

73rd Annual Fair



**Connecticut  
Science &  
Engineering  
Fair**

March 8 - 20, 2021

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# **Student Abstracts**

Urban School Challenge

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## Fair Categories

	Life Sciences	Physical Sciences
<b>7<sup>th</sup> &amp; 8<sup>th</sup> Grade Team</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>

## Special Categories

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

## Special Category 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

125

Fair Category

L7

Project  
Number

2001

Title: How water temperature affects seed germination.

Student Name(s): D. Delgado

## Abstract:

In my experiment I wanted to see if water temperature affects seed germination. In order to test this out I grabbed 3 paper towels, made a lentil sandwich with the towels and put the same temperature of water on them. The idea is that the water temperature will change with the environment the seeds are in. The three environments I put them in are cold (refrigerator, 2.8 C), Warm (Room temperature (23.9 C), and Hot (Lamp (26.7 C). After doing this for 2 days I saw that the lentils exposed to the hot temperature water grew the largest. In conclusion plants or seeds exposed to hot water grew the largest. On the other hand the seeds exposed to the cold temperature water grew the slowest.

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

EA 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

231

Fair Category

L7

Project Number

2003

Title: Does gender affect smiling

Student Name(s): A. DeRosia-Estwick

## Abstract:

I did a project on smiling. I asked the question, "Does Gender Affect Smiling?" I based my research on a website about someone who did a project similar to mine on smiling, which I found on the Internet. In the procedure, I gathered old yearbooks and used the photographs in them as my test subjects. I went through the pictures to see who was smiling or not. The test subjects were 10 boys' photos and at least 7 girls' photos. Then I analyzed the data by making a table comparing the percentage of girls and boys smiling. The results from my project showed that the girls smiled more than the boys. From the data I collected, I realized that there was a difference between boys and girls. I noticed that even if there were fewer girls in the class, the number of girls smiling was larger than the boys. Grades 4th, 5th, and 6th were studied in this project. Each grade consisted of a selection of 10 boys and at least 7 girls. I noticed that the girls were smiling more than the boys were. Overall this study has shown that gender does have an effect on smiling. A future study that could be done would be to see how blindness affects smiling. Another study that could be done would be to see if boys see a smile differently than girls.

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

BE

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

- human subjects       potentially hazardous biological agents  
 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

98

Fair Category

L7

Project Number

2005

Title: The effects of a clinostat on Garden Cress

Student Name(s): Z. Colon

## Abstract:

The purpose is to see how plants grow in lower gravity. What happens when garden cress goes into low gravity? The plant on the clinostat will grow faster than the normal plant. To assemble, you must attach the 1rpm motor to the reused knife stand, drill out holes, screw the 1rpm motor in place, get the sponge set up, and turn it on. The results of the tests came out that the clinostat grew faster than the normal plants. My hypothesis was supported with data from the experiments conducted and evidence from other sources and my own research.

## 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

240

Fair Category

L7

Project Number

2006

**Title:** The Effects of Soil Type on Allolobophora caliginosa's Enrichment of NPK, pH, and Moisture Value in Soil.

**Student Name(s):** K. Brahmshatriya

**Abstract:**

After observing my family's yard with my father, I wondered how we can better improve the yard's health without the use of chemicals. When fertilizers are used, the remaining chemicals can infect our local waterways. The purpose of this experiment is to gain further information on Allolobophora caliginosa and how their productivity changes the NPK, pH, and moisture in different soil types. This study is important because it helps with growing improved crops without the use of chemical fertilizers. The problem addressed in this experiment is: How do worms enrich and change the soil differently in various soil types including Acidic, Alkaline, Peat, Clay, and Loam/store-bought? In the experiment, 15 worms were added into 6 different soil types for 7 days. The pH, moisture, nitrogen, phosphorus, potassium of the soils were tracked using a pH and moisture meter and an NPK soil test kit. The results attained are that the pH's went towards 7, the moisture went towards the 10 level and the nitrogen, phosphorus, and potassium increased. Conclusions included that clay soil had been improved in phosphorus and potassium, and the alkaline soil the most in nitrogen. The peat ended the most acidic and alkaline soil, the most alkaline. Alkaline excelled in moisture. Scientists would use lab reports to confirm test soils. In future studies, this would be preferred. This study can help further scientists' understanding of the impact that Allolobophora caliginosa has on various soil types.

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

EA EV

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

- human subjects       potentially hazardous biological agents  
 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

185

Fair Category

L7

Project Number

2007

Title: The Effect of the Bee Box Volume on the Temperature and Humidity of a Wintering Hive

Student Name(s): L. LaRosa

## Abstract:

The purpose of the research is to find out what size beehive boxes are best for wintering bees. How does the volume of a bee box affect the humidity and temperature of a wintering hive? The hypothesis is that the bee box with the smallest volume would have the highest temperature and humidity because the hives have about the same number of bees but the smaller box would have a higher population density. Humidity and temperature measurements were taken at three different times of the day from three different sized hives. To test the inside of the hive, a sensor slot custom piece was built for the bee box with a removable plug so you can put the pocketlab air inside the hive without harming the bees. The data shows the medium sized box had a larger change in temperature during the day. The largest and smallest boxes had an overall higher temperature and also maintained steady temperature and humidity levels. Overall, the volume had some effect on the hive environment but differences in hive conditions are also changed by the strength of the Queen.

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

AS EV EN

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

- human subjects       potentially hazardous biological agents  
 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

153

Fair Category

L7

Project Number

2008

Title: Will It Survive?

Student Name(s): S. Cuaya

## Abstract:

The purpose of this experiment is to show what liquids you could and could not use to extend the life of your cut flowers (roses in this case). People should care about my project because I feel like there might be a good way to help flowers live longer, especially if they have a nice smell or if their color is just perfect for decor. My experiment gives new information to science because scientists could try and use the ingredients in vodka or in fertilizer to make a new liquid that could help cut flowers survive for a longer time (a month or even two). This could improve our lives since most people give flowers as gifts to others and it might be special and they might want to have it as a memory. Not only that, but for moms. My mom loves flowers and she loves to have them around the house.

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

126

Fair Category

L7

Project  
Number

2011

Title: The Effects of UV Light on Bacteria From a Horse Bit

Student Name(s): S. Blumenreich

## Abstract:

The purpose of this project was to determine how UV light affected bacteria that came from a horse bit. How does exposure to UV light affect the bacteria on a horse bit? If you expose a horse bit to UV light, the bacteria on it will be killed. A used horse bit was exposed to UV light for four different times, 0 minutes, 5 minutes, 10 minutes, and 20 minutes, and after the bacteria grew, the petri dishes were compared. The longer the horse bit was exposed to UV light, the more bacteria was killed. Prior to experimentation, it was hypothesized that if you expose a horse to UV light, the bacteria on it will be killed. The decreasing trend in the data supports this hypothesis.

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

AS 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

239

Fair Category

L7

Project Number

2012

Title: Does the 5-Second Rule really work?

Student Name(s): K. Ochoa

## Abstract:

I have seen many kids eat the food that they drop because they believe in the 5-second rule. I wanted to see if it was safe to eat any food that fell on the ground by testing the 5-second rule. This was accomplished by getting apple slices, 2 containers, gloves, cotton swabs, and a timer. First, an apple slice was dropped on the floor for 1 second using the timer. Then, put your gloves on, get one cotton swap and a container, and spread the cotton swap on the apple slice. Next, take the same cotton swap and spread it around the sides of the first container, put the apple slice inside, and close it. After, take a piece of paper and write the 1 second apple slice to label it. Afterward, repeat the above-mentioned procedure with the second apple slice, except you will let sit on the ground for about 6 seconds. Finally, take the second piece of paper and label it the 6 seconds apple slice. Set both containers in a safe spot for about a week and check on it throughout the week. As a result, the 1 second apple slice was about 15% covered by mold and the 6 seconds apple slice was about 55% covered by mold. In conclusion, the 6 seconds apple slice is riskier to eat than the 1 second apple slice due to the greater mold growth observed.

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

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

153

Fair Category

L7

Project Number

2014

Title: Using earthworms to enhance bioremediation of oil contaminated soil

Student Name(s): S. Sanchez - luna

## Abstract:

My experiment is about using earthworms to enhance bioremediation of oil contaminated soil. My questions was, "Can earthworms and redworms breakdown oil in soil". I had 3 containers. One container had soil and oil (control), a second container had earthworms & redworms, and a third container had earthworms,, redworms, and PSEUDOMONAS PUTIDA bacteria. I added 10 ml of oil to all containers and then allowed the experiment to run for 2 weeks. I did keep the soil moist by adding water because worms do not like dry soil. I used Hydrocarbon detection strips to detect if there were any hydrocarbons from the oil present in the soil. My results showed that the container with only worms had mostly oil present according to the test strips and my container with worms and bacteria showed some oil present. So according to the results, adding soil bacteria in with earthworms helps to break down oil in soil.

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

167

Fair Category

L8

Project Number

2501

Title: The Circulatory System

Student Name(s): C. Huerta-Arriaga

## Abstract:

My experiment is based on the circulatory system. Since I was a child I have been amazed how the circulatory system work. Once I came across the video about the circulatory system, I thought it would be a great idea to experiment on it. My hypothesis is Can I build a model that shows how the blood flows throughout the human body using the video as a guide. My Independent Variable- A bigger heart model than the regular one used in the video. My Dependent Variable- The amount of blood that can be pumped from each model. In the end, my hypothesis was proven because I managed to build 2 models 1 using the video instructions and the other making it bigger (only the ball), in order to see which model would pump the most water/blood. In conclusion, this experiment is a great way to educate how the circulate the blood and how much important is the heart in our body system and also how to prevent any problems in the future.

