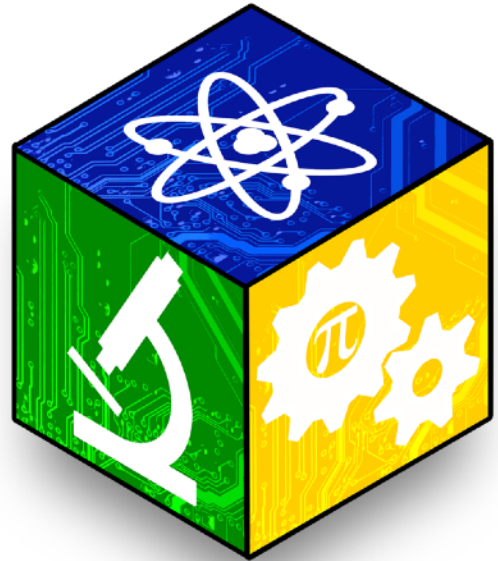


CONNECTICUT  
SCIENCE &  
ENGINEERING  
— FAIR —



**76th Annual Fair**  
**March 4-16, 2024**

**Student Abstracts**

## Fair Categories

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

## Technical Disciplines

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

## Technical Discipline Composites

<b>Biotechnology</b>	<b>AS, BI, CB, EN, ME, MI, PS</b>
<b>Environmental</b>	<b>EV, EM</b>
<b>Engineering</b>	<b>EN, EE</b>
<b>Sustainability</b>	<b>EA, EN, EE, ET, EV, EM</b>

# CSEF Official Abstract and Certification

Word Count

248

2024

Fair Category

LT

Project Number

1001

Title: Does Water Temperature Affect Seed Germination?

Student Name(s): J. Brooks, P. Knowlton, E. Callender

## Abstract:

The purpose of this investigation was to determine how water temperature affects seed germination. This was to expand knowledge and help farmers grow crops more efficiently. This could help have an overall better agricultural growth, and have a better group harvest of crops. The hypothesis was that cold-water temperature would result in better growth.

A planting tray was used to plant the seeds. Dandelion, kidney bean and pea pod seeds were used in the experiment. The seeds were planted individually, except the

dandelion seeds which were planted with a group of six. The seeds were planted 1" deep in the soil. The water temperature was measured by cooling the water if too hot with ice and heating the water that was too cold with boiled water until the cold water was at 2.2 degrees Celsius the room temperature was at 22.7 degrees Celsius and hot water was at 42.7 degrees Celsius. Watering occurred every Monday, Wednesday, and Friday .

In Conclusion, water temperature did not affect seed germination based on height of seed growth. The kidney beans had an average height of 27 centimeters on day 7, the pea pod seeds had an average height of 11 centimeters on day 7 and the dandelions had an average height of 1 centimeter on day 7. The averages were not significantly different than individual results, as seen in the data table. Therefore, water temperature is not something that needs to be considered when identifying most effective ways to germinate seeds.

## 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

Word Count

200

2024

Fair Category

LT

Project Number

1002

Title: Effect Of Essential Oils On Bacterial Growth

Student Name(s): N. Wyse, C. Young

## Abstract:

This experiment proved that essential oils promote the growth of bacteria. The experiment results were surprising because some essential oils have been advertised as healthful additives, while others claim them to be antiseptic. The oils tested were: TerraShield, Cedarwood, Tea Tree, Coconut, Black Castor, and Olive. We began by making a solution of agar powder and water and then microwaved it for 4 minutes. The solution was then poured into 14 Petri dishes and set aside for a day. After the agar had coagulated, 14 cotton swabs were used to gather bacteria from various areas in the room. The cotton swabs were then swabbed onto the Petri dishes. Twelve new cotton swabs were then dipped into each of the 6 essential oils, and then back onto the Petri dishes. Each essential oil was swabbed over the surface of two Petri dishes and then labeled. 2 dishes were left as a control by not introducing essential oils. The bacteria started to grow predominantly in the Petri dishes with essential oils, concluding that essential oils do promote the growth of bacteria. Essential oils tend to contain a variety of secondary metabolites which are capable of inhibiting or slowing the growth of bacteria.

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

BI MI 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

Word Count

250

2024

Fair Category

LT

Project Number

1003

Title: Terra-fic Battery

Student Name(s): L. Layog, G. Santos

## Abstract:

The research investigates the potential of utilizing compost-enhanced soil in Earth batteries as a clean energy resource. The purpose is to contribute to the development of a sustainable and environmentally friendly battery system for off-grid communities and homes. Earth batteries harness the exchange of electrons between zinc and copper electrodes in the soil to generate electricity. This study aims to determine whether regular or compost soil produces more energy, with the hypothesis that compost-enriched soil will result in increased energy production. Materials for the experiment include two jars, one pound each of regular and compost soil, two ice cube trays, galvanized bolts, copper wire, a voltmeter, and screws. The independent variable is the type of soil, while the dependent variable is the amount of energy produced. Controls include the amount of soil, the type of ice cube tray, the number of bolts and wires used per hole, and the number of holes in the ice tray. The procedure involves filling ice cube trays with normal and composted soil, inserting galvanized bolts and copper wires into the trays, and connecting them to create an Earth battery. The voltage produced is measured using a voltmeter. Data collected shows a significant 10% increase in average voltage in the compost sample compared to regular soil. The conclusion supports the hypothesis, highlighting the potential of compost-enhanced soil for increasing Earth battery voltage. Acknowledging potential sources of variability, such as temperature and moisture distribution, the study suggests future experiments with controlled conditions.

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

EV 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

Word Count

89

2024

Fair Category

LT

Project  
Number

1004

**Title:** How Does Temperature Affect the Brightness of Bioluminescent Plankton?

**Student Name(s):** M. Urban, E. George, S. Madera-Guridy

**Abstract:**

The purpose of this project was to find how climate change affects bioluminescent plankton growth. We did this by testing how bright bioluminescent plankton would glow in different temperature water. Our hypothesis is the plankton in the 15 degrees Celsius, (60 degrees Fahrenheit) water will glow the brightest. We measured how bright the dinoflagellates glowed for five weeks in 15 degrees Celcius, 21 degrees Celsius, 26 degrees Celsius, and room temperature water. Based on our results, we found out that the plankton in room temperature water glowed the brightest.

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

AS 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

Word Count

196

2024

Fair Category

LT

Project Number

1005

Title: Growing Radish Plants with Different pH Solutions

Student Name(s): L. Haron, E. Notik

## Abstract:

For our experiment we measured the growth of radish heirloom plants that were watered with different pH solutions. We were trying to figure out which pH solution would produce optimal growth for our plants. We tested 3 solutions, across 30 plants using solutions with a pH of 5, a pH of 6 and a pH of 7. At the end of our experiment, we concluded that the pH of 7 is best for radish plant growth. The plants fed with the pH of 7 solution grew the healthiest and the tallest. The plants grown with a solution of pH 5 were unsuccessful, and grew the least. Originally we thought that the middle group, grown with a pH of 6, was going to be the best for plant growth because based on some research we found that many plants do well with a slightly acidic solution. This middle group was successful and grew well but not as tall as the group fed with the solution of pH 7. In conclusion, when watering your radish heirloom plants the best solution you can use is one with a pH of 7, you do not want a very acidic solution.

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

PS EM 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

Word Count

242

2024

Fair Category

LT

Project Number

1006

Title: Wildfires vs Plants

Student Name(s): M. Quinby, A. Plaz, A. Borodii

## Abstract:

Over the last two years, wildfires have raged across the United States and Canada. After reading several studies, it was indicated that crop production near wildfires had declined by 13% falling 8.3% below the previous five-year average. We decided to test the effects of smoke on the growth of plants by burning incense in a closed container. The hypothesis was that the incense would negatively impact the plants' growth. Three different plants were used: Raphanus sativus (radishes) Poaceae (grass) and Lactuca sativa (lettuce). They were placed in two separate air-tight containers. Three sticks of incense were lit each day in the container designated for smoke. Plants were measured to record how much they grew and watered each day. We found that the smoke negatively affected the plant growth: Radishes, with the control growing 30% more than the smoke plants; Grass, with the control growing 25% more than the smoke plants; Lettuce, with the control growing 32% more. The plants in the smoke container browned significantly after several days because the smoke left a residue that blocked sunlight and caused them to die by the end of the experiment. According to a study by Sotirios Archontoulis, Professor of Integrated Cropping Systems, from the Iowa State University, smoke blocks out sunlight and affects the air that the plants use. Through this experiment, we proved that due to the particles in smoke, it negatively impacts crop production causing higher prices and possibly famine.

