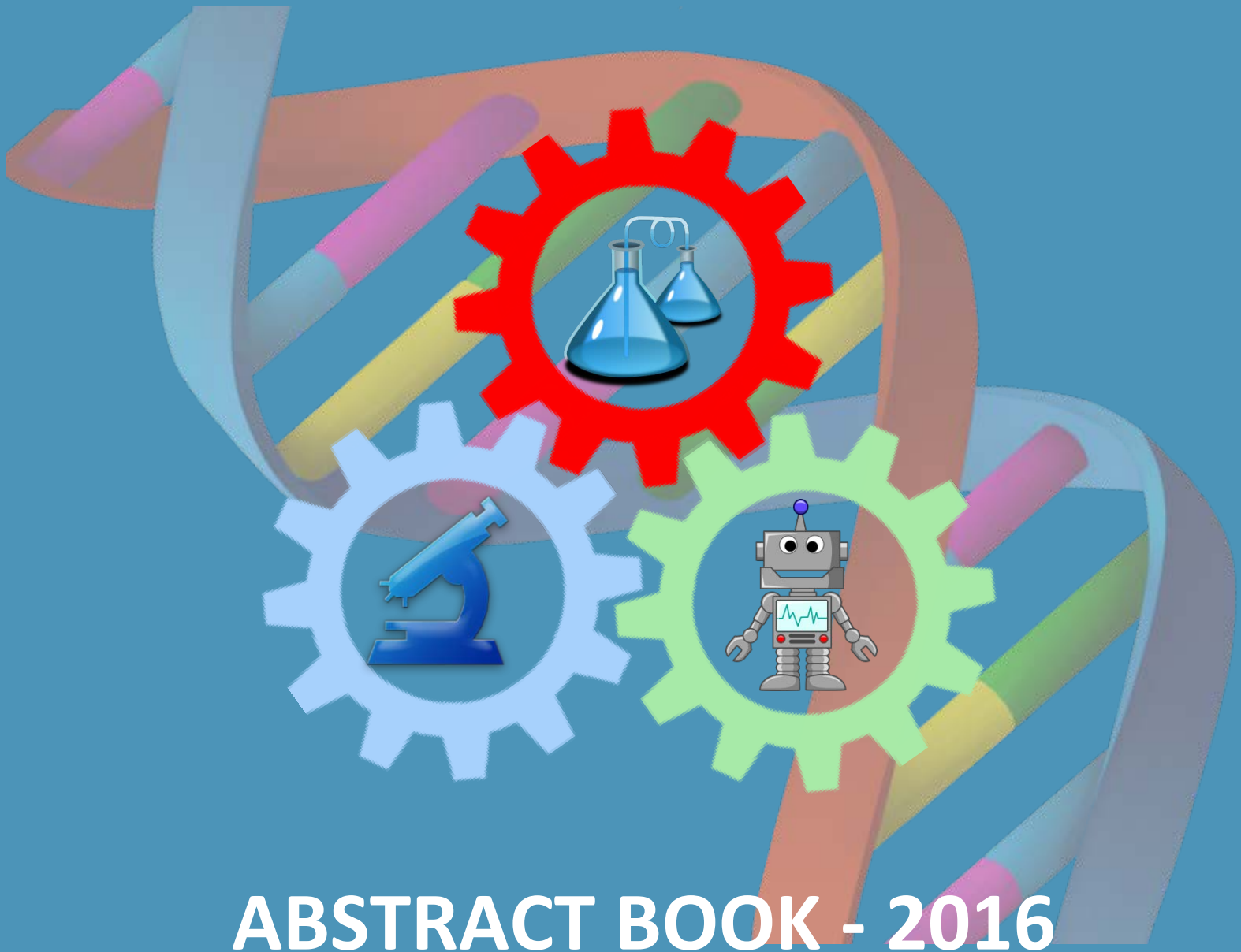
Science Symposium

"Where Creativity Meets Innovation"



ABSTRACT BOOK - 2016

Organized by
NBT India Day Committee
(A Service Project of Agraj Seva Kendra)

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NBT SCIENCE SYMPOSIUM 2016

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Learn and explore the possibilities in STEM!

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"So he who earns for himself lives for himself, progressively restricts his capacities to himself. He, who lives and works to give to others, progressively expands himself. So, the secret of expansion of the self is in giving."