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

243

Fair Category

L8

Project Number

2510

**Title:** COVID-19's Impact on Water Quality in Recreational Areas Along the Long Island Sound Coastline

**Student Name(s):** I. D'Agostino

**Abstract:**

When the pandemic started, other countries reported a drop in forms of pollution. Italy reported they finally had clear water in the Venice canals. This was attributed to strict lockdown measures that were put in place limiting all economic and non-necessary activity. When I heard about this I wanted to see if Long Island Sound would experience the similar effects on its water quality as other countries that were going through lockdown. For the past two years, I have gathered water quality information by testing salinity, pH, ammonia, phosphate, nitrate, nitrite, calcium and carbonate hardness at six recreational coastal beaches. Data was taken from previous years and compared to this year's data collections during a six-month interval. It was seen that many of the parameters did not follow the typical trend line that was observed in 2018 and 2019. Improved water quality was recorded at recreational areas adjacent to metropolitan areas, while in more rural areas, the water quality fluctuated, perhaps due to the increased social activity of families seeking recreation during the pandemic. It was seen that 2020's ammonia levels increased about 50.01% from 2019 and 48.81% from 2018. The pH levels from 2020 decreased by about 3.04% from 2019 and about 3.29% from 2018. These are examples of how the pandemic could have affected the Sound and I am interested to see how the water quality continues to trend in 2021 as we move out of the pandemic.

**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

262

Fair Category

L8

Project Number

2511

Title: Dog-Be Gone-No Plastic: An evaluation of dog waste bag materials and biodegradation

Student Name(s): P. Pitsoulis

## Abstract:

From 2019-2020, in the U.S., 63.4 million household dog owners used over a billion waste bags in just one month. The increased amount of dog ownership also resulted in the usage of plastic bags that cause significant pollution to the environment as they are non-dissolvable, are a source of waste in landfills and oceans, resulting microplastics and chemicals leaching out of the plastic into the environment cause health problems in humans and ecosystems.

I wanted to find a way to substitute those plastic bags with an environmentally friendly biodegradable material that will help reduce harmful waste from entering the environment. I have tested bags created by EPI (Environmental Products Inc.) technology, biodegradable starch materials, made of plants and vegetables, made of corn, biodegradable high-quality HDPE (High-Density Polyethylene) plastic, water-soluble material, and PVA (Polyvinyl Alcohol) material.

I created controlled environments using tabletop greenhouses. The environments-maintained temperatures between 27-47°F -and above 75°F- with a humidity range 65-80%. The water-soluble bags exceeded the biodegradation time of all the other materials, as they dissolved in 5 minutes (above 75°F-and/or humidity range 65-80%) and 15 minutes (27--47°F). However, they can be hard to use, especially in hot and rainy/humid environments, as they dissolve so quickly without giving dog owners a chance to dispose of them appropriately. Therefore, I would recommend the second-best bags, the vegetable/plant-based bags, that still dissolving quickly, 5 days (above 75°F- and/or humidity range 65-80%) and 20 days (27--47°F) and the dog owners can dispose of them without worries.

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

EA 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

248

Fair Category

L8

Project Number

2516

**Title:** The impacts of the presence of Canada Geese (*Branta Canadensis*) on the water quality in local ponds and lakes.

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

**Abstract:**

My project 'The impacts of the presence of Canada Geese (*Branta Canadensis*) on the water quality in local ponds and lakes' studies how the amount of geese and rainfall affect phosphate and nitrate levels in bodies of freshwater. My hypothesis was that the more rain that has fallen in the past week, and the more geese estimated at that location will increase the amounts of nitrates and phosphates in the water, because the nutrients contained in waste from the geese would be washed into the water. I conducted this experiment by going to two locations: a pond at Meig's Ravine and a lake at Butternut Park in Middletown, CT and took samples every Saturday while also estimating the amount of geese at each location. I tested these samples for temperature, pH, nitrate, phosphate levels and noting any unusual circumstances. I used an online source to record rainfall amounts and air temperature. After 8 weeks I concluded the testing period. I consistently recorded 0ppm for phosphate levels, which supports that the amount of geese and rainfall did not adversely affect that parameter. Using trend lines to interpret my data I noticed that more rainfall lowered nitrate levels and increased pH levels slightly. They also showed that nitrate levels rose as geese numbers also rose but pH levels dropped slightly. Overall, the data showed a healthy water quality in these ponds. If I were to do this project again, I would test more often and make efforts to increase accuracy.

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

EV 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

244

Fair Category

L8

Project Number

2517

Title: Microplastic Concentration in Four Harbor Locations in Fairfield County, CT

Student Name(s): S. Atehortua

## Abstract:

The purpose of my project is to analyze and compare the amount of microplastic particles that are found in (1,000 ml) of ocean water after gathering water samples from Four Harbor Locations in Fairfield County, CT. (Milford, Westport, Bridgeport, and Norwalk). To compare the microplastic particles found in all harbors I created four filter devices made of 2 inch PVC tubing and nitex screening (plankton netting) of four sizes (400, 200, 80, and 30 micron sibs). To see the microplastic particles I used a fluorescent U.V light in the dark and a magnifying glass to supply the dissecting scope function. This process was effective and showed results. Microplastics are small pieces of plastic, less than 0.2 inch in length, that occur in the environment as a consequence of plastic pollution. Plastic pollution in many forms breaks down into tiny bits of plastic no bigger than the period at the end of this sentence. My hypothesis was not supported by data because I stated that Bridgeport Harbor in comparison to the Westport, Milford, and Norwalk locations will be the most polluted because of the increased number of human population and industry present. Norwalk Harbor was the most polluted (with an average of 374 particles), Milford Harbor was the second most polluted (with an average of 281.25 particles), Westport Harbor was the third most polluted (with an average of 242.25 particles), and Bridgeport Harbor resulted being the least polluted harbor (with an average of 100.5 particles).

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

249

Fair Category

LS

Project Number

3008

Title: Potential Use of Marine Microalgae to Absorb Excess Salt Road Runoff

Student Name(s): Z. Succow

## Abstract:

Not too long ago, winter headlines were dominated by snowstorms. One of the major concerns with this is our ability to traverse main roads in town. We have long used a variety of salt mixtures to drop the freezing point of the icy conditions, but this has come under ever increasing scrutiny due to the adverse impacts the salt has on automobiles and the danger it poses as a pollutant to the environment. Marine phytoplankton have a well documented ability to absorb lighter ions (salts) for a variety of biochemical reasons (Cole et.al, 1993). This planktonic metabolic process was tested here to evaluate its potential use in absorbing the excess salts applied to the road prior to their arrival in surrounding environments. Replicated trials saw road salts comparable to DOT mixtures applied to grass patches grown in a lab. Although inconsistent, there was some evidence that marine phytoplankton will absorb the salts and further testing will be needed to confirm and evaluate. The results also raised another question for future research. Phytoplankton that absorb salts in the roadside theoretically would degrade, but would the salt then be released back into the surrounding environment or be reconfigured in the biological breakdown of the algae. The temporal aspects of this research question definitely need further study, something beyond the scope of what we could get done, but intriguing nonetheless. The prospect of having a phytoremediative technique to combat the negative impacts of road salts is a huge win for the environment.

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

BI EM EV

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

- human subjects       potentially hazardous biological agents  
 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

203

Fair Category

LS

Project Number

3013

**Title:** Relationship between the area of equilateral triangles compared to the sum of the areas that follow

**Student Name(s):** G. Phillips

**Abstract:**

In this study the repeatability of the spidron pattern was analyzed. The spidron pattern is a series of isosceles and equilateral triangles that follow the other in an alternating pattern infinitely. Daniel Erdély, the mathematician who discovered the spidron pattern, found that the sum of the area of triangles following an equilateral triangle is equal to the area of that equilateral triangle. To investigate further into Erdély's work, the research question for this study is, does the sum of the areas in the sequence of spidron triangles that follow an equilateral triangle equal the area of the equilateral triangle itself? The results of this study showed that the equilateral triangle in all the groups did not equal the sum of the areas that followed it. This did not fit into the predicted results because the total sum of the areas was either smaller or larger than the area of the equilateral triangle they followed.

The importance of the spidron pattern carries into engineering and the designing process of buildings and different types of toys. The work done in this study can lead to different shock dampeners, crumple zone in cars, as well as solar cells that will follow the sun and different stars.

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

EE

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

- human subjects       potentially hazardous biological agents  
 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

208

Fair Category

LS

Project  
Number

3017

Title: An Investigation of the Effects of Spices on Zebrafish Embryonic Development

Student Name(s): B. Akberzai

## Abstract:

The intent of this part of the experimentation is to further provide information regarding the conducting of my experiment. In my experiment, I am essentially finding out what effect spices have on the development of aquatic organisms? More specifically I would like to see the effects on Zebrafish embryos because they are unique in the sense that they are transparent so you are able to view them. A research question that I am also discovering is what effect does black pepper, turmeric, and saffron have on the development of zebrafish embryos from days 0 to 6.5 post fertilization? In the medical field, medicines are derived from certain plants and I would like to further use that field of study in medicine which is known as Ethnopharmacology. In finding the answer to my question the idea is to gather hypotheses and observations before conducting my experiment so that I will have the necessary resources in planning my procedure for the experimentation. Although I haven't had the opportunity to test primarily due to not having access to the materials the procedure will be the same. It would be interesting to see the results of this experiment once it is conducted because there aren't many studies or trials on this topic.

