plant Growth
3504	Maintaining a Better Society by Decreasing CO2 Levels Through the Growth of Large Trees and Plants
3505	DNA Barcoding to Detect Mislabeling and Endangered Species in Turtle Meat
3506	Plant Growth Research
3507	Use of <i>Saccharomyces Cerevisiae</i> and Biosorption in the Purification of Industrially Polluted Waters
3509	The Effects of Seed Priming
3510	The Designing and Application of the Single-Cell Immunoplex Device
3513	The Effect of Prescribed Burns on Soil Nutrients
3515	Manure to Methane
3516	The Effect of Soil Alkalinity on the <i>Lycopersicon Esculentum</i> (plum tomato)
3517	DNA Barcoding of Invasive Species on a Suburban Campus

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Sustainability

Project Number	Title
3518	Using Fall Foliage as an Alternative for Paper Production to Reduce Deforestation
3519	The Effect of Reduced pH on Submerged Aquatic Vegetation
3520	A Natural Way to Keep Insects Away by Using Various Essential Plant Oils as an Organic Insect Repellent
3521	The Effect of pH Levels in Presoaking Liquids on Fruit Dehydration Duration
3522	Desalination by Portulaca oleracea: Maintaining and stabilizing overall growth and production of Omega-3 Fatty Acids
3523	The Thermal Stress Of A Coenbita Clypeatus(Land Hermit Crab)
4001	The Hard Truth About Water Hardness: Which body of water is the healthiest (in Water Hardness)?
4003	Analysis of Safer Electroplating Metals and Electrolyte solutions with their Environmental Impact
4006	Meltdown
4008	Investigating Novel Methods to Harvest Solar Energy for Generation of Solar Steam from Salt Water and Snow Using Graphene and Carbon Foam
4011	Fore!
4013	Power Brace: A leg brace designed to help the victims of Duchenne Muscular Dystrophy and other diseases walk and stand in every day life
4014	Hydroelectric Energy
4015	Ramps, Textures, and Cars, Oh My!
4016	What is the Best Ice Insulator?
4017	The Sensing Cane
4019	Analysis of the Extraction of Proteins from Under Utilized Resources and Their Nutrient and Bioavailability Values
4021	Keep Out! : An Animal Proof Garden Enclosure.
4022	A science fair project on how a trebuchets arm length affects the projectile distance.
4023	Wind Power: How the Shape of the Blade Affects the amount of Power Produced.
4024	A New Type of Energy in Cars
4025	Installing a Wind-gust Turbine to generate energy to power highway lighting or to see the Power Grids.
4026	Structure Vs Nature: The Effect of Landslide Duration on Different House Structures
4027	Shape Affects Speed
4028	Does your shirt have your back: A study of clothing features that protect against UV light
4029	Incorporating the Flutter Effect in Flags to Produce Energy
4030	To Melt or Not To Melt: Using Natural Materials As Insulators
4033	BabyBot: Creating a Robot to Soothe a Crying Infant
4034	The Designing and Testing of a Self-Constructed Aircraft
5001	BOBS (Baby on Board) System
5002	How much air is needed to allow a weighted structure to rise?
5003	Do Wheels Increase Distance On a Trebuchet?
5004	The Effects of Boiling on the pH and nitrite Levels of Water
5005	Parachutes: Does Size Matter?
5006	A Test of Batteries
5007	Changing the Water Content in Soil to Generate Electricity in form of an Earth Battery
5008	Crossing the Gap... But With What?
5009	The Impact of Turbine Blades on Power Output
5012	Die sensitized solar cell
5013	Build a raft powered by surface tension
5014	Can The Weight of a Car be Accurately Weighed by Using an Air Pressure Gauge and a Ruler?
5015	Salt Water Floating Food Production using low cost desalination techniques.
5016	The Effect of Water Depth and Beach Surface on the Onshore Height of a Tsunami