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

PS 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

Word Count

223

2024

Fair Category

LT

Project Number

1007

Title: Creating Safe Sunscreens For Coral Reefs With The Best U.V. Protection

Student Name(s): E. Ambrosini, T. Boscarino

## Abstract:

Sunscreens containing octinoxate and oxybenzone, two toxic chemicals, have been found to be harmful to coral reefs. Coral reefs are being affected by global warming and human activities. Coral reefs are important for many things such as flood control, aquatic ecosystem health, and even in finding new medicines. In this experiment, a homemade mineral based sunscreen was designed that includes the active ingredients zinc oxide and titanium dioxide that are proven to not be harmful to coral reefs. Using other ingredients, the sunscreen was tested for its UV protection using SunPrint paper which goes through a chemical change when exposed to sunlight. The sunscreen was placed on SunPrint paper and exposed to sunlight for a period of time. When this paper is exposed to sunlight it turns blue. The amount of UV penetration was measured by rating the amount of white color left on the paper. It was compared to other sunscreens on the market, as well as those with octinoxate and oxybenzone. Through conducting the experiment homemade sunscreen with lotion was the best and Sun Bum was the worst. The average protection of Sun Bum is 0.00%, homemade with lotion is 66.67%, Glow sunscreen is 41.67%, and homemade with Aloe is 2%. The homemade sunscreen with lotion had a better overall protection with UV light then any of the other sunscreens tested.

## 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

Word Count

174

2024

Fair Category

LT

Project Number

1008

**Title:** Air Purifier that Effectively Removes Air Toxins - PM 2.5 and Formaldehyde

**Student Name(s):** A. Arias-Paulino, K. Roy, S. Sivasundar

**Abstract:**

The purpose of this project was to help eliminate air toxins using an air purifier. The main inspiration for this project was the fact that most of the world now suffers from air pollution due to multiple hazardous chemicals such as PM 2.5 and HCHO. This project was conducted to identify which material combination and structure has the best result when purifying air toxins. The proposed solution was to create a purifier using different material combinations of fiberglass, wool, and charcoal. All purifiers were purposed to test the efficiency of different materials in the purification of air toxins. When charcoal and fiberglass were combined to purify the air, they were the most effective for air toxin removal compared to wool and fiberglass. In generations 3 and 4, with the fiberglass and charcoal, the design solution was nearly successful, unlike the first 2 models containing fiberglass and wool. Although healthier PM 2.5 and HCHO levels are recommended to maintain complete safety, these results were closest to the healthy air levels compared to the other generations.

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

EM 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

Word Count

149

2024

Fair Category

LT

Project  
Number

1009

Title: Can you detect Artificial Intelligent generated Text from Human Generated Text?

Student Name(s): A. Philogene, K. Lilley

## Abstract:

In today's world our reliance on technology grows exponentially every day. As our dependence on technology grows one part that has made its way into our lives is the use of artificial intelligence (AI). The use of AI in the classroom, workplace, or even our everyday conversations creates a situation of how we distinguish between AI written material and human written material. In our experiment we put this idea to the test. Our subjects were given three AI written texts about three different subjects and human written texts on the same topic to see if our subjects could detect the AI generated text. What we found was that it was difficult to decipher one from the other. While the texts were displayed next to each other in a survey format there was almost a 50% split among the subjects on which text was either AI or human written text.

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

BE CS CBIO

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

Word Count

235

2024

Fair Category

LT

Project Number

1010

Title: Which salt is best for hatching brine shrimp?

Student Name(s): D. Raich, S. Pachter

## Abstract:

Our experiment aimed to see which salt is best for hatching brine shrimp. Using an efficient salt to hatch brine shrimp is important to our world today because many animals, including fish and birds, rely on brine shrimp as a part of their daily diet. Brine shrimp can survive in very harsh environments that other aquatic animals cannot live in, which means that they grow quickly in population. For our experiment, we used four salts: Epsom salt, sea salt, potassium chloride salt, and aquarium salt. Since brine shrimp thrive in high-sodium water, we hypothesized that the aquarium salt, which is high in sodium, would be the most effective option. To start our experiment, we added 1 tsp salt and 1/8 tsp brine shrimp to a mason jar filled with 82°F water. We connected an air pump to the tubing, and inserted the tubing into the jar for our experiment. Forty-eight hours later, we tested the hatch rate of the brine shrimp. Our experiment was conducted over four weeks. We were amazed to learn that Epsom salt did the best of all the salts, with a result approximately 7% higher than sea salt, which came in second. In conclusion, we believe that this information will be valuable for businesses seeking to breed a large quantity of brine shrimp. Epsom salt is a more affordable option compared to aquarium salt, which is significantly more expensive.

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

AS 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

Word Count

243

2024

Fair Category

LT

Project Number

1011

Title: Do Energy Drinks Affect Microbe Growth?

Student Name(s): D. Bernier, L. Vidaal, W. Goodman

## Abstract:

The purpose of our experiment was to find out if energy drinks negatively affect microbe growth. If this is true, it would help us figure out if it affects the human body. The drinks tested were Ghost, Monster Energy and Celsius. The ratio used for the control was 10 grams of agar powder to 200ml of water. For energy drinks it was 10 grams of agar powder to 200 ml of energy drink. We swabbed bacteria from different locations around our school. The petri dishes were put in a warm, dry place and we left it for three days. For Monster Energy, one petri dish had 5% bacteria growth and the other 4 had 0% growth. Zero out of 5 petri dishes containing Ghost had bacteria growth. The 5 Celsius petri dishes showed a range of 10%-20% growth. Meanwhile, the control had the most microbe growth which was 4 types of bacteria; 3 out of 5 petri dishes had 100% bacteria growth. One petri dish had 25% microbe growth and the last had 0% bacteria growth. When we started this experiment, our hypothesis was that energy drinks with the most preservatives would limit growth. Preservatives proved to be unhealthy and often are unregulated by the FDA. Preservatives are found in most junk food, juice and sauces, they essentially make food last longer using mostly unregulated chemicals. Our hypothesis was correct because the drinks with the most preservatives grew the least amount of bacteria.

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

MI BI 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

Word Count

222

2024

Fair Category

LT

Project Number

1012

Title: Do Plants Absorb Acidic Precipitation?

Student Name(s): S. Borjas, I. Mendenhall

## Abstract:

Pollution and the resulting acidic precipitation are a growing issue all over the world, and it is negatively affecting humans, plants and animals. This experiment examined how plants absorb acidic precipitation. Cilantro, Lettuce and Arugula were used because of their quick germination time. To make our "acid rain", we will dilute distilled water with Sulfuric Acid to mimic airborne sulfuric dioxide falling to the ground as acidic precipitation. (Sulfur Dioxide is one of the most common chemicals causing acidic precipitation). All the plants were watered with pure distilled water for 2 weeks. Afterwards, we split the plants into two groups, one continued to be watered with pure distilled water, and became our control group. The other was watered with our "acid rain," and is our acidified group. After one week of watering with acidified water, harvested all the plants from both groups and chopped them up into small portions. We made tea bags using cheesecloth and steeped the plants in distilled water for five minutes. We measured the pH of the "tea" water, and our hypothesis was disproven. The pH of the water was within the 6.00 -7.00 range, indicating that acidified water did not affect the plant's pH level. Going forward we intend to study the effect of acidified water, based on pH level, as to plant height and germination rate.