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

CB ME 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

180

Fair Category

LS

Project  
Number

3021

Title: The Cognitive Abilities of Bearded Dragons

Student Name(s): G. Squatrito

## Abstract:

The cognition of animals needs to be studied and understood to ensure they are properly cared for in captivity. As the number of animals kept in zoos or as pets continues to increase, it has become clear that caring only for their physical needs is insufficient. In order to truly be healthy, animals need to be enriched, and we cannot properly enrich them if we do not understand their cognition. Despite being one of the most popular reptiles to keep as pets, bearded dragons' cognition has barely been researched. This lack of understanding means owners are uninformed, and often keep these lizards in environments that provide little to no enrichment. This improper management only leads to boredom, the development of poor habits, and stress for the animals. Establishing an understanding of bearded dragons' cognition is critical in being able to properly enrich them. The purpose of my research is to establish an effective method of target training through the use of a coding protocol, which simultaneously proves a bearded dragon's cognitive potential in areas such as learning, and spatial cognition.

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

255

Fair Category

LS

Project  
Number

3024

**Title:** Developing an Adhesive Constructed from a Maize-based Matrix Mixed with Chondrus crispus Carrageenan and Determining its Solubility in Saltwater

**Student Name(s):** M. Duffy

**Abstract:**

Epoxy and acrylic based bandages present a bio-hazardous, non-biodegradable waste product. With the amount of trash in the ocean accumulating at an alarming rate, the need for plastics requires mitigation. A biodegradable adhesive would eliminate the annual production of tens of millions of pounds of epoxy. The goal of this research project is to develop an adhesive made from organic material to replace the plastic bandage adhesive; the project will test the solubility of the adhesive in seawater. Cornstarch and carrageenan extracted from Chondrus crispus (Irish Moss) were used for the adhesive matrix. The carrageenan was extracted by first heating the seaweed in a 60% calcium hydroxide solution at 60°C for 60 minutes, then boiling the seaweed in a 5% potassium chloride solution for 20 minutes. The carrageenan was then added to a bowl containing cornstarch, water, and corn syrup. The adhesive is placed in 0.5-L of seawater. The average density of the top layer, the bottom, and the middle of the saltwater is recorded for data collection, and biodegradation is analyzed through salt fractionation. Two of the three densities both reached a density of 1.05g/mL, but one density reached 1.07g/mL. One problem raised by this project is the adhesion of the mixture. The epoxy and acrylate bandage adhesive was much more adhesive than the organic adhesive, adhering to artificial skin for about 750 more minutes. The adhesive became moldy after three weeks at room temperature, therefore another preservative is needed in order to increase the practicality of the adhesive.

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

EM PS 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

244

Fair Category

LS

Project Number

3027

**Title:** Investigating the Efficacy of Cannabidiol on the Elongation Time of Coagulation to Mitigate Intravascular Blood Clots

**Student Name(s):** M. Dos Santos

## Abstract:

This project was designed to investigate the efficacy of cannabidiol distillates (CBD) on the elongation time of the coagulation cascade. The coagulation process is extremely important, however, sometimes the hemostasis mechanism fails, which leads to the formation of unnecessary blood clots which remain in the bloodstream. Many medical conditions can arise from these unwanted loose clots, including deep vein thrombosis and pulmonary embolism. Treatments from conditions like this include blood thinners such as warfarin and compression stockings. It is proposed that CBD's wide-ranging therapeutic properties include coagulation mitigation. The cannabidiol distillate used in this project is certified 0% THC content. To evaluate the CBD/coagulation cascade relationship a series of prothrombin time tests (PTT) with CBD ranging from 0.1ml to 0.3 ml to provide a definitive conclusion that CBD can mitigate coagulation cascade destabilization.

The average PTT results acquired in this experiment are as follows: 29.19 seconds, 28.61 seconds, and 21.83 seconds. Compared to the controls ranging from 11.23 to 13.81 seconds, the data proves that cannabidiol distillates does in fact prolong the clotting time by up to 129%, which proves that CBD can be utilized to treat life-threatening conditions such as DVT and pulmonary embolism. This research can easily be furthered by exploring effective delivery methods of CBD into the bloodstream. In addition, new experiments can be performed in order to test the effects of different forms of CBD on the clotting system, such as crystalline CBD isolate or cannabis salt.

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

ME BI

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

- human subjects       potentially hazardous biological agents  
 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

243

Fair Category

LS

Project Number

3029

**Title:** Comparison of Potential for Coastal Marine Macroalgae to Absorb Excess Nitrate in Runoff

**Student Name(s):** L. DeCola

**Abstract:**

There has been a recent resurgence of interest in human impact in coastal ocean waters for a variety of reasons. It has long been known that nitrogen runoff is one of the largest contributors to this impact, but natural sinks and mitigation techniques have been greatly understudied in my opinion. The species of nitrogen entering our waterways and the ability of known nitrogen users, marine macroalgae (Ulvaes), were both put to the test in this study to evaluate potential natural remediation of this runoff issue. Replicated studies compared algal density to nitrate removal in a controlled setting. The idea was that this could help create a clearer picture of possible sinks for nitrate runoff in coastal waters. The near immeasurable amount of nitrate removal lead to a few conclusions ( $p > 0.05$ ,  $\alpha = 0.05$ ). The idea of species specific removal of nitrogen runoff is not new in the literature (Heathwaite and Johnes, 1998), and raises questions for future studies about whether capacity of natural sinks for human impact can be a product of what the algae have been conditioned to experience. They are possibly exposed to ammonium nitrate as opposed to  $\text{NO}_3$ , and selectively removing other species of nitrogen not as commonly found in fertilizer runoff thereby explaining the lack of nitrate removal here. The other possible future application of these findings lies in aquaculture, and the use of algae who are selectively removing chemical species in algae scrubbers to naturally balance aquarium tanks.

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

EM ET EV

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

- human subjects       potentially hazardous biological agents  
 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

251

Fair Category

LS

Project Number

3032

**Title:** The Effects of a Bacillus and Trichoderma Inoculant and Lepidium Sativum on the pH and Microbial Recolonization of Low Intensity Burned Soil

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

## Abstract:

This experiment examined the role that inoculants and plant growth play in soil recolonization after a fire. To answer this question, soil with an average pH of 5.35 was burned for 3 hours at low intensity. Sticks, leaves, and other organic material were placed on the soil for a steady fire. A week after the fire, unburned and burned soil were cultured. The soil samples were cultured again a week after the inoculant and Lepidium Sativum were placed in. The pH of both soils was taken 6 months after the fire and 20 days after the inoculant and Lepidium Sativum were in the soil samples. In general, burned soil had a greater microbial population than unburned soil. This pattern was also detectable after Lepidium Sativum and the inoculant were in the soil. Burned soil with Lepidium Sativum did not differ in pH greatly from burned soil with the inoculant. The same pattern was seen when comparing the pH of unburned soil growing Lepidium Sativum and with the inoculant. Burned soil continuously had more alkaline pH values. The overall microbial population of the burned soil was greater after burning and continued to dominate unburned soil samples regardless of being inoculated or growing Lepidium Sativum. With increasing fires worldwide, soil microbial populations will be greatly affected. Possible short-term solutions to aid low-intensity burned soil would be to add an inoculation to the soil. This might not apply to high-intensity fires which are more detrimental to soil substrate, fungi, and bacteria.

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

EM 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

212

Fair Category

LS

Project Number

3049

Title: Can Orange Peels help plants to grow?

Student Name(s): A. Smith, A. Smith

## Abstract:

My research project was on plants behaviors to orange peels. Many people buy oranges and throw away the peels in the bin when they could be used for something else. I decided to see if instead of throwing the peels away, could they be used in gardens because many people have gardens. I decided to use two red beans for each of the 2 cups. So, I could keep track of the heights on both types of soil- one without orange peels and one with orange peels. I planted two seeds in the orange peels soil and he other two in the soil without peels but both soils being topsoil. All four seeds were planted on the same day and recorded data went to the 23rd of December. My beans in the peel soil did not grow or even germinate but my soil without peels grew 11 inches on the 23rd. I concluded that some plants like red beans have a low ph intolerance meaning they can't tolerate too much acids and stops them from germinating. Since orange was a citrus fruit the peels had limonene in it that would keep pests away but had acid. But plants like bunchberries and rhododendrons can tolerate acid, so they can grow with orange peels.

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

251

Fair Category

LS

Project Number

3052

**Title:** Evaluating the Intraspecific Relationship and Reciprocal Reaction Within Group Learning Shark Behavior Patterns.