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Sustainability

Project Number	Title
5018	Heat Output
5021	Rust A Bunch
5022	Cu at the Bottom
5023	Which Variables Affect The Flight Of A Rocket?
5025	Can You Taste the Difference Between tap and spring water?
5026	The Power of Wind
5028	Which Metal Will Corrode the Fastest?
5029	Sound Barriers: How does the type of material affect the amount of sound that carries through a surface?
5030	Opening a Garage Door with Raspberry Pi
5031	Design and Build a working Hovercraft
5032	Maximizing the Energy Output of a Wind Turbine
5033	Changing the pH of Soil to Generate Electricity in the Form of a Microbial Fuel Cell
5034	Wood Toughness
5035	Keepin' Warm
5037	Using Different Plant Xylem to Filter Phosphates
5038	Frozen
5040	Effectiveness of Fertilizer Application Techniques in Reducing Fertilizer Runoff and Pollution
5041	Free Energy
5042	Drone for Science
5043	A Matter of Facts: Designing a Math App to Help Kids Learn Their Math Facts
5044	What is the most effective treatment for melting ice?
5045	Can Biomass be used as a Renewable Energy Source
5046	The Effect of Different Temperatures on the Strength of a Magnet
5048	Let's Beet Slippery Roads
5051	Which Bridge Design Is Best?
5052	Does the Number of Fins on a Rocket Effect How Long It Stays in the Air?
5054	Development of a technique to detect explosive residue for use in avoiding terrorism threats.
5055	How Do Environmental Conditions Affect the Performance of Duct Tape?
5056	Electromagnetic Energy and Innovative Applications
5057	What's in this water?
5058	The Voltage Changes from Different Wavelength Radiations on a Solar Panel
5060	Ice Matters
5063	How Accurate can your Local Weather Applications Be?
5501	Fired UP!!!
5502	Water Filtration and Flocculation Methods
5503	Evaporation Rate Of An Ice Cube In Liquids With Varying Densities
5504	Green Energy Ferris Wheel
5505	Does temperature matter?
5506	Effect of Blade Angle and Wind Angle on Rotation Speed of a Home-Built Wind Turbine
5508	The effects of cloud coverage on the out put of solar panels
5509	The Effect of Using Foam to Create a More Sophisticated Highway Barrier on Lessening the Spike of G-forces During an Impact
5510	Hovercraft
5512	Design, build and program a robot using an Arduino Mega 2560 R3 through an Android app to cheer up or relax children at a hospital

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Sustainability

Project Number	Title
5513	HOW TO INSULATE YOUR HOUSE AND REDUCE YOUR FUEL BILLS
5514	Substitution of Metals in a Salt-Water Engine to Increase Energy-Efficiency
5515	Measurement of Tensile Strength of Various Wet & Dry Woods
5516	Home-Made Particle Accelerator
5517	Burning Biofuels: An Alternate Form of Energy
5518	Strength Of An Electromagnet
5519	Instrument Science: Bell Flares
5522	Thermodynamics of the Stirling Cycle: Testing the Effects of the Relative Temperature Difference on Stirling Engine Output
5523	Power Wind
5524	Are soccer balls affected by air pressure?
5525	Solid Ground?
5526	Do expensive basketball sneakers outperform inexpensive basketball sneakers?
5528	Efficiency of Piezoelectric Materials for Electric Production
5530	What's Shaking? - A Study of Soil Liquefaction
5531	Gauss Launcher Efficiency
5535	Thermoelectricity Phenomenon
5536	Tap Water vs Bottled Water- Is There a Difference?
5539	Weather Conditions And Its Effect On Football Pressure.
5541	Spot On! The Use of the Visible Electromagnetic Spectrum to Determine the Effectiveness of Stain Removers
5543	The Performance of Greener Alternatives vs. Standard Hydraulics Fluid
5545	Using Induced Wind Force to Increase the Efficiency of an Electric Vehicle Battery
5546	Is Your House Radioactive?
5548	Making Music Louder Without Electricity
5549	The Effect of Catapult Arm Length on the Distance the Projectile Travels
5550	Evaporation Situation Part II: A Study of the Evaporation Rate of Water
5551	UV-C Lighting As A Supplemental Method Of Preservation In Refrigerators To Reduce Energy Consumption
5552	How can I make my own rubber pointe shoes?
5553	Effect of different soil types on Hyacinth plants.
5555	Powerful Propellers
5557	Injury Reducing Characteristics of Running Shoes Using Innovation and Design
5559	Soaking it Up?
5560	Energy Scavenging--Proving the Seebeck Effect with a Homemade Thermoelectric Generator: A Source of Free, Sustainable, Low-Voltage Power
5561	Fireplaces - To Heat Or Not To Heat, That Is The Question!
5562	Shrouded Wind Turbine and the Venturi Effect
5563	Conduction Junction
5565	The Universal Soccer Shoe
5567	Super Suds
5569	Spandex: Speedy or Spendy?
6001	Drone-based, Tropospheric Gas Collection for use in Air Quality Monitoring
6002	Developing an Alternative Technique of Mechanically Exfoliating Topological Insulator Bismuth Telluride
6003	Boiling Water with Nano Particles.
6004	The Effects of Thickness of Steel, Ball Bearing Size, and Drop Height of Ball Bearing During Dent Resistance Testing on Galvanized Steel versus Aluminum-Alloy.