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

# CSEF Official Abstract and Certification

Word Count

194

2024

Fair Category

LT

Project  
Number

1013

Title: Homemade Fertilizers affect on Plant Growth

Student Name(s): I. Shiralkar, A. Zaloski, I. Diaz

## Abstract:

The purpose of this project was to help farmers plant food in the winter faster and more efficiently. This study answers the investigative question of How do the Different Types of Homemade Fertilizers affect the Plant's Growth. We hypothesize that wood ashes will help the plant grow the best because it fertilizes the plant and it has a lot of the nutrients that a plant needs. There are 5 trials for every fertilizer, water (control), egg shells, coffee grounds, and wood ashes. Each plant receives the same amount of fertilizer and the same amount of light (sun). The plants are fertilized every Tuesday, and plants are measured and made an average of all of the heights for each fertilizer. Plants are watered every other day. After week 5 the plant with Eggshells grew the tallest because those plants were being fed calcium carbonate. Coffee grounds came in 2nd, the Control was 3rd and the plant with wood ashes grew the least. In the end, our hypothesis turned out to be wrong and the complete opposite happened. We thought that wood ashes would be on top because it has multiple nutrients that a plant needs.

## 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

Word Count

235

2024

Fair Category

LT

Project  
Number

1014

**Title:** Growing Pleurotus Ostreatus Mycelium with Full Synthetic Engine Lubricant to Create Biodegradable Alternatives to Supersede Environmentally-Harmful Substances

**Student Name(s):** A. Gupta, G. Kaimal

## Abstract:

Thousands of oil spills happen every year, ranging from fuel leaks to tanker explosions. Unfortunately, the current methods used to clean oil spills often cause more harm to ecosystems. The main objective of this project is to utilize the mycelium of Pleurotus Ostreatus (Oyster Fungus) to naturally degrade oil contaminants. Additionally, this project aims to explore the potential of Pleurotus Ostreatus as a sustainable alternative to non-biodegradable substances. We divided a mix of mycelium (Pleurotus Ostreatus) and substrate (hemp hurd) into two parts to create a control group and an experimental group. We mixed the control group with water and the test group with a 50-50 mixture of oil and water. After the mycelium finished growing, we neutralized it by heating it to 200 degrees Fahrenheit for 45 minutes. This brought the mycelium to a polystyrene foam-like consistency which we tested to be durable and compressible. Comparing the success of mycelium grown with part motor oil to a group grown without it let us methodically assess the impact of motor oil on mycelium growth. The ratio of the weights of the test mycelium to the control mycelium is approximately 8:9. This confirms that the mycelium absorbed the denser oil and as a result was heavier. This is an environmentally friendly way to convert devastating spills into a material with the potential to replace polystyrene foam, a substance that has adversely impacted countless ecosystems.

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

MI EA 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

Word Count

149

2024

Fair Category

LT

Project Number

1015

Title: Can Ultraviolet Light Be Used To Detect Ticks On Human Bodies?

Student Name(s): P. Sullivan, E. Johnson, A. Pember

## Abstract:

This investigation will determine if ticks can be identified with UV light because ticks have fluorescent properties. This experiment will investigate if it is possible to detect ticks on the human body. It has been found that ticks exhibit fluorescent properties. This will be tested by shining ultraviolet light on simulated ticks. The tick will be detected when the test subject puts their hand in a plastic bag. The subject will put their hand into the bag first without a "Tick" and then with a "Tick". This experiment will determine if fluorescence can be detected in particles that range from 2-5 milliliters, equivalent to the size of the deer tick (*Ixodes scapularis*) The design of this investigation will be to create a detection system on phones to detect ticks. In conclusion, the "tick" was able to be identified with ultraviolet light. These results were consistent with the experiments hypothesis.

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

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

Word Count

251

2024

Fair Category

LT

Project Number

1016

**Title:** How Long Does it Take for Mold to Grow on Different Types of Bread  
and Why?

**Student Name(s):** A. Banker, T. Mroz, G. Kelly

**Abstract:**

Research has shown that consuming large amounts of preservatives in bread can cause harmful side effects such as respiratory and skin irritation and obesity. We wanted to investigate how long it takes for different brands as well as different types of bread to grow mold and to see why some grew mold and some did not. We hypothesized that cornbread and gluten-free bread would grow mold the fastest because they have fewer preservatives. We exposed ten types of bread to mold spores. We put them in bags and let them sit for two weeks so they have time to grow mold. Our results showed us that more than half of the bread did not grow mold after 30 days. Normally bread should begin molding soon after exposure to the air, but most of the bread did not mold at all. We suspect this because of the high concentration of preservatives. The bread that did grow mold held little to no preservatives in them, with the majority being produced in a local, small bakery. We did have an outlier in the experiment. The ciabatta grew mold the quickest, although it contained three preservatives. A potential reason is that it might have been in the store for a long time. Preservatives are added for extra shelf life and to reduce costs. However, are the savings worth the health risks in the American diet? In conclusion, even though these breads might grow mold faster, they are healthier, as they may have less preservatives.

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

EA 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

Word Count

230

2024

Fair Category

LT

Project Number

1017

**Title:** BEAT THE PEAT - RICE HUSK, THE SUSTAINABLE AND ECO-FRIENDLY ALTERNATIVE TO PEAT MOSS

**Student Name(s):** K. ROKKAM, S. BALAJI

**Abstract:**

Approximately 4% of global CO<sub>2</sub> is emitted from harvesting peat moss, which is used for soil amendment. Harvesting peat from bogs, Earth's largest carbon sinks, also ruins natural habitats and disturbs the Ph of water bodies. Our hypothesis was that Rice Husk (RH) would be a more sustainable and eco-friendly alternative to Peat Moss (PM). Our research process involved comparing their physical, chemical, and biological attributes. First, microscopic examination showed that RH and PM had very similar physical properties such as open connected pores and microcracks leading to good permeability, water holding capacity, and aeration. Next, 5 different soil mixes containing different % of RH were created and compared with 2 controls i.e. soil alone and MiracleGro, as MiracleGro contains peat. Of the 5 RH soil mixes, two maintained optimal Ph (6.5-7.5) and three maintained optimal moisture levels (4-7 scale) and fared favorably versus controls. RH mixed also fared better on two additional metrics, Available Water and Water Holding capacity. Similarly, soil testing showed RH soil mixes faring better for Phosphorus, Nitrogen, and Potassium, nutrients necessary for chlorophyll production and root health. Finally, real world biological evidence collected by growing fenugreek and mustard in the RH soil mixes and controls over a two week period revealed that the RH based plants outgrew controls, in the number of sprouts and in inches grown, and conclusively proved that RH Beats The Peat.

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

BI 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

Word Count

216

2024

Fair Category

LT

Project Number

1018

**Title:** What Types of Locations Produce the Highest Bacterial Colony Counts at our Local Elementary School?

**Student Name(s):** H. East, S. BunkerCai

## Abstract:

The purpose of this experiment is to find where the microorganisms in the school might be a concern for cleaning and hygiene. The prediction is that the dirtiest place in the school would be under the bleachers in the gym because there is visible dirt, it is rarely cleaned, and things fall down there. The cleanest places in the school would be the places that are cleaned regularly. The cleanest places are outside because they are cold and rained on, making it harder for the colonies to grow.

For this experiment, 40 nutrient agar petri dishes were prepared, labeled and swabbed for 30 seconds each at different locations over several days, 2 locations per dish for a total of 80 trials. Dishes were incubated and photographed at days 1, 4 and 6. Numbers of colonies were counted from each photograph and recorded in the data notebook then graphed.

The outdoor hypothesis was mostly supported. Places under the bench were not supported. The gaga ball was the 2nd highest because it's usually covered in dirt and mud. The outside air was also very high. The chicken farm near the school makes the outside air "stinky". The hypothesis for the not regularly cleaned sites were supported because the colonies there had a large amount of bacteria and fungi.

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

MI ME 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

Word Count

182

2024

Fair Category

LT

Project Number

1019

Title: The Effects of Different Water Plants on Water Nitrate Levels

Student Name(s): S. Suda, C. Dodoo, S. Pacheco

## Abstract:

Revealing the different nitrate water levels found after three days of testing 3 different water plants, The purpose of this project is to find the water plant that was most effective on nitrate levels. The research question of this project is “What are the effect of different water plants found in lakes on levels of contaminated nitrate water.” The hypothesis is if there is Water Lettuce in Nitrate Water, then we will see how fast the Water Lettuce will clean out the nitrates from the water the fastest. Each day, a plant was placed in each water plant listed inside the nitrate filled water cups. (repeated for 3 days). The results that were collected were that nitrate water had an average of 500 ppm, the Duckweed and Water Wisteria both had an average of 333 ppm and finally that Water Lettuce had an average of 283 ppm. In conclusion the water plant that was most effective on removing the nitrate water levels was the Water Lettuce. This is because Water Lettuce is able to remove nitrates in water in under 18 hours.