**Student Name(s):** C. Nyiri

**Abstract:**

The goal of this study is to teach the practice, target training, to a single *Mustelus canis* (Mud Shark) and then determine if subsequent introduced sharks will interact and learn the practice from the initially trained shark, to evaluate the learning cascade. An initial goal is to successfully train one shark using a static target food reward allowing for the measurement of the time required for target acquisition and attack angle. This process is repeated until all daily food allotments are consumed. It is anticipated that once target training is completed the introduction of subsequent individuals will be used to determine if the social learning cascade can be realized. Data being recorded is the amount of time it takes for an interaction to occur with the static target and reward. Also, attack angle is being recorded for recognition of feeding patterns. Over 16-trials the initial shark was successfully trained with a 78.33% increased learn rate. The R-Value concluded at 0.3386, however the significance of F was 1.8%. This provides the necessary foundation to conclude that the trials and times were correlated. The untrained shark was then brought into the tank with the trained shark was. Data was kept on the interactions and reaction times. Over 7-trials, the introduced shark interacted with the target 11.90% of the time resulting in success for the study. This data can be applied as a foundation to future research regarding shark-human interaction in future studies/research, such as multi-generation migration patterns.

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

BE 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

227

Fair Category

LS

Project  
Number

3053

**Title:** The Effect of Artificial and Natural Lighting on Dinoflagellate Growth and Bioluminescence

**Student Name(s):** S. Nieves

**Abstract:**

Bioluminescence has been an interest to humans for centuries, and we have finally gotten a better grasp on the topic. Today, many scientists are using bioluminescent creatures to help with life saving procedures in neuroscience and more. Thanks to the natural chemical reaction, we are able to light up more of the body to detect and visualize things we couldn't have in the past. Understanding the best living conditions for these helpful creatures could prove useful, as we rely on their glow to show us the unthinkable. What exactly is the best way to culture and care for these creatures to get the best chemical reaction? My project for the CT Science fair revolves around the bioluminescence of Dinoflagellates, specifically *Pyrocystis Lunula*. I will be changing the amount of light, along with the type of light given to my dinoflagellates and observing the amount of light produced, and how long they continue to glow until dying out. The dinoflagellates I am using were shipped from Carolina science, where they are given light from a LED bulb. There's no data I have as of right now, as my materials have just arrived to me on the 27th of February. However, I can hypothesize that the cultures will be the healthiest and brightest with natural light rather than artificial light, as it is closest to its natural living conditions.

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

CB BI 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

146

Fair Category

LS

Project Number

3063

Title: The Effects of Chemical Lightening on Hair Tensile Strength

Student Name(s): D. Drye

## Abstract:

The purpose of this lab was to observe the effects chemical lightening had on the tensile strength of hair strands by chemically saturating three strands for different amounts of time and measuring how much weight they could support in grams. It was hypothesized that a longer saturation period would result in a lower tensile strength. A device was created that allowed pennies to be placed in a bag attached to the hair strand. Pennies were continually added until the hair strand broke. It was discovered that chemical lightening treatments resulted in lower tensile strength. Thus it was concluded that the longer the treatment was, the lower the hair strand's tensile strength was. Based on the results in this lab, the next step in this study would be to use a microscope and observe the physical structure of a hair strand in correlation to chemical lightening treatments.

## 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

243

Fair Category

LS

Project Number

3067

**Title:** Determining the Proliferation of Cellular Oxidative Stress through Blue Light Induced ROS Formation

**Student Name(s):** G. Silva

**Abstract:**

There exists a divide within the scientific community about whether the effects of blue light radiation are detrimental or not. Research suggests that blue light exposure may play a role in development of visual issues such as macular degradation and cataract formation, but a lack of evidence leaves the question of what cellular mechanisms cause these issues. It has been reported that blue light exposure may cause intracellular reactive oxygen species (ROS) overproduction, which can lead to cell damage. A better understanding of the exact cellular mechanisms that cause these health issues may lead to a more effective prevention or treatment.

This experiment aims to determine if blue light causes the production of ROS within cells, which would signify that it causes cell damage. Yeast, or *Saccharomyces cerevisiae*, is cultured and subjected to blue light radiation for one hour and H2DCFDA, a fluorogenic reagent, is used to determine ROS levels. In order to keep the concentration of yeast cells constant throughout samples, a ten microliter inoculating loop is used to suspend cells in distilled water, and cell concentration in each sample is calculated using an equation that estimates cell concentration per milliliter from absorbance measurements. H2DCFDA fluoresces when it binds with intracellular ROS, and the greater the fluorescence the greater the level of ROS. The fluorescence of yeast cultures, both subjected to blue light and not, is recorded and compared to determine if blue light had any effect on the production of ROS.

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

ME BI 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

254

Fair Category

LS

Project Number

3069

Title: Evaluation of a Model for Urban Vegetation Barrier Effects on Air Pollution

Student Name(s): R. Nassar

## Abstract:

Air pollution is a serious global issue, responsible for approximately one in every nine deaths each year, ranking it among the greatest environmental hazards to human health. It is of particular concern in urban areas, where elevated pollutant concentrations and potential sufferers converge. Over one half of the world's population presently lives in urban areas, and the urban population ratio is expected to reach 68% by 2050. Common air pollutants include particulate matter (PM), sulphur dioxide (SO<sub>2</sub>), ground-level ozone (O<sub>3</sub>), nitrogen oxide (NO<sub>x</sub>) and carbon monoxide (CO). While elevated rates of air pollution pose serious health risks for humans, outdoor plants can help reduce the harmful effects of air pollution by filtering and purifying the air around us.

In this project Common Ivy, Aster and Miniature Andromeda plants were evaluated for air pollutant mitigation. In this study we developed a vegetation barrier model with the plant located in the middle of the greenhouse box, and air pollutant was sprayed on one side of the plant. Dispersion patterns of sprayed pollutants were tested with and without vegetation barrier. Measurements of carbon dioxide (CO<sub>2</sub>), Formaldehyde (HCHO), Total Volatile Organic Compounds (TVOC), and Particulate Matter (PM<sub>2.5</sub>/PM<sub>10</sub>) were taken before spraying, then at 0 and 30 minutes after spraying, using both monitors.

The results show mitigation rates (in 177 ft<sup>3</sup> of air after 30 min): for TVOC the minimum reduction is 5 mg/m<sup>3</sup>; for HCHO, 1 mg/m<sup>3</sup>; for CO<sub>2</sub>, 2000 ppm; for PM<sub>2.5</sub>, 2000 ug/m<sup>3</sup>; and for PM<sub>10</sub> it was 1000 ug/m<sup>3</sup>.

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

252

Fair Category

LS

Project  
Number

3072

Title: Efficacy of Dissolved Flavonoid Supplements in Chelating Iron (II) in a Solution

Student Name(s): P. Gagnon

## Abstract:

In the Alzheimer's Disease research community, the dysregulation of iron is widely accepted as one of the probable causes of Alzheimer's Disease. Multiple studies have shown that early in the progression of Alzheimer's Disease, before obvious mental symptoms arise, there is a buildup of excess iron in the liver, eyes, and brain. However, many early-onset Alzheimer's Disease patients are diagnosed with iron-related anemia, suggesting that iron is not being properly circulated through the bloodstream. Natural chelating agents such as flavonoids, a chemical produced by plants to protect against environmental stressors, can be very effective in regulating the circulation of iron. Many researchers believe that the key to slowing or even stopping the progression of Alzheimer's Disease may be finding what the perfect daily dose of flavonoids is. In my research, I tested the ability of four different flavonoids to bind to the free iron in an aqueous solution to determine which was the most effective. After combining the flavonoid and free iron in one solution and allowing them sufficient time to bond, I was able to test the amount of unused flavonoid in the solution by using a spectrophotometer, which measures the concentration of a solution by shining a beam of light through it and calculating the amount of light absorbed by the solution. After testing each flavonoid, I determined that quercetin was the most effective in binding to the iron because it had the least amount of unused flavonoid remaining, meaning that more free iron was bound to it.

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

BI CH 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

151

Fair Category

LS

Project Number

3077

Title: Are Phones Bad for You?

Student Name(s): Z. Choudhry

## Abstract:

In order to determine if cell phones released electromagnetic radiation and to also determine whether electromagnetic radiation negatively affects humans, we decided to measure the amount of electromagnetic radiation that was released by a cell phone in hertz, when being called, over the distances of 2 cm, 5 cm, and 15 cm away from a radio frequency (RF) meter. For each distance, we decided to run three trials and we also averaged the results of all three trials per distance. After this, we would compare this data to the amount of electromagnetic radiation that causes negative effects to the human body such as sleep disorders, concentration issues, cardiovascular disorders, and memory loss. After conducting this experiment, our team was able to conclude that phones do release electromagnetic radiation and that the amount of electromagnetic radiation that is released by phones does not cause any of the mentioned negative effects on humans.

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

ME BE 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

253

Fair Category

LS

Project  
Number

3080

Title: A Natural Remedy to Decrease Asthma

Student Name(s): S. Akther

## Abstract:

The original goal for this project was to find a way to minimize asthma attacks and symptoms. Food intake and asthma symptoms were looked into which concluded that there was some correlation between food intake and asthma. Turmeric specifically has shown in previous studies to reduce inflammation in the lungs. This led to a turmeric tea experiment being created to measure participants' symptoms and asthma color zone before drinking turmeric tea and after drinking turmeric tea. The hypothesis of this study was if turmeric tea is drunk daily, then the subject will show a decrease in asthma symptoms. The independent variable was the addition of tea to a person's diet. The dependent variable was the self-reported asthma color zone and symptoms. The control variable was the first 2 weeks of the experiment. The experiment was done on 2-5 people with asthma diagnosed by a physician. During the experiment, participants filled out a survey every day during a 4-week process: tracking their symptoms without turmeric tea for 2-weeks and with turmeric tea for 2-weeks. The data showed participants experienced frequent coughing and shortness of breath during the first 2 weeks, however, these symptoms decreased during the weeks in which they were drinking the turmeric tea. This data supported the hypothesis that turmeric tea can help decrease asthma symptoms in people. Future studies can be done in larger groups of people to see how turmeric tea affects them and whether it can be used as a natural remedy to control asthma.