Messages

Gangadhara Rao Vakkalagadda

Dear Friends,

I would like to extend my warmest welcome to all of you. I am honored to invite all of you to the 1st NBT Science Symposium, held here at the North Brunswick High School on 22nd of May, 2016. It gives me immense pleasure to see such an overwhelming response from the North Brunswick community in this science symposium to display their enthusiasm for STEM.

This year, we have invited children from Grades 4th to 12th to display their talents and research. In the coming years, we wish to expand this to lower grades too in order to give them a head-start in scientific thinking. It is my dream to make this an event that not only brings out the budding scientists' talent from North Brunswick, but also from across the state and, eventually, the nation. The current world thrives on scientific advances and these science symposia will help the young ones learn, collaborate and place themselves strategically in the forefront, as great scientists and leaders.

I would like to acknowledge the efforts of the Executive Members of NBT India Day Committee, the Advisory Board and the numerous volunteers who helped make this event possible in such a short time frame. I also want to take a moment to recognize the partnership of NBT India Day Committee, (A service project of Agraj Seva Kendra) with the North Brunswick Board of Education and the North Brunswick Department of Parks, Recreation and Community Services.

I wish every student a great success in their future endeavors. I hope you can reflect on this Science Symposium later in your life with a positive and inspiring sentiment!
Thank you,

Gangadhara Rao Vakkalagadda
Chairperson, NBT India Day Committee
Member, North Brunswick Board of Education

Govinda Rajan

Dear Friends,

My hearty congratulations to the NBT Science Symposium Executive Committee and the Advisory Committee for bringing out the First NBT Annual Science Symposium. One hundred and thirty nine students have teamed up to create fifty two projects, which is commendable.

The Science Symposium gives the students an opportunity to focus on Science, Technology, Engineering and Math (STEM) areas together. Skills and knowledge in each discipline are essential for student success. Also, these fields are deeply intertwined in the real world. These projects are testimony as to how students learn most effectively. I hope this symposium will take them beyond being just a participant, to boosting their creativity and research capabilities and enjoying the pure pleasure of learning and teaching STEM-related topics.

On behalf of Agraj Seva Kendra and on my own behalf, I express sincere gratitude to the North Brunswick Board of Education and North Brunswick Department of Parks, Recreation & Community Services for being partners in organizing this event. I also thank the local business community, donors and sponsors for their generous donation. Thanks to all the volunteers who have helped in shaping this event.

Sincerely,

Govinda Rajan
CEO
Agraj Seva Kendra

Messages

Dr. Brian Zychowski

Dear Community Member,

Benjamin Bloom, the great American educational psychologist, defined that the highest level of mastery learning is having students “evaluate and create”. Students are being exposed to this rigorous challenge of creating science projects that they must present and defend. This educational endeavor captures the quintessence of the ***North Brunswick Township Science Symposium.***

On behalf of the North Brunswick Township Board of Education, I would like to thank the NBT India Day Committee and Department of Parks, Recreation & Community Services for generating an alliance to make the ***North Brunswick Township Science Symposium*** a reality. This event has stimulated great interest amongst our community because it highlights our students’ work. I look forward to discussing the many projects with the student inventors. There will be educational excitement permeating throughout the high school that can only be produced by creative minds demonstrating their aptitude.

It is with great pride and admiration that I express to all students and families best wishes for a successful program. I am confident that our students will continue to excel while meeting the highest standard of learning.

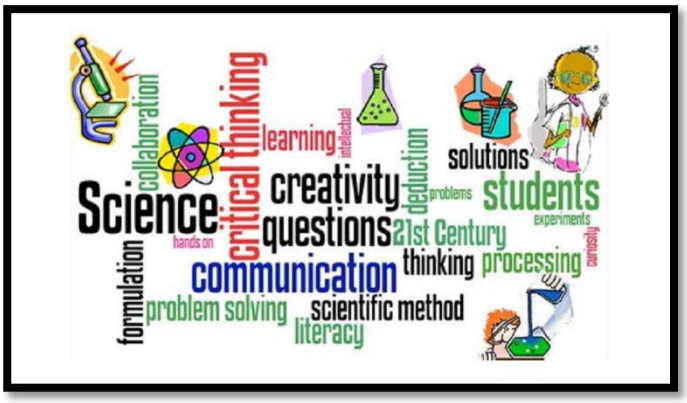
Sincerely,
Brian Zychowski Ed.D.
Superintendent of Schools
North Brunswick Township Public Schools