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

Word Count

238

2024

Fair Category

LT

Project Number

1020

Title: Biodegradable Hydrogels: Improving our Agriculture's Sustainability

Student Name(s): S. Janiga, A. Deener

## Abstract:

Water wastage is a large problem in agriculture. Due to only 3% of water on Earth being freshwater, we cannot afford to waste any. But, in farming water often evaporates, leaving plants with less water than they need to grow. In our experiment, we wanted to figure out if biodegradable hydrogels could help reduce water waste, to grow a healthier plant.

To test our hypothesis, we watered bean plants three different ways: one salt water plant, one control that we watered with tap water, and a plant we watered with normal tap water but added hydrogel liquid to it. By watering each plant with less than the recommended amount of water, we would see which substance maintained the health of the plant best. We knew that if our hypothesis was accurate, the plant with the hydrogel would grow the tallest and healthiest despite having less water than the bean plants were said to need.

After looking at our data, we concluded that biodegradable hydrogels are helpful in promoting faster plant growth. The plant that had hydrogel liquid grew the most, and was the healthiest. By using biodegradable hydrogels, we were able to prevent water evaporation, causing the plant to need less water overall.

In conclusion, biodegradable hydrogels are a new and innovative way to conserve water. Through our experiment we learned that hydrogels aid plant growth, and prevent water wastage, leading to a more sustainable agriculture and environment.

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

PS 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

Word Count

234

2024

Fair Category

LT

Project Number

1021

Title: The Effect of Different Soils on Bambusa(Bamboo)

Student Name(s): M. Cerkanowicz, S. Patel

## Abstract:

Due to the increasing amount of greenhouse gasses in the atmosphere, bamboo is a plant that could have a major impact on reducing the amount of carbon dioxide through photosynthesis. We wanted to study which type of soil bamboo grows the fastest. We investigated sand, potting soil, and a mixture of potting soil and sand. We collected bamboo culms and planted them in pots. Each of the three pots held a soil type of potting soil, sand, and a mix of potting soil and sand would be watered according to a predetermined schedule. The bamboo that was in the potting soil grew much more than the sand and the mix of sand and soil.

Further investigations could be done to see if bamboo could be grown faster in potting or outdoor soil. The differences between potting soil and outdoor soil are simple: potting soil has fewer nutrients and is lighter making it easier for the water to travel. The downside to potting soil is that it needs to be fertilized more often. Outdoor soil is denser; therefore, it holds more nutrients and does not need to be fertilized as early as potting soil. Bamboo is starting to be used for all distinct types of clothes such as socks, underwear, shirts, etc. Therefore, helping lower the cost of everyday clothing and could be donated to homeless shelters to support all people living in poverty globally.

## 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

Word Count

251

2024

Fair Category

LT

Project Number

1022

Title: Green Grind: Coffee vs. Chemicals, Which Is Better?

Student Name(s): V. Prabhu, M. Arizu

## Abstract:

The objective of this experiment and our observations was to observe if coffee was a better fertilizer for household plants and home gardens. Chemical fertilizers are proven to cause nitrogen leaching which destroys 50-60% of plants in the soil. We have observed that coffee is a better fertilizer because coffee is rich in essential nutrients that plants need to grow and be healthy. Coffee is especially rich in these five nutrients Nitrogen (N), Phosphorus (P), Potassium (K), Magnesium (Mg), Calcium (Ca), and coffee has these nutrients which makes it a good fertilizer for plants.

One key issue is nutrient imbalance. Synthetic fertilizers often focus on a few specific nutrients, like nitrogen, phosphorus, and potassium, while neglecting other essential elements that maintain soil structure and fertility. This imbalance affects the overall health of the soil and reduces its ability to sustain plant growth naturally. Coffee on the other hand has a lot of the essential elements and nutrients that synthetic fertilizers do not have and has more consistency in containing nutrients than synthetic fertilizers

To see if coffee is a better fertilizer than chemical fertilizer we planted three rows of plants, one was our control group, with no fertilizer or any additives in it. The second row of plants was watered with fertilizer additives where we mixed miracle-gro packets. When we recorded plant growth we saw that the average plant height was much higher than plants watered with fertilizer. Due to this we can see that coffee is a better fertilizer.

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

PS EM 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

Word Count

180

2024

Fair Category

LT

Project Number

1023

Title: How Does Different Liquids Affect Brine Shrimp?

Student Name(s): M. Turner, K. Scott

## Abstract:

For this experiment we wanted to determine which liquid would hatch brine shrimp the best. This experiment would best benefit those who hatch brine shrimp in big batches for fish feed as that is what brine shrimp is meant for. The hypothesis is that the brine shrimp in carbonated water will hatch the shrimp the best.

Take petri dishes and label them; label 4 more dishes. Add Powerade into two, spring water in two and carbonated water in the last two. Label 3 bottles also. Add Powerade in one, spring water one and carbonated water in the last one. Add salt into the petri dishes and bottles. Finally add the brine eggs and give a gentle stir. Then these dishes and bottles under a plant light.

Contrary to the hypothesis, we observed that the brine shrimp in the carbonated water did best by a landslide. Not only this but the experiment was valid given that we did the experiment many times and could be used in real life situations. This helps support the quality of our experiment and overall project.

## 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

Word Count

221

2024

Fair Category

LT

Project Number

1024

Title: Brain Timing

Student Name(s): J. Medina-Calderon, D. Gilmore, M. Profit

## Abstract:

Students are constantly stimulated by competing inputs while learning in classrooms. The goal of this study was to determine if the brain takes longer to process information when confused by multiple inputs. The testable question was “How does adding multiple inputs affect the processing time in the brain? Eleven subjects read aloud the colors of the words matched correctly in the Stroop Control, then incorrectly in the Stroop Test. The same procedure was followed for the Supply Test and Control. Subject’s brain processing time was collected. Results showed that adding multiple inputs caused brain processing time to increase in the Stroop Test and the Supply Test. Average brain processing time for the Stroop Control was 13.62 seconds compared to the Stroop Test average of 22.55 seconds. Adding multiple inputs in the Stroop Test caused an additional average processing time of 8.93 seconds. The Supply Control average was 12.69 seconds of processing time, and the Supply Test average was 26.04 seconds. Adding multiple inputs in the Supply Test caused an additional average of 13.35 seconds of processing time. The results of this study show the brain processes faster when it's not managing conflicting information. The nervous system controls and coordinates the body systems. The brain controls thoughts, emotions, and memories. The prefrontal cortex in the frontal lobe processes inputs and manages thoughts.

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

BE 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

Word Count

246

2024

Fair Category

LT

Project Number

1025

Title: How do Different Types of Grass Effect Soil Erosion?

Student Name(s): S. Dand, K. Capone, A. Calero

## Abstract:

The purpose of our project was to figure out what type of grass best prevented soil erosion. Many floods occur every year, and our experiment will help us understand what types of grass will be best to prevent them. Our question is "How do Different Types of Grass Affect Soil Erosion?" We hypothesized that the Kentucky bluegrass would have the least soil erosion because these types of grass grow on mountains, where they are versatile and can stop soil erosion. Our procedure was to pour four cups of water over the sod we made using the different types of grass. We then measured the soil that had fallen through (grams). The more soil that fell, the more soil erosion that occurred. The Fescue grass had the best results, with only one gram of soil coming out of the tray. On the contrary, the Kentucky Bluegrass had the worst results with an average of 8 grams of soil, and the containers with no grass had an average of 6.5 grams. Although our design ended up successful, our hypothesis was not supported by our experiment. The Kentucky Bluegrass had the worst results because it was unable to strengthen its roots quickly enough, therefore allowing water to pass through. Further study opportunities would be to test more types of plants. We would have more accurate data which would be more reliable. Increasing the amount of water could also improve our project by simulating a flood to be more realistic.

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

PS 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

Word Count

209

2024

Fair Category

LT

Project  
Number

1026

Title: Does Organic or Non-Organic Feed Impact a Chick's Growth or Learning Ability?