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

142

Fair Category

LS

Project Number

3087

**Title:** The Effects of Negative Thermal Stress on the Germination of Invasive and Native Plant Seeds in Connecticut

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

**Abstract:**

This study tested the effects of negative thermal stress on eight seed types, four of which were native to Connecticut and four of which were invasive to Connecticut. Each seed species collection was split in half, with half of each species experiencing negative thermal stress. All of the seeds were then germinated for three weeks and the number of seeds that germinated within each sample were counted. The difference in the number of germinated seeds from each species exposed to negative thermal stress was compared to the percentage of germinated seeds of the same species that were not exposed to negative thermal stress. This showed that the seed species out of the types used in this experiment that best survived negative thermal were native to Connecticut, thus showing that plants native to Connecticut survive better thermal stress than plants invasive to Connecticut.

**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

252

Fair Category

LS

Project Number

3089

**Title:** Determining the Efficacy of Zingiber Officinale to Promote the Bioremediation of Bioplastics through Amylase Hydrolysis

**Student Name(s):** S. Matregrano

## Abstract:

As the expansion of the bioplastics industry continues to grow there is a new stress to mitigate the long and short-term effects of starch-based bioplastics on environmental parameters. This research proposes that Zingiber Officinale (ginger) can be used to promote amylase hydrolysis of starches in Crassostrea virginica (Eastern Oyster), the model filter feeding organism, allowing for less excess starch to remain in the marine environment. The purpose of this experiment is to determine the water quality mitigation requirements and the efficacy of the oyster ginger/amylase systemic bioremediation process. Multiple trials were conducted to evaluate water quality parameters over a twenty-four-hour period with the addition of bioplastics to saltwater. Starch absorbances of tanks with oysters and different concentrations of ginger were compared to measure the starch concentration over time. All research was independently designed and executed unless otherwise noted. Hardness, salinity, and temperature were not affected while the turbidity, dissolved oxygen, and pH data indicated that there was a statistically significant change over time due to bioplastics. Data concluded; oysters treated in a .1M ginger solution bioremediated 230% more starch than the untreated oysters, oysters treated in a .055M concentration of ginger bioremediated 317% more starch in 5 hours compared to untreated oysters. The starch concentration decreased 13% faster in the .055M solution compared to the .1M solution. Future applications include a secondary ginger treatment of oyster beds for bioremediation of microplastics in addition to the supplemental ginger in the starch matrix of biodegradable plastics prior to dehydration.

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

EM BI 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

209

Fair Category

LS

Project Number

3091

Title: Active Aeration of Hydroponic Systems.

Student Name(s): A. McLaughlin

## Abstract:

**Objective :**Hydroponics is a novel way of growing food. Hydroponics grows plants with roots suspended in water. Growing in buckets of water allows precise control of the growing medium giving the farm a way to reduce waste of water and nutrients. Aquaponic technology is a growing field of research because of its increasing use in the agricultural sector. Because oxygen content influences rooting depth active aeration was tested as a way to increase growth.

**Methods:** Two groups of arugula were grown in containers of water, perlite and fertilizer. The experimental group was bubbled 24/7. The control group had stagnant water. 6 week old plants were removed and measured for mass and length..

**Results:** The average length of the experimental group was 5.5 cm. The average length of the control group was 3.3 cm. Mass was never taken because every arugula combined did not register on my scale. The survival rate of the experimental and control was 38% and 16% respectively.

**Conclusion:** This study cannot draw strong conclusions. Many plants never germinated. Molds and algae contaminated both groups. Nevertheless, the experimental group had algae, which probably comprised a majority of the biomass and survived better against the onslaught of diseases. Perhaps that means aerated water is better for plant life.

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

PS 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

251

Fair Category

LS

Project Number

3112

Title: Optimal Light Conditions for the Growth of Biofuel Algae

Student Name(s): I. Edelstein

## Abstract:

Many universities and research institutes, such as the University of Texas Biofuel Research Laboratories, have been researching the overall optimization of biofuel algae growth. Algal biofuel is an alternative to liquid fossil fuels that uses algae as its source of energy-rich oils, and algae, compared to other biofuel sources such as corn, produces hundreds of times the amount of gallons of oil per acre. Over time, fossil fuel deposits within oceans will become scarce, and more expensive, whilst algae will simply be continuously regrown. Optimizing the growth of biofuel algae has been sought after since the first, proven discovery that biofuel algae will not only better the economy, but also the environment as it is a carbon neutral source of energy, rather than the carbon footprint of burning fossil fuels. My project will be focusing specifically on testing the optimal light condition to produce biofuel algae, one part of harnessing its full potential to help better energy resource production. I will grow Spirulina major in seawater growth medium over intervals of 3-6 weeks in three different light conditions: no light, UV light, and sunlight. I will allow for the algae to fully mature as if it is going to be later harvested for biofuel, recording quantitative data such as the pH of the medium and the time it takes for the algae to mature in each light condition. This data will either prove or refute my hypothesis that Spirulina major grown using UV light will increase the most in size.

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

CB 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

99

Fair Category

LST

Project Number

3502

Title: Green Tea: The Bacteria Killer?

Student Name(s): S. Uanino, A. Tran

## Abstract:

To determine if green tea prevents the growth of bacteria, the researchers took two saliva samples before and two saliva samples after drinking green tea. They swabbed the saliva onto petri dishes filled with nutrient agar, and made observations after 24, 48, and 72 hours. The research team hypothesized that if green tea was applied to oral bacteria, then there would be less bacteria in the agar plates with green tea because there are many rumors about green tea helping oral health. . After 72 hours, their hypothesis was proven correct. Green tea does in fact reduce oral bacterial growth.

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

MI ME

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

- human subjects       potentially hazardous biological agents  
 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

220

Fair Category

LST

Project  
Number

3511

**Title:** The Effects of Varying pH and Amyloid Levels on the Brain Cells of Zebrafish Embryos

**Student Name(s):** A. Recio, N. Shields

**Abstract:**

The focus of this literature review will provide an in-depth understanding of how amyloid formation and pH levels can impact organisms. Through our experimental investigations, we hope to answer the question: does a change in pH and Amyloid proteins in Zebrafish embryos affect their physical and neurological traits, leading to Alzheimer's, and investigate how does a deviation from homeostasis affects an organism and its properties? Our experiment involves breeding 1 male and 5 adult females together in a breeding chamber in the morning and harvesting the resulting embryos at the end of the day. Our investigation will not impact adult zebrafish. The experiment will be performed on zebrafish embryos from days 0-6.5 post-fertilization. We will have a control group and several experimental groups. One experimental group will be exposed to varying pH levels over 6.5 days post-fertilization. The other experimental group will be exposed to different concentrations of amyloid proteins over 6.5 days post-fertilization. Observations will be taken every other day during first period over the course of one school week. Examination of the zebrafish brain will be made to determine if there are any alterations in morphology and will be documented via microscopy. Unfortunately, at the time of writing this, our fish and supplies have yet to arrive and we cannot draw any reliable conclusions.

**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):

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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

242

Fair Category

LST

Project Number

3521

Title: Effects of Microplastics on the Regeneration of Organisms

Student Name(s): A. Rinaldi, K. Brown

## Abstract:

Our research focuses on the abundant appearance of microplastics in the food and water that is consumed by the human population. Microplastics are not only consumed by humans, but also many aquatic organisms. By understanding how microplastics can affect smaller marine organisms, it may lead to future understandings of how microplastics can affect humans. We want to know if microplastics have the capacity to be harmful to organisms. More specifically, we are interested in studying if microplastics can harm the regenerative processes of certain organisms, and to what extent. In our experiment, we will have seven groups of *Nematostella vectensis* and seven groups of brown planaria. One of the seven groups will be a control group where the organisms are not exposed to plastic. Three of the seven groups will have different amounts of plastic and will be exposed to the microplastic before we cut them (these will be referred to as the pre-exposure groups). The remaining three groups will have the same amounts of plastic as the pre-exposure groups but the organisms will be exposed to plastic after the organisms are cut. To compare growth we will measure the organisms with micrometers and take pictures of them in each class. As of right now, we do not have any results, but we plan to have some soon as we are currently conducting research. No conclusions can be drawn yet as we do not have sufficient data from our research.

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

CB EV AS

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

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 vertebrate animals       controlled substances

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

190

Fair Category

PT

Project Number

4002

Title: The Design and Testing of Debris Deflectors to Prevent Buildup in Culverts

Student Name(s): D. Thomas, C. Zhu

## Abstract:

Culverts are pipes that are connected to storm drains. The purpose is to prevent debris buildup in culverts and design debris deflectors that will decrease debris. Using debris deflectors will help with culvert damage and buildup. Without debris deflectors, water can become contaminated and unsafe for drinking. This could also lead to disruptions to the aquatic ecosystems which the water ends up near. These animals may be harmed because of debris. The use of debris deflectors will decrease contamination in waters, make safer water for drinking, and it will help aquatic life in nearby ecosystems. How can debris deflectors prevent the least amount of buildup? For the control, no debris deflectors were used in the testing rig. The debris deflectors were measured by how much debris they captured in percentages and the debris deflector with the highest percentage performed the best. Mark 3 was the best at capturing debris with an average of 89% debris trapped. Mark 1 and Mark 2 did worse than mark 3 with an average of 73% and 78%. Based on the results, Mark 3 captured the most debris compared to Mark 1 and Mark 2.