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Sustainability

Project Number	Title
6005	An Optically Self-Healing Metallo-Supramolecular Polymer Encapsulated UV-NIR Organic Solar Cell for Transparent Energy-Harvesting and Electronic Skin Applications
6006	Low Temperature Thermal Cracking of High-Density Polyethylene via Zeolite and Pillared Clay Catalysts
6007	The effect of snow and ice thickness on the winter respiration Carbon Dioxide output
6008	Study to Improve the Constraint of Ultra-High Performance Concrete Double-T Bridge Girders by Adjusting the Architecture of Steel Fibers in the Web
6011	Application of the near-IR Luminescence Property of Egyptian Blue and related Alkaline Earth Metal Copper Silicate (MCuSi ₄ O ₁₀ -BaCuSi ₂ O ₆) in Infrared Technology (IR)
6013	Chemical Looping Combustion: A Zero CO ₂ Footprint Energy Conversion Process
6015	Synthesis of an Electromagnetically-Controlled Corn-Starch/PVA Biopolymer Microstructure for Extended and Targeted Drug Delivery
6016	More Holes More Goals
6017	Size Variation In Ichthyornis from Humeral Articulation Measurement
6018	A Novel Approach to Increase the Power Efficiency of a Wind Turbine with a Shroud and Diffuser Design
6019	Maximizing the Efficiency of Passive Solar Energy
6020	Printlet (combination between a printer and a tablet)
6021	Measuring the Feasibility of an In-Home In Situ Carbonation Device Utilizing Calcium Rich Basalt
6023	A Comparative Analysis of Rotating Solar Cubes vs. Horizontal Solar Arrays
6024	The effects of highly reflective material to be use for housing and their ability to mitigate global climate change.
6026	Investigation of a Bacteriorhodopsin-Pt/TiO ₂ Hybrid System for Enhanced Nanophotocatalytic Production of Hydrogen
6027	Financially Superior Energy Source for Subterranean Inhabitants
6030	Electrically Independent, Low Cost, Self-Filling Water Bottle for use in Water Locked Regions
6031	Biodiesel: The Fuel of the Future
6033	Harvesting Energy Through Key-Strikes Absorbed by Piezoelectric Sensors
6034	The Synchronous Rotation of the Eris/Dysnomia Binary System
6035	The European Centre for Medium Range Forecasts verses the Global Forecasting System
6036	Using Peltier and Thermoelectric Principles for Humanitarian Applications
6037	The Effect of 2-dimyristoyl-sn-glycero-3-phosphocholine (DMPC) Dillutions on Nanoparticle Radius Using Small Angle Neutron Scattering (SANS)
6038	Uses and Application of thermocouple in space exploration
6039	Optimization of Reflectivity of GaN for Solar Applications
6040	Gender-Specific Copepod Susceptibility to Phytoplankton Neurotoxins at Various Concentrations
6041	Using a Hydraulic System and a Heat-Induced Magnetic Adhesive to Create a Manipulatable Array that Increases the Efficiency of Piezoelectric Generators
6042	Biomimicry of Whale Fins
6043	Physical and Cost Optimization of a Human Powered Axial Flux Generator for use in Electrically Isolated Environments.
6044	Creation of a Predictive Model of Climate Change Impact Through Ensembling of a Variety of Artificial Neural Netowrks
6045	Graphene Solar Cell
6046	Sequestration of Carbon Dioxide by Lithium Orthosilicate in a Clay Body in Ambient Air
6047	The Effect of Different Checkerboard Sizes on Steady State Visually Evoked Potentials
6048	Is The Money Worth It?
6050	Using wastewater to reclaim energy
6051	Revolutionizing A 16th Century Product For The Modern World: A Thermoelectric Chair That Creates Energy From The Human Touch
6052	Enhanced Organic Solar Cells Using 3m Micro Prismatic Technology
6054	A field study on the widespread effect of three viruses on the domesticated honeybee, the Apis mellifera
6055	A Novel Method of Controlling Size of Carbon Nanotubes