Student Name(s): Z. Shamsi, L. Caswell, M. Czerwiec

## Abstract:

The purpose of our experiment was to determine if organic or non-organic feed could affect a chick's growth and learning ability. We chose to do this to determine what feed we should give to our chickens at our school chicken coop. We received the chicks on Thursday, November 29th from a hatchery in California and immediately put them under heat lamps, separated into two cages. After one week, the organic-fed chickens weighed 28g, with the non-organic weighing 30g. However, after 4.5 weeks, the organic-fed chicks weight skyrocketed, exceeding the non-organic chicks.

To summarize, organic feed had a significant positive impact on the chicks' growth after about 4.5 weeks, which was a 20.5% difference from the other group's weight. Through target-training tests, conducted on both the organic and non-organic chicks, we found that their learning ability was not impacted by their food. Unsure why this happened, most evidence points to either the GMO and non-GMO difference in foods, causing the growth hormones or preservatives to differentiate. The amount of fiber, prebiotics, and probiotics in the food given could differ as well. According to the National Library of Medicine "Probiotic fed chicks showed significantly increased performances in body weight" Further research is needed.

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

AS BE 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

Word Count

252

2024

Fair Category

L7

Project Number

2001

**Title:** The effects of different plastic decomposing fungi on rates of plastic decomposition.

**Student Name(s):** F. Sansing

## Abstract:

Since the 1950s, the amount of plastic on our earth has been steadily increasing to unsuitable levels, such that scientists predict that climate-change will reach irreversible levels in only 12 years. However, there could be a cure. Recently, I experimented on fungi. To be specific, three types of fungi that decompose plastics. These fungi are known as the oyster mushroom, the split Gill mushroom, and the petalopsis microspora. My hypothesis was: If it is known that Petalopsis microspora takes only two weeks to decompose plastic, it will be able to decompose plastic faster than the other species. Unfortunately, I was unable to collect data due to an outbreak of Orange Bread Mold. However, from early observations, I can infer that the oyster mushroom would be able to decompose the plastic the fastest. I hypothesize this because the oyster mushroom had shown the most growth in the beginning. Its mycelium had spread the fastest of the three over the grain spawn, therefore, the oyster mushroom would most likely spread over the plastics with its mycelium the fastest, causing it to decompose the most rapidly. However, this is still an ongoing project. In the future, I plan to order a separate culture and compare my findings with researchers around the world. If these findings were applied in the real world and were successful, the human race could almost wipe out plastic pollution. Also, since certain plastic-degrading fungi can survive without oxygen, they could be used in great garbage patches and similar environments.

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

PS 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

Word Count

185

2024

Fair Category

L7

Project  
Number

2002

Title: Which Moisturizer is Best?

Student Name(s): L. Gillis

## Abstract:

My science experiment was to test which brand of skin moisturizer will keep skin hydrated the longest. I did this experiment because I personally wanted to find the results and see which moisturizer lasts the longest. I am testing which brand prevents the most evaporation. I put the same amount of water in each jar with filter paper on top of each jar. I put the same amount of moisturizer on each jar and waited 24 hours for my results. I found out that some brands did really well while others had varying results. With these results I will know which brands will keep my skin hydrated all day long. I found out that the brand that I thought would do the worst actually did the best. It was also the least expensive of all the moisturizers that I tested. I was shocked with the results of the other brands as well. I am glad I did my experiment because it was really fun and interesting to do. I will also know which brand of moisturizer to purchase next time I go to the store.

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

Word Count

240

2024

Fair Category

L7

Project Number

2003

**Title:** The Study of a Novel Toothbrush Cleaning Methods To Decrease Bacterial Surface Growth Using Ultraviolet (UV) Germicidal Light and Mouthwash.

**Student Name(s):** A. Davis

**Abstract:**

The problem I am addressing is that most people clean their toothbrush with water from their sink without realizing that 70% of the bacteria that is in their mouth is still on their toothbrush after use. Oral microbes such as streptococcus and gingivalis live in your mouth which if not properly taken care of will cause illnesses. The experiment being presented will show the most effective methods to clean off these bacteria from your toothbrush testing using mouthwash with alcohol, mouthwash without alcohol, water and a UV germicidal light. In the results of the experiment I have come to find that the most effective method to clean your toothbrush out of 4 different methods is mouthwash containing alcohol. The data shows that the mouthwash with alcohol killed 90% of the bacteria on the toothbrush. The second best method I came to find is mouthwash without alcohol killing 80% of bacteria. The least effective method was UV germicidal light causing there to be 60% of bacteria still left on the toothbrush. Leaving your toothbrush in mouthwash for longer than five minutes may give you a stronger result in bacterial decrease. This proves my initial hypothesis that if toothbrushes stored in a bathroom are rinsed with a water temperature range of 33-120 degrees after usage, then exposed to different storage conditions, concentrations of mouthwash, using UV Germicidal Light Bulb treatments will decrease the population of microbial colonies found in the toothbrush bristles.

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

CB MI 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

Word Count

137

2024

Fair Category

L7

Project Number

2004

Title: Growing algae in different salinities.

Student Name(s): A. Palker

## Abstract:

The purpose of this experiment was to determine the best salinity to grow Tetraselmis, and see if it can grow in less optimal conditions. The hypothesis of this experiment was that the control group would do the best, followed by ten ppt and then fifty ppt. One milliliter of Tetraselmis was added to three bottles of each salinity in optimal growing conditions. After twenty four days, samples of each bottle were collected and counted using a microscope. The mean cell count of each salinity showed that Tetraselmis grows best at normal and ten ppt, and didn't grow well at fifty ppt. This experiment is important because it shows the best salinity to grow Tetraselmis. Tetraselmis and algae related to it can be used for skin care, hatchery feed, farming, plastics, fuel, removing carbon, and many other uses.

## 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

Word Count

241

2024

Fair Category

L7

Project Number

2005

**Title:** Reducing *Lycorma delicatula*, Lantern Fly, Infestation: Using Essential Oils to Address Crop Damage and Food Shortages.

**Student Name(s):** B. Veliu

## Abstract:

*Lycorma delicatula*, or lantern flies, are an invasive species that ruin crops and trees with high sugar contents. Farmers and people are negatively affected by lantern flies destroying crops and trees leading to food shortages and less absorption of CO<sub>2</sub>. A natural repellent to target adult flies can help prevent crop destruction and food shortages. In this experiment, fruit flies were used in place of Lantern Flies since both are invasive and able to destroy crops. Peppermint, lavender, and tea tree essential oils were used to evaluate their effectiveness in deterring fruit flies. The fruit flies were placed in a two-sided choice chamber and various concentrations of essential oils will be placed on one side of the chamber. The essential oils were diluted using vegetable oil since essential oils are insoluble in water. The other side of the chamber was the control chamber and will not have essential oils, only vegetable oil placed on the filter paper lining the chamber. Fruit flies were started at the center of the choice chamber. Data on the number of fruit flies in each chamber was recorded every 3 minutes for 9 total minutes. Three trials for each essential oil was performed. During the experiment, the average amount of fruit flies that went to the peppermint essential oil was 5.37%, tea tree had 6.67%, and lavender had 17%. From this experiment, it can be concluded that peppermint essential oil worked best in repelling insects.

**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

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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

Word Count

194

2024

Fair Category

L7

Project Number

2008

Title: What temperature do legumes fixate nitrogen the most efficiently In?

Student Name(s): K. Harb

## Abstract:

Food waste is a big problem in our society and the world in general. Millions of people starve and are left hungry without any food to eat. If we can make more food, for less cost, then millions of people will be saved. In my experiment, I am finding what temperature Lima Beans grow faster and what temperature they fixate more nitrogen in. Lima Beans are symbiotic with a bacteria known as rhizobia. Rhizobia allows legumes to grow and fixate nitrogen without nitrogen rich soil. Lima beans are very healthy and have nutrients such as potassium and proteins. If I can find a temperature or climate in which the Lima Beans grow faster than usual, then more people can be fed and potentially other rhizobia symbiotic legumes can grow faster as well. In my experiment, there are three sets of beans, each growing at different temperatures. One set is growing at 70(21 Degrees Celsius) degrees Fahrenheit, another at 80(26), and the other at 60(16). I think the 80 degree plant is going to grow the fastest because it has more energy to absorb but isn't hot enough to kill the plant.