Jennifer K. Diszler

Dear Friends,

As Albert Einstein said, "To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science.” The Science Symposium has offered an empowering, self-guided outlet for North Brunswick students to problem solve, discover, inquire, and be creative. I firmly believe that bringing together people who share similar passion for innovation and a commitment to better the world is a recipe for science greatness. I am grateful for all of our staff and community members who made this symposium possible. Our young scientists in North Brunswick make us proud everyday and it is my hope that they continue to challenge their limits and dream the impossible!

Sincerely,
Jennifer K. Diszler
Director of Curriculum, Instruction and Technology
North Brunswick Township Public Schools



May 15, 2016

Dear Gangadhara Rao
and NBT India Day Executive Committee

It is our pleasure and honor in extending greetings to the 'NBT India Day Executive Committee' on celebrating **NBT Science symposium** on Sunday, May 22, 2016 at North Brunswick Township High School, New Jersey.

Children are our future and they carry the torch for future generations. Thanks for leading such a noble initiative for Science Symposium. It gives me immense pleasure to learn that this is the first time the township of North Brunswick has a science fair and you have an overwhelming response from children from grades 4- 12, around 50 teams, who will be displaying their talents in the areas of STEM.

Agraj Seva Kendra is an invaluable organization dedicated to community service and charitable projects. Though I came to know your organization recently but thrilled by knowing your generous contributions in so many versatile areas with selfless service.

Rotary Club of Plainsboro, North & South Brunswick is serving humanity and community serving projects. This year we have completed Free A1C camp, spreading awareness about autism in the community, beach cleaning along with Old bridge Waterfront park, fundraise for Military/Veteran appreciate day, Constructed new hiking trail at Thompson Park Conservation in Monroe, donated food items to local township food pantries.
At international front, we are supporting Jaipur Limb project, India, Nepal "homes for hope" project and books to Cape Town Schools in South Africa. This year RCOPN&SB has won 6 awards for its amazing work during the district conference that occurs once a year.

Please accept our sincere gratitude for the superior job you and your organization members are doing to bring out the best in students and motivate rest of students & parents in our community. This is really a great initiative and we sincerely wishing you all a huge success in this and all of your future projects.

Sincerely,

Balram Chinta

(Balram Chinta)
President
Rotary Club of Plainsboro, North and South Brunswick

NBT SCIENCE SYMPOSIUM 2016

Program Schedule

Time	Activity
9 AM to 10 AM	Participants to pick up the registration packages and setup displays
10 AM	Judging Sessions begin Room 1 (Room # 420) Judges • Aruna Dontabhaktuni • Stacie Oliveri • Daniel Bachalis Room 2 (Room # 423) Judges • Rajeev Mohan • Kelly Streko • Giridhar Tirucherai Room 3 (Room # 424) Judges • Madhusudan Reddy • Michael Kestlinger • Ed Szemis
1 PM	Welcome address by Gangadhara Rao Vakkalagdda Address by Dr. Brian Zychowski Address by Jessica McNulty Address by Lou Ann Benson Symposium Speaker Ryan Catelano Symposium Speaker Vijay Reddy Symposium Speaker Carlton Hoye
2 PM	Awards Distribution Vote of Thanks

Room 1 (Room # 420)

Team #	Team Name	Judging Time
149	Energy Saving Musketeers	10.00 AM
145	Angels from Space	10.10 AM
143	Guardians of the Reef	10.20 AM
142	3 Awesome Girls	10.30 AM
140	Brains of Steel	10.40 AM
132	Anuva and Gowri	10.50 AM
130	Science Sisters	11.00 AM
129	The Balloonists	11.10 AM
127	Go Green	11.20 AM
124	Innovation	11.30 AM
122	Whizkids	11.40 AM
121	Team Awesome	11.50 AM
120	Contagious Intelligence	12.00 NOON
119	Dirt Fishing	12.10 PM
118	Supersonic Angels	12.20 PM
117	The Furious 3	12.30 PM
114	Power Trio	12.40 PM