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Sustainability

Project Number	Title
6056	A Field Study Analysis of Carbon Fiber Electrode Weaves and Conductors in the Design of Sedimentary Microbial Fuel Cells
6057	The Fire-fighting robot based on artificial intelligence
6058	Move Over Opec/Oil from Biomass
6059	A Statistical Analysis on the Effects of Volcanic Sulfate Emissions on Precipitation Patterns as Analogue for Geoengineering
6060	Hydrogen Fuel Cells: How Electrode Material Affects Them
6061	The Effect of Sunspot Number on Radio Propagation
6062	Ferromagnetism: Using ferromagnetic fluid to control prosthetics
6063	Testing the Effectiveness of an improved French Trench.
6064	Power generation via downdraft of humidified dry air
6065	Low-Cost Solid-State Cosmic Ray Observatory
6066	Biochar Electrodes Incorporated with Cuprous Oxide Substrates to Optimize Solar Cells' Efficiency
6067	Efficient Soundproofing: Design of a System using Multiple Technologies
6068	Evaluation of Several Resonant Power Electronic Converters in Capacitively Coupled Wireless Energy Transmitters
6069	A prototype system for moving cars around around a track using electromagnetics
6070	InMoov: An Independent Study in Mechanical and Electrical Engineering and Computer Science
6071	Designing a Braille E-Book For the Visually Impaired and Blind People
6072	Omni-Directional Maglev Cableless Elevator
6073	Chef NAO: The Humanoid Cooking Robot
6074	Converting Ambient Water Vapor to Potable Drinking Water Inspired by the Shorebird beak
6075	Energy Transfer Using Laser Power Beaming
6076	Novel Approches of Making Human to Robot Interaction Possible for the Handicapped.
6077	A Novel Solar Powered Photobioreactor Design for Waste Water Treatment and Producing Biofuel From Micro-Algae
6078	Exoplanet Discovery: The Transit Method
6079	The Application of Sub-undulatory Locomotion Principles Utilized by Sub-carangiform Swimmers to Increase Submersible Efficiency
6080	A Water-Resistant, Piezoelectric Precipitation Generator; A comparative analysis of mobile v. stationary systems
6081	Reverse Osmosis Water Desalination Via the Harnessing of Perpetual Wave Energy
6083	Engineering of ZnO Tapered Pillar Nanostructures as Antireflection Coatings on Silicon Solar Cells
6085	Creation of a Fresnel Lens Array for use in Water Purification
6087	Application of Manganese-Based Ionic Liquid for Optimized Performance of Non-aqueous / Aqueous Redox Flow Batteries
6088	Impact of the manipulation of the viscosity of ethanol on the particulate matter output and the efficiency of combustion.
6090	The effect of application of a solenoid on the magnetic properties of gadolinium at varying temperatures and current levels.
6092	Developing a tool to repeatably extract cartilage samples: An application of 3-D printing
6093	How does the weight of a wind turbine's blade affect energy production?
6094	The refinement and production of bio-diesel derived from laboratory grown nannochloropsis algae
6095	Novel Creation of a versatile, low-cost water purification system via a graphene oxide-TiO2 composite membrane with incorporated electrified nanostructures
6096	The Rate of Meteors
6097	Biodegradable Plastics using a variety of fruits and vegetables
6098	The Development of an Immunosorbant Assay (ELISA) for detection of IgG and IgA antibodies against Tissue Transglutaminase for the diagnosis of Celiac disease.
6099	Algae Balls
6100	Exploring the Optical Audio Link

Scientific Disciplines Selected by Student

2015 Conn. Science & Engineering Fair

Sustainability

Project Number	Title
6101	Low Grade Waste Heat Recovery and Carbon Sequestration using an Innovative Reverse Electrodialysis (RED) and Pressure Retarded Osmosis (PRO) System
6103	Hardening of electronics and satellite communication systems from sunspots and coronal mass ejections
6502	Heat Retention
6503	Designing a High Efficiency and Low Cost Wind Turbines bu Utilizing Organic Solar Panels made from Rosa Canina
6504	An investigation on the effects of radiation emitted from the three most popular mobile phone operating systems.
6505	Determining the Effects of Different Products on Desalination
6506	Validating the Effectiveness of Biosensor Imaging of Redundant Deviation in Shifts
6507	Environmentally Friendly and Low Cost Usage of Naturally Extracted Dyes from Organic Materials to Produce Renewable Energy at Efficient Rates
6509	Echocardiogram-Based Wireless Left Ventricular Assist Device (LVAD) with Mobile Application Monitoring and Control
6511	A Feasibility Study of Portable, Ground-Based Ice-Penetrating Radar to Resolve Cartography Deficiencies.
6512	Using Plants to Reduce Atmospheric Carbon Dioxide
6513	Designing an Efficient Method of Collecting and Recycling Ocean Debris through the Use of Uniquely Shaped Containment Booms.
6514	The Existence of a Volcanic Season
6515	Exploring the Effects of Ammonia on the Electrical Resistivity of Graphene
6516	The Use of Carbon Nanotubes for the Filtration of Heavy Metal Ions From Water