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

PS 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

Word Count

284

2024

Fair Category

L8

Project  
Number

2501

Title: Design of a Smart-Bandage to provide lasting Itch-Relief and Healing for an Insect Bite.

Student Name(s): L. Bittman

## Abstract:

The U.S. CDC called mosquitoes the “world’s deadliest animal,” with ~700,000 deaths annually due to mosquito-transmitted diseases. These bites often swell and itch, where bite-scratching leads to bleeding, and possible infection. A new, smart-bandage is needed, to lessen swelling and itching of a bug-bite, and promote healing through the timely release of therapeutic agents. In this research, such a product was developed, using raw honey (RH) due to its anti-inflammatory and anti-bacterial properties, and baking soda (BS), which provides relief for minor irritation, pain, itching, and redness. Both were integrated into a Hydromed-D (HMed) ether-based hydrophilic urethane, that is ideal for time-release of load-reagents under moist conditions. To construct the time-release polymer, 1.5g Hmed was stirred in 50ml ethanol for 24hr, to obtain a clear gel. RH and BS (0.75g of each) were added, stirred for 2h, and poured to dry, creating a 2-3mm thick, flexible gel-bandage. ATR-FTIR spectroscopy supported the successful inclusion of the agents, to create the new RH-BS-HMed bandage. Measure of dissolution of the RH-BS-HMed bandage in water, via ATR-FTIR, highlights 50% release of anti-bug-bite agents in 45min, with full-dissolution in 2h. To simulate usage on a bug-bite, a 4cm 2 RH-BS-HMed bandage was inserted into a band-aid, in place of gauze, and affixed to a pig-intestine skin simulation. Following, 1-2 drops of water were added below the RH-BS-HMed bandage, to stimulate agent release. ATR-FTIR results highlight immediate release of bug-bite reagents in as little as 2min, with continual release of RH-BS that mimics the original dissolution timing.

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

EN ME 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

Word Count

142

2024

Fair Category

L8

Project Number

2502

Title: Reducing the Waste of Polyethylene Plastic by Galleria mellonella

Student Name(s): Y. Hsiao

## Abstract:

Polyethylene accounts for about 30% of plastic pollution. Previous research has shown that *Galleria mellonella* may have potential to digest polyethylene through two enzymes in their saliva. The three most common types of polyethylene in oceans were tested: Polyethylene terephthalate (PET), High-density polyethylene (HDPE), LDPE polyethylene (LDPE). After placing 0.05 grams of plastic with 5 worms in each chamber, the three types of plastic were weighed every 24 hours. LDPE turned out to be easily digested, on average, 0.01 grams was eaten every 24 hours by 5 worms. Further research can be done to extract the enzymes from the saliva, and create mixtures to help tackle our planet's pollution problem. Also, people can be encouraged to use more LDPE and eventually replace other types of plastic. So, with enough research, waxworms' amazing saliva might just become the future of plastic waste!

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

EM AS 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

Word Count

130

2024

Fair Category

L8

Project  
Number

2503

Title: The influence of various factors on yeast fermentation

Student Name(s): R. Skarica

## Abstract:

Yeast fermentation is an important biochemical process used in the food and pharmaceutical industry, discovered 7,000 years ago. I wanted to test how different variables and their optimal conditions (temperature, substrate, yeast strain, yeast age) affect this process. The effectiveness of fermentation was measured by assessing one of the products (CO<sub>2</sub>) and by using a water displacement volumetric gasometer. The best fermentation conditions were achieved by using young yeast cells at 128OF with the sports drink Gatorade offered as a substrate. There are many biological, chemical, and physical variables that can be changed and fine tuned in order to improve fermentation performance. The future of food production and drug discovery will ultimately depend on the ability to use yeast genetics and various prebiotics in coordination with the variables I tested.

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

CB 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

Word Count

249

2024

Fair Category

L8

Project Number

2504

**Title:** Leveraging Zea Sheaths to Prolong Food Freshness: A Strategy for Mitigating Bacterial Growth and Reducing Food Spoilage.

**Student Name(s):** N. Khan

**Abstract:**

In my experiment I explored the antibacterial properties of Zea Sheaths. I was able to see the effects of the lysosomes that are in the upper epidermis of the Zea Sheaths. I experimented with these zea sheaths in an experiment to use the zea sheaths to reduce bacterial growth on common foods. I used Bananas, Strawberries, and Apples. making 4 samples for each. For my first sample- I left the banana by itself as the control- and followed by doing this for the other fruits- for the 2nd sample I layered 1 Zea Sheath over another- then followed this for 3. I left these samples together for 4 days in an environment of 55 degrees. After, I sampled these into petri dishes- and incubated for 17 hrs at 80 degrees. I then analyzed my results I was truly astonished by them. The Zea Sheaths were most effective for the strawberries- we saw a decrease of 83 percent of bacteria from the control of the strawberry to the 3 layered Zea Sheaths sample. For the bananas, there was a decrease of 52.15% of bacteria from the control the most layered. And for the Apples, I saw a decrease of 34 percent of bacteria. Over all, this experiment explores and sees the true benefits of Zea Sheaths. I hold plans to take this experiment and perform it in a professional lab- reducing errors- and increasing preciseness. I plan to take this experiment further- and layer more sheaths to see its impact.

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

MI 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

Word Count

168

2024

Fair Category

L8

Project Number

2505

**Title:** Finding the Most Effective Time Interval of  
Feeding for Hormesis to Starvation of *Lumbriculus variegatus*

**Student Name(s):** A. Wang

**Abstract:**

Adaptation to stress can allow the body to undergo longer periods of stress without significantly affecting health or wellbeing. The purpose of this experiment was to see if short and frequent bursts or long intervals of stress help the body adapt more effectively. Blackworms were starved for 2 weeks then fed at varying time intervals of starvation in between. The time intervals were 5 days, 7 days, and 10 days. After these time intervals of feeding, they were starved again for 2 weeks. The pulsation rate was measured each time after feeding to see which trial had the most intense reaction to food and which trials had adapted the most effectively to starvation. The hypothesis studied in this experiment was “If *Lucumbriculus variegatus* is starved then fed at different intervals of starvation in between, then a second period of starvation following low intervals of starvation (fed every 5 days) will have a less severe reaction of pulsation rate when fed than high intervals of starvation (fed every 10 days).”

**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

Word Count

246

2024

Fair Category

L8

Project  
Number

2506

**Title:** Natural remedies research for seasonal allergies by Machine Learning of Crowd Information

**Student Name(s):** A. Lai

**Abstract:**

Seasonal allergies affect hundreds of millions, including me. I searched and found no centralized database that includes allergies, natural remedies, and their corresponding effectiveness. I compiled this data into a spreadsheet, but soon realized that manual research and correlation of allergy symptoms to natural remedies would be impossible, given the many permutations of allergy-to-remedy associations. An artificial-intelligence approach would simplify the availability and usefulness of these pre existing correlations; design of such a cause-effect remedy database became the focus of this research. I devised a program that correlates which natural remedy is best suited per individual's allergy symptoms, and allows for user-feedback through a web-based crowd data sourcing platform, so that the AI-model continually learns new permutations through public use. This continuous flow of data to the program allows it to refine its ability to find the correlation between the natural remedies and symptoms. Over time, the program should learn every single type of natural remedy, symptom, and the correlation between the two. This will allow for the program to recommend natural remedies to most if not all with seasonal allergies no matter what the symptoms might be. By extension, this new centralized database-platform can be used as a model for other illnesses. The key to this system is to not only give the natural remedies and symptoms, but to also find the correlation between the two with special attention paid to the individual characteristics of the patient.