NBT SCIENCE SYMPOSIUM 2016

Room 2 (Room # 423)

Team #	Team Name	Judging Time
150	Excalibur	10.00 AM
147	E-Liquefiers	10.10 AM
146	The Clone Queens	10.20 AM
139	ANN's Science Lab	10.30 AM
138	Scientific Superminds	10.40 AM
137	Rugrats	10.50 AM
136	Team Aurora	11.00 AM
134	Whovirgent	11.10 AM
133	32 Marshmallows	11.20 AM
131	The Nefarious Wizards	11.30 AM
128	Team MC Square	11.40 AM
116	Cedar Hill	11.50 AM
113	SAS-Einstein Divas	12.00 NOON
112	The Cool Scientists	12.10 PM
110	3SG	12.20 PM
107	BOT-Brains of Tomorrow	12.30 PM
106	Ardonauts	12.40 PM

Room 3 (Room # 424)

Team #	Team Name	Judging Time
152	Falzon A	10.00 AM
151	Falzon B	10.10 AM
148	Team SAP	10.20 AM
144	Boss	10.30 AM
141	Drosophila melanogaster	10.40 AM
135	XWomen	10.50 AM
126	The Cheating Team	11.00 AM
125	Work in Progress	11.10 AM
123	Ephyra	11.20 AM
115	The Generators	11.30 AM
109	The Einsteins	11.40 AM
108	Creative Creators	11.50 AM
104	Mad Magnets	12.00 NOON
103	Volcano Girls	12.10 PM
102	Team Emoji	12.20 PM
111	ECOFY Scientists	12.30 PM
105	Hydra	12.40 PM
101	Windmills	12.50 PM

Abstracts

Elementary School Projects

Team: Team Emoji (102)
Title: Laughter is the Best Medicine
Participants: Aruhi Vakkalagadda, Gabriella Seiden, Alyssa Mikita, and Stacy Rappolt

Abstract: This presentation discusses the benefits laughter. To name a few, it benefits the heart by lowering the blood pressure, reduces stress by stimulating the release of endorphins, increasing blood flow to muscles, burning calories, and preventing diseases by stimulating the immune system. It also modulates hormones that are beneficial to the body. Laughter also prevents anxiety, sleeplessness and depression, which are a major problem for a number of people worldwide. Laughing about 15 to 20 minutes a day is all what it takes to maintain a healthy heart. Please stop by our presentation to discover more about laughter and its benefits, something that you could do anywhere, everywhere, and easily with a lot of FUN!

Team: The Volcano Girls! (103)
Title: Our Slimy Volcano
Participants: Ashlee Irizarry and Poorvi Shekar

Objectives/Goals: To construct a volcano out of household materials. It will trickle out homemade slime.

Materials/Methods: A narrow, glass vase will be used to contain the homemade lava. A mixture of duct tape and papier-mache will be used to make the outer shape of the volcano. A mixture of borax, baking soda, and white vinegar will be used to create the slime that will trickle down the volcano. The entire project will sit on a home constructed wooden base.

Results: A simple mix of chemicals can cause a small, combustible reaction.

Conclusions/Discussions: The pressure increases inside the volcano because of the baking soda mixing with the white vinegar. This causes a carbon dioxide gas. This together causes our homemade volcano to erupt! The same pressure in a real volcano is what causes it to erupt as well. When in a small space, the gas can increase and move the liquid upwards.

Summary: The lava inside a real volcano erupts due to a chemical reaction. Our project is a small scale, safe demonstration of what happens inside a real volcano.

Team: Mad Magnets (104)
Title: Train in the Spring
Participants: Saatvik Kabra, Aman Srivastava, Vivek Tumuluri, and Manish Vankadara

Objectives/Goals: Our objectives and goals are to show that neodymium magnets and a triple A (AAA battery) battery can be used as a vehicle with a copper coil. Also our goals are to see what the electro-magnetic fields do.