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

EV EE EM

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

- human subjects       potentially hazardous biological agents  
 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

Yes  No

# CSEF Official Abstract and Certification

Word Count

237

Fair Category

P7

Project Number

5006

Title: Thermoelastic energy generation using variable temperature gradients

Student Name(s): K. Suri

## Abstract:

The amount of energy created using a thermoelectric generator with different temperature gradience. I performed this experiment in hope of finding a new way to create energy by only using one simple device.

How much energy can be created by using thermal energy to measure the temperature gradient?

The amount of energy (voltage) will be measured in this experiment. Using a multimeter, the two wires connected to the thermoelectric generator will connect with the two wires from the Multimeter. The highest amount of voltage would be measured for each test.

The reason for my project is to try to discover new and better ways to create energy without using any gas.

A thermoelectric generator is a piece of equipment used to create energy from a temperature gradient. The temperature gradient is the movement from something very hot to something cold. As well as something very cold, to something very hot. The thermoelectric generator is a thin device that on one side can collect energy from something hot, and on the other, energy from something cold. The mixture from the two temperatures collides and the generator collects it and forms energy from it. To be able to measure the energy amount being created, you would have to use a device called a multimeter to measure the voltage. One more thing about the thermoelectric generator is that it is extremely durable, and can last a while without being broken.

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

ET EE

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 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

247

Fair Category

P7

Project Number

5009

Title: Using Snell's Law to Determine the Index of Refraction in Solutions

Student Name(s): S. Borst

## Abstract:

The purpose of this project is to represent the concentration of sugar in a solution using the principle of light refraction. The scientific question is how does sugar in a solution affect the index of refraction? The hypothesis for this experiment is that the more sugar in a liquid the more laser light will bend or refract. A prism will be filled with different solutions containing known and unknown amounts of sugar. The prism will have a laser light passed through it. The prism will then be rotated so that the laser light inside of it is parallel to the bottom side of the prism resulting in a spot on a target board. This spot will be marked on the target board using colored pencils for each different solution. Based on these marks distance measurements in centimeters will be taken and used along with an understanding of trigonometry to calculate an angle theta. Knowing what theta is and plugging it into Snell's Law allows additional mathematical calculations and results in the index of refraction for each known and unknown solution. The results of my project showed that as the sugar concentration of the prepared solutions increased so did the index of refraction. That means the more sugar in a liquid the more the laser light bent or refracted resulting in a higher index of refraction. In conclusion, my hypothesis was supported by experimental data proving the more sugar in a solution the more the laser light refracted.

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

MA PH

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 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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- Yes  No

# CSEF Official Abstract and Certification

Word Count

166

Fair Category

P7

Project Number

5010

Title: How Fast Can Fabrics Dry?

Student Name(s): D. Ciscel

## Abstract:

This project explores the drying properties of different fabrics. To do this, I did an experiment on what fabric dries the fastest out of cotton, corduroy, flannel, thin polyester, thick polyester, and mesh. The hypothesis was that the thin polyester fabric would be the fastest to dry. The experiment was conducted by wetting squares of fabric, wringing them out, then putting them in a place with equal sunlight to dry. Afterwards, the squares were tested every fifteen minutes to determine if the fabrics felt dry. The result of the experiment is that mesh was the fastest to dry followed by cotton, then thick and thin polyester, then corduroy, and finally flannel. Mesh only took fifteen minutes to dry while flannel took three and a half hours. The hypothesis was proven incorrect because thin polyester was only the third fabric square to feel dry. The results showed that the density of a fabric does not affect drying speed as much as the materials the fabric consists of.

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

CH

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 vertebrate animals       controlled substances

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

4. Is this project a continuation?  Yes  No

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

Fair Category

P7

Project Number

5016

Title: The Algorithm of the Rubik's Cube

Student Name(s): M. Rosario

**Abstract:**

The Rubik's Cube is a 3-dimensional color based combination puzzle that was created in 1974 Ernó

Rubik. The original Rubik's Cube had six sides that were each covered by nine stickers, each side had

one solid color: white, red, blue, orange, green, and yellow. The goal of the Rubik's Cube is to mix it up and resolve it to its original form. I tested several algorithms and settled on two that solved the cube more frequently. In the end, both algorithms simultaneously were needed to solve the cube.

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

MA

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 vertebrate animals       controlled substances

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

4. Is this project a continuation?  Yes  No

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- Yes  No

# CSEF Official Abstract and Certification

Word Count

255

Fair Category

P8

Project Number

5501

**Title:** Implementation of Metal-Oxide-Induced Agglomeration and Electromagnetic Filtration for Removal of Microplastics

**Student Name(s):** S. Mohanraj

## Abstract:

Microplastics, nondegradable fragments of plastic debris less than 5mm in size that arise from the breakdown of consumer products, are persistently found in water sources and pose health hazards to all species. Their microscopic size renders them difficult to remove using conventional water purification processes.

This project investigated using novel electrically-driven methods to agglomerate and remove microplastics from contaminated water samples. Three methods were analyzed: electrically-magnetized filtration, electrically-magnetized filtration enhanced by the addition of metal (iron, manganese, nickel) oxides into the contaminated water samples to better agglomerate microplastics, and electrolysis. It was hypothesized that enhanced filtration would be most effective due to metal oxides' agglomeration with microplastics, allowing microplastics to be attracted to the filter, iron oxide being the most effective oxide due to strong magnetic properties.

Microplastics (HDPE, PETE, PP) were each added to distilled water to create separate samples, along with a sample of washing machine discharge containing microplastic fibers from synthetic cloth. These were assessed using three analyses prior to and following the above agglomeration methods: spectroscopic analysis (using Beer-Lambert's Law to determine the extent of filtration of suspended microplastics from the samples), microscopic analysis (quantifying the number of microplastic fragments within the samples), and turbidity tube analysis (determining turbidity levels).

In all three analyses, the implementation of iron oxide with the electrically-magnetized filter, removing about 50% of microplastics, worked most effectively in all microplastic samples compared to all other methods. The electrolytic cell worked the least effectively out of all the methods, removing only about 7%.

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

CH EM AT

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

128

Fair Category

P8

Project  
Number

5502

Title: CATALYST CHEMICAL REACTION -Coke and Mentos

Student Name(s): M. Akbar

## Abstract:

MEEM'S ABSTRACT: My research is about the "Coca Cola & Mentos Experiment" that shows how higher or lower the height would be from the Catalyst Chemical Reaction after we add the number of Mentos wanted. The number of Mentos added to the 2 Coca Cola Bottles would show the results by itself because the explosion is going to happen after the amount of Mentos are put into the Coca Cola Bottles. For example, 1 Coca Cola Bottle has 14 Mentos, and the other Bottle has 7 Mentos. I would like to know the results are the same height or different heights. Next the research of my project will be about heights. My definitive answer to my research project would be about how higher or lower the Coca Cola explodes.

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

CH EV

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 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

249

Fair Category

P8

Project Number

5504

**Title:** The Effect of an Insulator with Styrofoam on the Temperature Difference in Celsius Between Two Pieces of Cardboard.

**Student Name(s):** C. Borges

**Abstract:**

In modern society, insulation can be found all around you, whether that be through insulation in your walls, or insulation in containers containing the Pfizer vaccine. All around the world, insulation is used, and all around the world, insulation saves lives. Insulation has propelled humanity to a place it would not have reached without it, and is crucial to our ever so fragile civilization. The experiment was done in order to add on to the vast amount of studies and data on insulation and try to discover new insulative properties or interesting phenomena. The project narrowed down the broad topic of insulation to combinations of insulators. The study aimed to figure out how insulator combinations differed from single insulators in terms of insulative efficiency. The experiment used styrofoam as the control and as the constant in each trial, and used polyester, leaves, and cotton paired with it to test each combination's efficiency. It did this by placing said insulator combination between two pieces of cardboard, one of which was heated up by a blow dryer. After 5 minutes, one would measure the temperature of both pieces of cardboard, and calculate for the temperature difference. A higher temperature difference would indicate better insulative efficiency since it showed how much heat was absorbed. The original hypothesis stated that polyester and styrofoam would perform the best due to polyester's density and manipulability, however the results instead indicated that cotton and styrofoam performed best because of cotton's higher density and less present manipulability.

**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):

- 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

141

Fair Category

P8

Project Number

5507

Title: Rusting Nails

Student Name(s): A. Eneh

## Abstract:

The purpose of my experiment was to find out if and how the amount of salt in water affected how much a nail will rust. My hypothesis was that if there is more salt added to water then the iron nail will rust more. To conduct this experiment I placed 4 iron nails into 4 test tubes which contained water with different amounts of salt in them. I repeated this process 3 times. The results showed that the nail in the test tube without salt rusted and gained 4.6 pounds. The nail in water with 3 bottle caps of salt gained 6.1 pounds of rust. This supported my hypothesis in that the nails in test tubes with more salt gained more weight, which means they rusted more. In conclusion the amount of salt in water increases the amount a nail rusts.