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

ME CBIO

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

Word Count

253

2024

Fair Category

L8

Project Number

2507

**Title:** Modeling of Fairfield County Fresh-water and Estuary Waterways to Highlight Contamination of Ecosystems/Environments

**Student Name(s):** B. Lissauer

**Abstract:**

Freshwater habitats and surrounding water sources in Fairfield County, Connecticut face many pollution sources. This study aimed to learn how pollutants impact water quality and what a good water ecosystem has that others don't. Examining this on a broad scale, factors covering air and water temperature, and measurements of Turbidity, Conductivity, DO, Nitrates, pH, Salinity, TDS, and Polyaromatic Hydrocarbons (Phenanthrene and Naphthalene) concentration were examined in water samples collected from various freshwater and estuary sites in lower Fairfield County. This research seeks to establish causes and identify locations with poor water quality. Considering air and water temperature, dissolved oxygen in an aquatic ecosystem causes increased pathogens and lower nutrients at warmer temperatures. This was found in 3 locations. Higher turbidity is more problematic (25% of locations sampled), and is caused from external polluting factors, such as debris and runoff. Low conductivity (>50% found) is caused by unwanted contaminants in the water, such as PAHs, phenols, and alcohol. Nitrate levels in water sources, likely due to fertilizer runoff from commercial and residential lawns, were normal for all locations, and non-problematic. Increased freshwater and estuary acidity found in 2 locations is attributed to nearby surroundings, roadways in particular. Salinity and TDS levels in nearly two-thirds of locations tested is likely affected by runoff, as well as weather and water currents. Nearly all locations exhibited above-normal PAH content, which is a clear indication of contaminants' release from commercial causes such as automobile tires, vehicle exhaust, and roads, particularly during and after rain showers.

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

EV EM 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

Word Count

230

2024

Fair Category

L8

Project Number

2508

Title: Can AI learn to solve a maze?

Student Name(s): E. Lambert

## Abstract:

By learning how AI solves problems, I can make better use of this technology. I wanted to create a simple experiment to see how AI learns. I found Machine Learning (ML), is the area of AI that algorithms learn without explicit instructions. My experiment is to see how AI/ML works is, "Can AI learn to solve a maze?"

I searched online for resources that could help me test if AI can solve a maze. I found that science buddies could help me test my theory. Science buddies had a sample that I followed to learn how AI worked. I trained the AI using reinforcement learning. I ran the AI with reinforcement and without reinforcement learning. The results of solving the maze without learning were 313 steps and with learning were 8 steps. The reward system is a system where if the AI does something right it gets a reward. The total reward was -2,111 without the learning system and with the learning system it was 93 as a total reward. Reinforcement learning is running something over and over and learning from mistakes. In this case, the AI ran the course 100 times and went from 313 steps to only 8 steps. Using this experiment I was able to confirm AI/ML was able to learn. This proves my hypothesis that trained AI can solve a maze using reinforcement learning

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

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

Word Count

153

2024

Fair Category

L8

Project Number

2509

Title: Will Roaches Direct Other Roaches to Food?

Student Name(s): T. McKeen

## Abstract:

Because roaches are such common household pests, people wonder how so many roaches have quickly invaded their home. If a dubia roach is taken and put in a container where going one direction will result in food, then when put with another cockroach to communicate with, will that roach direct the other roach to the location it found food even if there is none there? To conduct the experiment one roach was put in a maze where going one way would result in an orange slice. That roach was then put with another roach in a container for ten minutes. That second roach was put in the same maze, but this time there was no food at all to test if that roach would go the same way the other roach did. It was found that 80% of the time the second roach would go the same way the first roach found food.

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

AS BE 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

Word Count

231

2024

Fair Category

L8

Project Number

2511

Title: Leaf Light

Chlorophyll Light Bulb

Student Name(s): T. Lott, A. Pember, A. Pember

## Abstract:

This project's purpose is to determine if brightness of a light bulb can be impacted by submerging an LED light in a solution of chlorophyll. Chlorophyll is a chemical that is found in plants to make them green. Chlorophyll is found in every photosynthetic organism but chlorophyll can also reflect light. Chlorophyll filled plants were used in this experiment, cabbage and kale, then blended and crushed and collected from a juicer. Using juice and combining it with various combinations of juice and 99.99% isopropyl alcohol, an experiment was performed to measure the brightness of LED bulbs when submerged in the solution of juice and isopropyl alcohol. The results were encouraging. The cabbage juice had a higher lux reading (11) by itself then the kale (0) did by itself. Adding Isopropyl Alcohol (99.9%) to the kale, with a one to one ratio kale lux went up to (2) Then when one to two ratio the kale lux went up to (19). The density of the kale juice may have played a role in the lux measurement, thus the better lux when it was diluted. The cabbage juice lux rating deteriorated when Isopropyl Alcohol (99.9%) was added to the solution. Ultimately, these results suggest that chlorophyll has a positive impact on the lux reading. These results also suggest that varied combinations of chlorophyll diluted with Isopropyl alcohol will result in higher lux readings.

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

Word Count

239

2024

Fair Category

L8

Project Number

2512

Title: Emotionless Negotiator Droid

Student Name(s): L. Otto

## Abstract:

Many books talk of a point where the sky meets the Earth, Emotionless Negotiator Droid (or END) is that point. Where AI and Technology meets negotiation. END was developed on weekends and Monday mornings; it was designed to help the public with their daily negotiations. "Negotiating anything, from bedtimes to business agreements" (Voss). It was designed for anyone to use, so its user-interface had to be simple, and have an output that is easy to read and follow. The END Program is an AI that was designed in Python on the PyCharm Interface, to assist any person with any real-life negotiation, regardless of topic. It will do so by asking a series of questions to the user and then running a program to find keywords in the data, and later checking a "Cheat Sheet" to see what should be output to the PDF for review by the user. For example, the keyword "won't give up" will output, "It seems like this 30-year relationship is valuable to you." The topic "30-year relationship" can be filled with any keyword or phrase that is part of the situation (it will come from the input data) and will be something that the client's counterpart will value, like the relationship, or an object. END can assist in work negotiations, personal discussions, and an assortment of debate issues, where useful responses (after user input) are received in less than 1 minute.

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

CS EV 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

Word Count

249

2024

Fair Category

L8

Project  
Number

2513

Title: Implicit Gender Bias

Student Name(s): J. Gonzalez

## Abstract:

The purpose of my project was to determine how implicit gender bias changes as we age. I hypothesized that adults over the age of 18 would show less implicit gender bias than children between the age of six and seven and preteens and teenagers between the ages of 11 and 15. I tested my hypothesis by showing ten individuals in each age category an implicit gender bias test that I developed. I made this test by creating a slideshow with the name of a commonly gender stereotyped occupation at the top of each slide. I used 12 commonly stereotyped male jobs and 4 commonly stereotyped female jobs. I then inserted a stock photo of a male and a stock photo of a female onto each slide. I made sure that the photos were of white males and females to eliminate any implicit racial bias. I showed the slideshow to my volunteers and recorded my results. Next, I compared the levels of bias for each question and for each age group. Once I had found all of my bias levels, I had my results. I found that adults over the age of 18 showed the least amount of implicit gender bias in their answers, while preteens and teenagers showed the most. I believe the adults scored the best because of prior experiences that they have had that defied stereotypes. I also believe that preteens and teenagers scored the worst because social media may be establishing stereotypical ideas in their minds.

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

BE 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

Word Count

242

2024

Fair Category

L8

Project Number

2514

**Title:** Global Warming Management Through Utilization of Naturally Occurring Resources such as Eggshell-Derived Calcium Carbonate in Global Warming Reduction

**Student Name(s):** E. Agirman

## Abstract:

According to the National Aeronautics and Space Administration (NASA), since the onset of industrial times in the 18th century, human activities have raised atmospheric carbon dioxide by 50% – meaning the amount of carbon dioxide is now 150% of its value in 1750, contributing to the ever growing crisis that is global warming. The international community established ESG (Environmental Sustainability Goals) to contain this issue. This research proposes a method to capture carbon by a natural process; the reaction of calcium carbonate, water, and carbon dioxide. To study this process, jars filled with CO<sub>2</sub> and added 5-15 grams of calcium carbonate in separate air tight jars are experimented, including 10-30 mL of water. Sensirion CO<sub>2</sub> sensors are used to determine the amount of CO<sub>2</sub> reduction within a controlled jar environment. The first hours of our experiment had the highest peak of CO<sub>2</sub> in the jar, the largest value being 25125 ppm (parts per million). The chemical reaction of CO<sub>2</sub>+H<sub>2</sub>O+CaCO<sub>3</sub> decreases the remaining amount of CO<sub>2</sub>, Experiments show at least a decline of CO<sub>2</sub> 5,000 ppm via the anticipated reaction of CaCO<sub>3</sub>+H<sub>2</sub>O+CO<sub>2</sub> to form Ca(HCO<sub>3</sub>)<sub>2</sub>. Experiments suggest that CO<sub>2</sub> is dissolved in water, forming carbonic acid, that in turn reacts with calcium carbonate that is dissolved in water consuming the CO<sub>2</sub> in the atmosphere (in the air tight jars in case of this research). Experiments were conducted at 1 atm, and 24 deg C, and >90% relative humidity.