Materials/Methods: Our materials we used to just do the experiment were a Copper Coil, Neodymium Magnets, and a AAA battery. We tried this experiment because it seemed cool and we wanted to try this experiment and see what happens. First we bought some copper wire to see if copper is a conductor. And that is what we needed. To make sure that our transportation will go fast and work properly, we used a thick copper wire to make sure that it, the neodymium magnets and a AAA battery would create a good magnetic field. To make the copper coil, we wrapped the copper wire around a pole and then at the end tape the end down and then wait for a couple a minutes and then take off the tape and then carefully slide the wire on the pole off. It depends how long you want the coil. This part of the experiment shows how the electromagnetic fields react. The neodymium magnets had to fit in the copper coil we made in order to work. But our group always followed the rule that you cannot succeed in science first try. You can't get frustrated on your first try. For example, Thomas Edison used more than 10,000 materials for the filament of the light bulb and none of them worked. And here we are now with the light bulb. Last but not least, we made this model in a suburb area and our model representing the train station because:

- It is a transportation that represents a train
- Project best fits there
- Suburbs are a popular way of transitions in modern society.
- To show how this model impacts our everyday lives, and may enhance how we live.

Results: The neodymium magnets and the AAA battery work together and go with tremendous force through the copper coil. The magnets used the magnetic force and pushed the battery through the coil.

Conclusions/Discussions: Based on research we did as a group, when the battery and neodymium magnets magnetize they create an electromagnetic field. When that bond enters or touches the copper coil the magnetics push through the coil. The reason why they use a AAA battery is still unclear to us, as future scientists. However, we do know why we use a copper coil. This is because if the experiment consisted of using a metal coil, the magnet would attract to the coil resulting in nothing moving or working. Because copper is not a conductor the magnet cannot attract to the coil so which results in the "vehicle" moving cleanly through the coil. When the coil doesn't have the energy and magnetism would not flow smoothly so the "vehicle" gets stuck in the coil and starts to vibrate inside the coil. As long as that happens we still have hope that at least our experiment is still working.

Summary: This project attempts to show an electromagnetic field. Also it shows how just a simple AAA battery and some neodymium magnets pushed inside a copper coil can do.

Team: Creative Creators (108)
Title: Fast and Furious
Participants: Nathan Yeboah, Jayden McLeod,and Gabriel Taylor

Abstract: We are the Creative Creators! We had done something exciting! We are here to present it to you today. Would you like to hear about it? Our project name is Fast and Furious. It is a car that we designed.

We are seeking to prove that a simple car will operate on its own. Our team used two plastic bottles, glue, 4 bottle caps, batteries, and cardboard. We built the vehicle with these materials and tested to see if the car will move on its own. We proved that the car will move on its own. Our project proved that we can use almost anything to build a car or vehicle.

Team: The Einstein's (109)
Title: The Greenhouse Effect
Participants: Leah Hughes and Chakshu Mittal

Objectives/Goals: In our project, we will demonstrate the greenhouse effect. The greenhouse effect is the process by which ultra violet radiation from the sun is absorbed by planet's surface and reradiated as infra-red radiation (heat). Gasses in the atmosphere then trap the heat causing a net warming of atmosphere. Different gasses vary in the effectiveness at trapping heat. This project will demonstrate that atmospheres with increased concentrations of carbon dioxide (CO2) will show a larger greenhouse effect that those with lower concentrations. This definition was based on information from Wikipedia.

Materials/Methods: In our experiment, we will demonstrate the greenhouse effect by growing wheat grass and creating a "greenhouse" to place it in. We are going to water one plant with water, which will act as the control, and the other plant with seltzer water. Rates of growth will then be measured for each plant and compared.

Results: The plant that is going to be watered with seltzer will probably grow faster than the plant that will be watered with regular water. Please note that seltzer has CO2.

Conclusions/Discussions: This experiment is designed to show how the greenhouse effect works.

Team: ECOFY Scientists (111)
Title: The Eco House
Participants: Divya Salgarkar and Hetvi Khatri

Our science project is on an eco friendly house with one special feature; water harvesting. As we all know, the precious water on our planet is becoming scarce and costlier every year. Especially in the countries with drought going on. We in New Jersey are fortunate to have plenty of water but people are taking water for granted. For example, some people leave the water on while brushing or not finishing the water in their water bottle. Water harvesting will not only help us in NJ but also deserts and other hot and dry places. There will only be rain fall a couple of times in these kinds of places. They need to stock up on water in these kinds of places. So now, we have come up with an idea to use the rain as the water source to be our occasional or possibly daily use water. We hope to make our environment safer and smarter.
Now, our most important part; rainwater harvesting. All of the rainwater collected will be stored in a ginormous tank especially for the water to stay clean and cool. The collected can then be used for various needs such as watering the plants, washing things or even for drinking in emergencies.
We do really think that our project can make a massive difference in the world. Now hopefully this has interested you in our project. So come and check out our neat project! Thank you for taking the time to read our ECOFYING project!