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

CH

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

- human subjects       potentially hazardous biological agents  
 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

246

Fair Category

P8

Project Number

5508

Title: Crystal Current

Student Name(s): A. Mauborgne

## Abstract:

I have had an interest in geology and sustainable energy for a long time. Recently, there has been a lot in the news about deep space travel, exploration and eventual colonization. Many new technologies will be needed to make long-term space living possible. Existing technology may not work for such extreme exploration. Perhaps information gathered from this experiment could be used to further the distance we could travel by providing energy-creation in deep space where resources may be limited. This could extend the length of a mission.

The purpose of my experiment was to find out if minerals can be used to generate electricity, and determine which crystals create the most electricity. After doing some research, I devised a way to test different minerals. I attached a magnet to a voltmeter and struck the individual crystals and recorded if any current was created. Then, I recorded the mV reading from each crystal. Out of the eleven samples I tested, all of them produced an electrical current ranging from 36.2 mV, to 7.6 mV. Clear quartz produced the highest mV reading, and "crazy lace" agate produced the lowest output.

The next step for this project would be to do more research into what minerals are known to exist on various planets that could be used in the process of electricity generation. Additional calculations need to be made to determine the scale of materials that would be required to make enough electricity to be of use.

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

EN ET PH

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- human subjects       potentially hazardous biological agents  
 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

52

Fair Category

P8

Project Number

5510

Title: Energy

Student Name(s): S. Shaw

**Abstract:**

I did this project because in class we learned how people use their bodies to create energy and I wanted to try it also. My project is making a knee brace that collects energy and a hand crank to see which charges the phone the fastest. The results are still being calculated.

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

EN EE

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

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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

246

Fair Category

P8

Project Number

5512

Title: The Effect of River Bank Medium on River Erosion

Student Name(s): B. Chaleski

## Abstract:

The purpose of this project is to determine how river erosion is affected by the medium of the river bank. How does the medium of a river bank affect the erosion of a river bank? If gravel contains less volume and less density, then the water should flow through the gravel much faster than the sand. If the sand contains more volume and more density, then the water will have a harder time flowing through it leaving the gravel with the fastest time. In order to determine if river erosion is affected by the river bank medium, a percolation test was done. This will test how fast water passes through each specific medium. The container was held over the sink to contain all materials that might have fallen out of the holes to reuse them again. The fastest time of the empty container was 14.25 seconds. The Gravel came close, but only had a time of 16.47 seconds as its fastest time. The slowest medium was the sand at 118.82 seconds being the slowest. The fastest the sand ever came to was 116.66 seconds. The river bank medium effects erosion by slowing down or speeding up the drainage flow of water. This was predicted in the hypothesis and then proven throughout 12 trials. Hence, the overall conclusion is that gravel is the best medium for a river bank since it both reinforces the river bank, and it allows the water to flow at a constant rate.

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

EM 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

110

Fair Category

P8

Project  
Number

5514

Title: OXIDIZED CHEMICAL REACTION - Coke and Bleach

Student Name(s): L. Benzo

## Abstract:

The following science project will identify the Oxidized Chemical Reaction of mixing coke cola with bleach. The materials used for this project is a 16.9 oz bottle of coke, Bleach, a cup, and a mixing tool. This project contains a breakdown in a 5 minute interval in which the chemical starts to react. This project also contains my data findings. The purpose of this project was to identify the use of house hold products along with the mixture of soda. This project is also based on the hypothesis of a colored substance turning into a clear substance. This project also concludes my results and future recommendations the research I performed.

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

CH 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

125

Fair Category

P8

Project  
Number

5516

Title: Fingerprint preservation

Student Name(s): M. Das

## Abstract:

The purpose of this project is to test the preservation of fingerprints on different materials. To test this, I used wood, glass and metal to which I pressed my thumb against and blew some powder on top of. That revealed the fingerprint that I then transferred to a black paper after sticking it to tape. This experiment resulted in the glass fingerprints coming out clear, the metal ones clear but a little patchy, and lastly, the fingerprints from the wood were a little bit hard to tell because the ridges of the fingerprints clashed with the texture of the wood. After conducting this experiment, I can conclude that glass and metal are the best materials to preserve fingerprints, especially glass because of the smooth texture.

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

CH

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

- human subjects       potentially hazardous biological agents  
 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

Yes  No

# CSEF Official Abstract and Certification

Word Count

251

Fair Category

PS

Project Number

6016

Title: Harnessing Bio-Kinetic Energy Through A Wearable Non-Invasive Generator

Student Name(s): A. Vassallo

## Abstract:

Biokinetic energy is currently an overlooked/undervalued method for the generation of electricity. It is proposed that biokinetic energy produced through human body movement can be harnessed for electrical generation. To accomplish this goal, a set of retractable cables are connected to direct current generators, which are wired in series, using  $6M\Omega$  wire, on a breadboard. The breadboard forms a circuit which outputs into a portable power bank. The retractable cables then run through silicone tubing to prevent wear and are attached to each hand and foot. As the arms and legs move, actuating the cables, which then spin the pulleys through 3D printed cams attached to each generator. Being DC generators, a diode is wired on the positive lead on the output wire to the power bank to prevent the reverse flow of energy. Solar cells are added to compensate for stationery periods and increase electrical output potential. All the generation/control components are then held in a foam padded, hard carry case that can be worn as a backpack. The rate at which the power bank charges will vary on the movement speed of the individual wearing the device. The average power output is 0.8 Amps (A). To put it into perspective, a typical 110 Volt charging block outputs 2A of power. Based on this output data this novel device will successively serve small portable electronic devices in multi-faceted applications for civilian and government sectors. Further research will be required to directly integrate this technology into clothing garments.

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

EE ET

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- human subjects       potentially hazardous biological agents  
 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

232

Fair Category

PS

Project Number

6017

Title: The Impact of Temperature on Blood Vessel Dilation

Student Name(s): A. Skrabacz

## Abstract:

A recent poll revealed that roughly 90% of student athletes have had a sports-related injury. Another poll showed that roughly 54% of student athletes have played while injured (Justin Weinstein, April 17, 2020). This raises the question of how many of those injuries could have been prevented, treated, or healed with a simple ice pack or heating pad. This experiment explored the relationship between blood vessels and temperature, to further understand what icing and heating do to the blood vessels while healing injuries. Blood vessels bring oxygen, nutrients, and blood to the body, making them vital for survival and extremely important to understand and observe. To explore this relationship, scientific models of blood vessels were made out of latex gloves filled with water. These models had their starting volumes taken using a water displacement method then, had ice and heat applied to them, and finally they had their ending volumes taken. With the data gathered from the experiment, a line graph was made that showed the relationship between blood vessel dilation and temperature. The data supported the hypothesis that an increase in temperature will cause an increase in dilation, and a decrease in temperature will cause a decrease in dilation. Understanding icing and heating methods and what happens in the body while doing so, is necessary for coaches and athletes especially, to prevent further injuries and help to heal current ones.

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

ME BE

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

- human subjects       potentially hazardous biological agents  
 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

251

Fair Category

PS

Project  
Number

6019

Title: Yielding High Value Secondary Products from Fossil Fuel Waste Utilizing Electrolysis

Student Name(s): D. Steer

## Abstract:

Currently there is a large problem with the wasting of resources when it comes to the treatment of coal fly ash. With the use of electrolysis on a coal fly ash solution, aluminum can be sequestered from the material as well as other high-value byproducts. Using electrolysis to separate aluminum from coal fly ash could become a major source for the metal. The goal of the project are to develop a cost-effective and efficient way to obtain aluminum with electrolysis. The project is being completed with the use of an x-ray spectrometer to determine and analyze the yields of the electrolysis reaction with the coal fly ash. The electrolysis reaction is being completed with the use of a low voltage power supply that electrifies the solution. Aluminum is being reclaimed from the coal fly ash. With current data collected over many months of experimentation it seems that there is some alumina that is being separated from the coal fly ash, but at a very small efficiency. However, there is a large amount of silica and other materials that are being separated from the coal fly ash through electrolysis. Future implications that this project could have would include new ways of production for the world's most highly demanded metals and the efficient production of other materials that may be difficult to produce as of now. Future research relating to this project could include the uses of different electrolytes and methods in reclaiming these materials from the coal fly ash.

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

EM

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 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

255

Fair Category

PS

Project  
Number

6032

**Title:** Gravity-Assisted Energy Conversion: Improving the Feasibility of Mechanically Powered Electricity Generators

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

## Abstract:

As technocentric populations expand and global industries progress, there grows an increasing demand for research into methods of generating and storing energy. The refinement of new methods of energy conversion will lead to sustainable technological practices and reduce the impacts of wasteful energy consumption on an individual and macroscopic scale.

Current methods, such as wind or hydro power, utilize generators to convert mechanical work to electrical energy. These generators will be the focus of this engineering project: weight-powered mechanisms utilize gravity as a driving force by converting potential energy to other types of energy. Other quasi-perpetuation mechanisms, such as escapement mechanisms found in watches or pendulums used in grandfather clocks, are useful for extending the duration of the activation period of a mechanism.