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

EV CH 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

Word Count

247

2024

Fair Category

L8

Project  
Number

2515

Title: Sea Life: Looking Into The Future

Student Name(s): M. Green

## Abstract:

Today, our sea life still has many different species than we will have in the future. There are at least 1.4-1.6 million marine species on this planet. The ocean is a major part of human life, providing medicine, entertainment, and more. Without it, we would not be able to survive. This experiment's purpose is to use plants to simulate the reality of life in a world majorly affected by global warming. Three jars with three different types of plants are each tested in different circumstances. The first jar were at a very high temperature with baking soda water, the second jar was at room temperature, and the final jar was extremely cold. While the plants are in the jars for 1-2 weeks, they were be observed to see how they are affected by the environment, whether it is wilting, discoloration, brown spots, or flourishing leaves and roots spreading across the jar. As a result, two out of the three plants did well, but the final plant did not. It died and was engulfed in a mold that was not identified. The water it was growing in turned a chestnut brown. The heat and baking soda seems to have been contributors. In conclusion, the experiment shows that if the ocean reaches higher temperatures and CO2 levels, then sea life will be devastated. If I could change a few things, I would add snails to see how they react, or I would add a bubbler to produce better oxygen.

## 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

Word Count

258

2024

Fair Category

L8

Project Number

2516

**Title:** Development of a Simple Salivary Rapid Diagnostic for the Detection of Iodine Deficiency

**Student Name(s):** T. Malkin

## Abstract:

Iodine deficiency is a global problem affecting millions of people. Iodine Deficiency Disorders (IDDs) lead to serious health consequences including birth defects, developmental disorders, intellectual disabilities, and depression. Iodine deficiency is easily treatable with iodine supplementation. However, current diagnostic tests are inconvenient and/or invasive, require expensive detection equipment, and must be processed in a lab. This research created a rapid diagnostic assay for the detection of iodine deficiency using patient saliva. It was created using newly synthesized gold nanoparticles (AuNPs) and sodium thiosulfate (Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>) and utilizes a colorimetric method for iodine detection. AuNPs (~45nm) were synthesized and mixed with 1.6M Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>, and the diagnostic assay reagents were calibrated to produce a color changing response at a specific iodine deficiency threshold of 0.036μM-I<sub>2</sub>. Above this threshold (normal saliva iodine content), a red/purple solution is produced. For iodine deficiency of 0.036μM or less, a blue solution indicates IDD. Correlation of the solution color change as a function of μM-I<sub>2</sub> is linear, so that test-color could be used for eventual iodine-in-saliva quantitation. The diagnostic assay was successfully tested in artificial saliva and produced the expected visible color change, verified by UV-Vis spectroscopy. The diagnostic assay is easily performed, returning rapid results without the need for a lab or expensive detection equipment. The anticipated cost for this test is \$2, which includes all needed reagents. It allows the most vulnerable populations to easily monitor iodine levels at home, so that IDD can be identified and treated before leading to serious and often permanent conditions.

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

EN ME 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

Word Count

198

2024

Fair Category

L8

Project Number

2517

Title: Do our storm drains keep our waterways trash-free?

Student Name(s): J. Schwartz

## Abstract:

I picked this project because there are approximately 5.25 trillion pieces of plastic waste in our oceans. People have been trying to solve water pollution for many years and I think that little changes can help change the big problems in our world. My design goal was to create a storm drain that keeps 80% of plastic out of it. To do this I made a model of the storm drain on my street in Shelton, CT out of clay. I tested out my model by recreating a rain current going down my drain with pieces of litter in it. Afterward, I made my own improved drain out of clay and tested it out the same way. My results were that the drain of Shelton filtered out 22 out of 30 pieces of trash. That means 73% of litter got through. My improved drain on the other hand let through only 2 out of 30 pieces of trash, which is a percentage of 6.67%. My drain kept out 94% of litter and the Shelton storm drain kept out 17%. In conclusion, I exceeded my original design goal because my improved drain kept more than 80% of trash out.

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

Word Count

228

2024

Fair Category

L8

Project Number

2518

Title: The Effect of Different Substrates on the Growth of Mycelium

Student Name(s): M. Lenz

## Abstract:

This experiment was done to determine which substrate(s) cause mycelium to grow the most in 15 days. The purpose of this experiment is to further develop the use of mycelium based products. The research question is, "What is the effect that different substrates have on the growth of mycelium?" The hypothesis was if the cardboard, straw, and sawdust have the most amount of mycelium growth, then the coffee grounds, corncob, and sunflower seed head will have the least amount of mycelium growth. Cardboard, straw, and sawdust are more often used for growing mycelium than coffee grounds, corncob, and sunflower seed head. Cardboard, straw, and sawdust are also more commonly used to grow commercial mushrooms. Based on these facts, it is likely that the cardboard, straw, and sawdust will affect mycelium growth the most. Small pieces of substrate were put into a jar, then sterilized and inoculated. Substrates were then put into a warm and humid environment. The substrates were then left to grow in this environment for 15 days for 3 trials. The corn cob, sunflower seed head, and straw had the highest average growth percentages which were: corn cob, 53.3%, straw, 31.6%, and sunflower seed head, 15%. In conclusion, the corn cob, sunflower seed head, and straw showed the most amount of growth while the coffee grounds, sawdust, and cardboard showed the least amount of growth.

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

EN

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

Word Count

205

2024

Fair Category

L8

Project Number

2519

Title: Magic Mushrooms... from an Environmental Perspective

Student Name(s): C. Calomeni

## Abstract:

According to the EPA, each American produces an average of 4.9 pounds of trash each day! Most countries around the world have run out of space to contain all this trash. For years, countries have been paying to ship this to poor countries, however, those countries have realized the dangers this trash poses to the environment and most have stopped accepting trash from other countries. Countries like America now bury or burn a lot of their trash. According to Planet Natural, “buried in a landfill, the typical plastic trash bag takes 1,000 years to degrade, giving off toxins as it does”.

In this project, I will research the effect of mushrooms on decomposing the top three contributors (totaling 56.84% of all waste) to total waste: paper & paperboard, plastic and food waste.

This research to determine if there is a better way to decompose trash is important because we need to urgently solve the trash problem. Although it would be better for humans to reduce the amount of waste we each produce, this does not seem to be happening. If we can find a natural way to decompose trash without using (or producing) harmful chemicals, we can help reduce global warming and create a healthier planet.

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

EM MI EA

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

Word Count

237

2024

Fair Category

L8

Project  
Number

2520

Title: The Borebrush, A new tool in personal dental hygiene

Student Name(s): O. Lind

## Abstract:

My project is a new kind of toothbrush. It allows people to see the inside of their mouth while brushing their teeth. This allows them to focus on the areas that are dirtiest, improving dental hygiene overall. The toothbrush has an internal camera mounted near the brush head. The cable coming from the bottom of the toothbrush has a USB connector which can be plugged into a phone, this device is called a borescope. This allows the user to better view their teeth while brushing so that they can ensure that problem areas are paid special attention and they can make sure even the hard to reach areas of the mouth are brushed properly. To demonstrate my idea instead of creating a fully functioning prototype, I decided to create an up-scaled model that would be easier to build and compatible with the size of the borescope. I used Tinker CAD to design the toothbrush model, 3D printed it, then used a pair of pliers and tape to insert the borescope through the model. Once the model was complete, I created a survey of 4 questions to test the marketability of my project, and asked 10 different people to answer yes or no to know if my idea would be popular if it were a real product. Though I encountered some structural problems while making my model, I was able to find solutions to work them out.

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

AT 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