Team: Power Trio (114)
Title: Green City
Participants: Hael Raj, Pratyush Rajesh and Kris Rekha

Objectives/Goals: Our group strives to create a way to power our homes and our lives without breaking the fragile ecosystem that Mother Nature allows to use as our playground. As such, we have come up with a quick list of 3 renewable energy sources that are both powerful and more importantly, eco-friendly.

WEIGHT-POWERED ENERGY

Materials: Metal Sheet with small notch at bottom , Bowl,Water, 2 Turbines, 2 Magnets, Wire, LED

How it Works: The notched material will be above the bowl filled with water. When weight is exerted upon the notched material, it will create a overflow of the water in the bowl beneath it. This water will fall on the turbines which will have magnets attached to the turbines which since fluctuating runs an electric current through the wire which when connected to the LED runs enough electricity to light the LED.

Results: The LED is lit by a power source of the weight which successfully can power a LED so if put into effect on a larger scale, it could power a city or even a whole state or country if used correctly.

Conclusions/Discussions: In Conclusion, a Weight-Based System of electric generation would very well be a successful, useful, renewable resource.

GREENHOUSE GAS-POWERED ENERGY

Materials/Methods:
Dry Ice also known as Frozen Carbon Dioxide
Neodymium Magnet Stack
1 LED (Light Emitting Diode)

How it works: Dry Ice, also known as Frozen Carbon Dioxide, touches a magnet with an attached LED (Light Emitting Diode) on the top of the magnet which the LED will be lit up by.

Results: The LED is lit by the Dry Ice also known as Frozen Carbon Dioxide. If you used a larger scale you could power a city.

Conclusion: This is a system using Carbon Dioxide as energy, and as such is a successful, renewable energy that is very powerful.

SALT WATER-POWERED ENERGY

Materials:
1 Copper sheet, 1 Tin or aluminum can, Wires, Alligator Clips, 1 Motor, Plastic Container
2 Thick Rubber Bands, LEDs

How It Works: When salt is dissolved in water, it creates electrolytes which conduct electricity. By creating an insulating layer between the copper sheet and the tin can and having the salt water electrolyte poured between them and connecting them with wires there is a flow of electricity. The copper sheet acts as the anode (positive) and the tin/aluminum can acts as the cathode (negative). By connecting an LED to the wires it lights up.

Results: The LED is lit up using salt water. If you use it at larger scales you can use it to power a city, state or even a whole country!

Conclusions/Discussions: In conclusion, this system is a successful, renewable resource that can create enough power for a great amount of area.

Team: The Furious 3 (117)
Title: The Crazy Eruption
Participants: Hiya Nayyar, Reynah Thakur and Hind Nayyar

Objectives/Goals: Carbon dioxide, a colorless and odorless gas, is the chemical compound made up of two oxygen atoms bonded to a single carbon atom. Carbon dioxide can be found in soft drinks and soda water to give the beverage it's "fizz".

Materials/Methods:
1 Roll of Mentos mint candies
2-liter of bottled diet or regular soda (note that diet soda erupts higher than regular soda)
A narrow test-tube that's about the circumference of the Mentos or a funnel wide enough for the Mentos to fit into. You may also use a narrow piece of paper to fold into a tube.
Index card

Estimated Experiment Time: Less than 5 minutes to set-up, only a few seconds for the eruption.

Step-By-Step Procedure:
1. Place your Mentos candies inside the test-tube or funnel so that they're stacked one on top of the other in a single column. If you don't have a suitable test-tube, you can roll a piece of paper into a narrow tube just wide enough to fit the Mentos into.