Thus, the goal of this research is to maximize both the intensity and duration of gravity-powered electricity generators, by trying to compound weighted mechanisms and duration-extending mechanisms. A 3D printed escapement mechanism was mounted onto the shaft of a generator and several alterations were made to the mechanism to improve the quality of the mechanism.

The experimental mechanism failed to perform either of its intended improvements in duration or intensity, regardless of changes made to either component. It is hypothesized that the weighted mechanism's intensity acted in counter to the escapement mechanism's duration extension. Further studies into "gravity power" should study alternative duration-extending mechanisms such as constant force springs that may avoid this counteraction within the compound mechanisms while improving the efficiency of weight-powered energy generation.

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

ET EE AT

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

- human subjects       potentially hazardous biological agents  
 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

118

Fair Category

PS

Project  
Number

6046

Title: Effect of Electrolysis on Water

Student Name(s): A. Pitts

## Abstract:

This project is on the effect of electrolysis on water that has been contaminated with sodium bicarbonate. This experiment had multiple tests including, Ph and conductivity of distilled water, water with sodium bicarbonate, water that has gone through electrolysis and water with sodium bicarbonate after going through electrolysis. The lowest and therefore least contaminated levels of Ph and conductivity were in the normal distilled water after electrolysis. This means that when looking for a way to decontaminate water, electrolysis is one of the possible solutions. Applications of this idea can be used in water filtration centers. To get even better results you could also use a higher voltage and put the water through a longer period of electrolysis.

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

CH

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

- human subjects       potentially hazardous biological agents  
 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

250

Fair Category

PS

Project Number

6056

**Title:** Identifying the effects of radiofrequency-electromagnetic fields on small insects and locating high RF-EMF zones in the environment.

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

**Abstract:**

Electromagnetic fields and radiation are becoming increasingly abundant and intense within the environment as dependencies on technologies like wireless routers and cell towers increase. The project focuses on the effects of fields on the neurological impacts on insects. The fields are measured using an EMF meter. Their effects on insects were analyzed through the measurement of neuron action potential. Field data was collected at points around Lordship, Connecticut to establish the baseline peak EMF strengths and radio radiation strengths respectively. Data of action potentials of insects exposed to different strengths of electromagnetic fields from 5 milligauss to 100 milligauss were collected. This data was recorded across multiple trials and a shift in data across differing EMF strengths was shown, but no correlation was shown between the strength and the number of spikes in the recorded time frame. Data on the Lordship area suggests that strong magnetic fields are not widespread and the strongest sources of EMF do not have much area. Based on these results, modern EMF emissions in residential areas are not a danger to insects and are not widespread. This implies more room to expand on the strength of electronics and wireless communication technologies in human environments, but more research should be done on the strength of electromagnetic fields in dense, more technologically populated cities with technology with 5G communications. Lordship does not have as much wireless technology as a large city may have so measurements of electromagnetic field and radio radiation strength may yield very different results.

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

AS EV

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

155

Fair Category

PS

Project  
Number

6066

**Title:** Natural Function Restrictions, Identities, and Properties to Determine Finite Cardinalities of Solutions for Real-Valued Functions Projected onto Natural Space

**Student Name(s):** P. Chitirala

**Abstract:**

The aspects of the natural function  $\text{nat}(f(x))$  and the natural solutions function  $\text{nats}(f(x))$ , which involves a compilation of definitions, properties, restrictions, identities, theorems, and relations are analyzed and developed for real-valued functions and determining the number of natural solutions  $(c_k, f(c_k))$  of general functions such that the property  $c_k, f(c_k) \in \mathbb{N}$  holds, where the x-values and the y-values of the points are both natural. These solutions are founded upon the equation  $[f(x)] - f(x) = 0$  in which the natural solutions to this equation satisfy the natural solutions function, and thus the natural function, of  $f(x)$ . The definition of the natural solutions function is formed in terms of the natural function, and the relations between the natural solutions functions of different real-valued functions are determined in terms of the mapping and organizations of the sets including unions, intersections, and morphisms.

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

MA AT

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- human subjects       potentially hazardous biological agents  
 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

231

Fair Category

PS

Project  
Number

6078

**Title:** Development of a Novel Classification Model to Determine Vegetation Habitability of Exoplanet Atmospheres Via Random Forest Machine Learning Algorithms.

**Student Name(s):** J. Gottlieb

**Abstract:**

Based on a 2013 NASA report there are ~11 billion potential exoplanets present in the Milky Way Galaxy of these, ~4,000 exoplanets have been confirmed. To further evaluate exoplanet candidates, data must first be filtered and sorted. Machine learning algorithms can streamline this processing time by providing definitive insight into which exoplanets require prioritization for further investigation. A novel application of a random forest algorithm was used for the analysis of exoplanet transit spectroscopy to determine the habitability for a given exoplanet's atmosphere. The data set used consisted of 20,206 transit spectroscopy points, 3,143 were collected from the Nasa Exoplanet Archive; the remaining 17,063 points were generated using Nasa's Planetary Spectrum Generator. Performance analytics data provided the model with Precision, Recall, Accuracy, and F-1 Scores for 0 and 1 Habitability rating as 0.68, 0.97, 0.82, 0.93, 0.74, and 0.95 respectively with an accuracy of 0.91. The model's ability to predict Habitability values of 1 with performance scores all above 0.9 indicates that the model is successful. Limited bias in the model's predictive capacity of inhospitable values was detected, as indicated by sub 0.9 scores. Through larger data set value input, it is expected that this bias will be eliminated. This novel machine learning model can be used to increase the efficiency at which exoplanet data is analyzed and interpreted, assisting in the prioritization of celestial bodies which merit further investigation.

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

CS PH 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

244

Fair Category

PS

Project Number

6079

**Title:** Sentiment Analysis on Twitter Data Regarding the 2020-21 Georgia Senate Runoff Election

**Student Name(s):** S. Jonnalagadda

**Abstract:**

In the age of social media, opinions can be shared easily and quickly. There are many platforms on which users can post highly biased and political messages, most of which display a positive or negative attitude towards a candidate. Twitter is a goldmine for such messages, and its API (Application Programming Interface) and the Tweepy library allow users to extract the messages. To get access to the API, I had to create and obtain approval for a Twitter developer account. Then, I had to make an app in the API in order to receive a set of keys, which must be concealed for account security. With those keys and the Tweepy library, the tweets can be extracted and saved as text in a pandas dataframe alongside the timestamp of the tweet. This text has to be pre-processed, meaning that words that are neutral will be removed and added to the dataframe. Raw tweets containing redundant information are disorganized. Pre-processing will help overcome those issues. After pre-processing, the tweets can be analyzed for sentiment by using the TextBlob library and saving the polarity in the dataframe. With the polarity saved, the data can be averaged. When 50% of the votes were counted, Perdue's average polarity was 0.113, and Ossoff's average polarity was 0.135. After 90% of the votes had been counted, Perdue's average was 0.092 and Ossoff's average was 0.197. My code predicted that Ossoff would win because of his higher average.

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

CS

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 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

143

Fair Category

PS

Project  
Number

6084

Title: pH Levels On Different Types Of Beverages

Student Name(s): N. Valencia

## Abstract:

Beverage sizes have been increasing since the year 1955 and with those, they contain lots of surgery components in the drink. If the drink is too acidic it can cause dental problems and lead up to health problems as well. The purpose of this experiment is to test if sugar affects the acidity or alkalinity of a beverage. To determine how acidic and how basic a beverage is; it is best to use a pH indicator strip. Each beverage was put in different cups and labeled with a black sharpie which type of beverage it contained. The results of the experiment show that the most acidic beverage was soda (Ginger ale) with a pH of 2 and Snapple (pH 2). Both beverages contain between 32 to 24 grams of sugar. The most basic beverage was Ginger Root tea with a pH of 7.

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

CH CH CH

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

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 vertebrate animals       controlled substances

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

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

4. Is this project a continuation?  Yes  No

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

- Yes  No

# CSEF Official Abstract and Certification

Word Count

159

Fair Category

PST

Project  
Number

6502

Title: The Drinker Dehumidifier

Student Name(s): R. Mistry, A. Dunning

## Abstract:

This engineering design challenge was to create a water collection device that will collect a substantial amount of clean water for drinking purposes. This mockup is meant for areas that face water scarcity such as the Middle East and North Africa. To build our device we used a large plastic container and set it up with a closed system inside. To create our closed system, we used a copper coil that was sealed on one side and had a metered valve on the other side. This metered valve can be connected to many different cooling products that the user may use. The idea behind the product is that humid air will form condensation onto the cold copper coils and that newly formed condensation will drip down the coil into one of the two drip pans. Our mockup has many parts that will function on a prototype however we do expect a working prototype of our mockup to work efficiently.

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

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

89

Fair Category

PST

Project Number

6519

Title: The Efficiency of Newer and Older Aircraft Designs

Student Name(s): D. Cammarota, M. Markowsky

## Abstract:

Many aerospace companies are designing new, innovative aircrafts in hope to save gas and money. In this experiment we will be testing the aerodynamics of 2 newer designs and 1 more generic aircraft design to see if these new and innovative designs are numerous times more efficient than the older design. To test the aerodynamics, we made 3d scale models of the Maverick by Airbus, the Celera 500l, and the New Midsized Aircraft by Boeing (NMA). And we will test and compare lift and drag using a wind tunnel.

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

EE PH

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 vertebrate animals       controlled substances

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

4. Is this project a continuation?  Yes  No

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- Yes  No