2. Place the index card over the mouth of the test-tube or paper tube on the top end. Invert the test tube (flip it over) so that the index card holds the candies from falling out.
3. Open the two liter of soda by removing the cap and shake the bottle a little.
4. The eruption will happen very quickly, so make sure you're prepared. Place the rolled candies from the tube over the bottle opening, index card down. Remove the index card so that the candies will fall into the bottle in one smooth motion.
5. Stand back and watch your volcano erupt, shooting jets of soda several feet into the air!

Results: When the Mentos candy is dropped into the carbonated soda, which is filled with carbon dioxide gas, the gelatin and gum Arabic from the dissolving candy create an energy that breaks the surface tension of the soda. The pits around the surface of the candy act as nucleation sites, which are conduits for carbon dioxide bubbles to form. Once the Mentos hit the soda, bubbles immediately begin to form on their surface. When the candy hits the bottom of the bottle, the gas is released and pushes all the soda from the bottle up in the air in an amazing.

Conclusions/Discussions: Active volcanoes have long been recognized for both their hazards and their benefits. The extent to which a volcano is considered hazardous (or beneficial) depends largely on its proximity to human population. Realistic estimates of the number of people at risk worldwide is necessary to systematically evaluate regional volcanic hazard and categorize individual volcanoes for potential human impact in the event of an eruption. This study quantifies the spatial relationship between global distributions of human population (in 1990) and recent volcanism. We estimate that 8.8% (455 million people) of the world's population lived within 100 km of an historically active volcano and 12% within 100 km of a volcano believed to have been active during the last 10,000 years (the Holocene Epoch). Of the 1410 Holocene volcanoes considered, we estimate that 457 volcanoes (222 historically active) had more than 1 million people living within a 100 km radius while 311 were relatively uninhabited with average population densities less than 1 person/sq.km. We also find that average population density generally decreases with distance from these volcanoes (within 200 km). The land around the 703 volcanoes with recorded historic eruptions had a median population density of 23 people/sq.km within 200 km as compared with the global median density of 4.3 people/sq.km for all occupied land area. Population density near volcanoes is not evenly distributed worldwide. The results of this study suggest that preferential population of volcanic regions may be influenced, in part, by climate. Volcanoes at high latitudes are generally uninhabited but at lower latitudes volcanic regions are often densely populated. In tropical areas, the elevation and fertile soils associated with volcanic regions can provide incentive for agrarian populations to settle close to potentially active volcanoes. In the tropical climates of Australia, Africa and Central America, higher population densities occur in closer proximity to volcanoes. In more temperate climates, such as those of Japan and Chile, population density tends to increase with distance from volcanoes - in part ,because the climatic "advantage" of volcanic elevation is presumably less important in these regions.

Team: Supersonic Angels (118)
Title: Solid Liquid Densities
Participants: Shreya Swamy and Ananya Pochinapeddi

Objectives/Goals: This experiment examines solids and liquids of different densities. The goal is to determine the comparative densities of various liquids and solids through a colorful demonstration.

Liquid Materials:
1. Honey
2. Corn Syrup
3. 100% Maple Syrup
4. Whole Milk
5. Dish Soap
6. Water
7. Vegetable Oil

Solid Materials
1. Jar
2. Bolt
3. Bottle cap
4. Lego block
5. Plastic ball
6. Beads

Method:
1. Measure equal amount of liquids and pour them into 7 small cups.
2. Use Food Coloring to color the Water and corn syrup.
3. CAREFULLY layer Honey, Corn Syrup & Maple Syrup to the Jar and DON'T let it touch the sides of the Jar.
4. CAREFULLY layer Milk & Dish Soap.
5. CAREFULLY layer Water & Vegetable Oil from the side of the Jar.
6. CAREFULLY drop the objects into the water, one after the other, starting from Bolt, bottle cap, plastic ball, Lego block and Beads.
7. Watch the object settle down at different levels, depending on the liquid density.

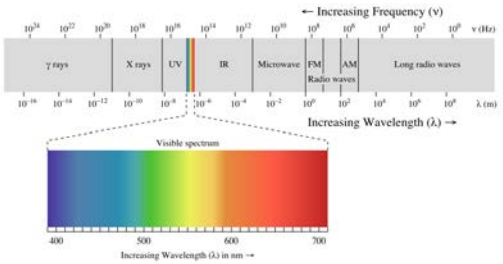
Result:
The greater the density of the object is the lower it sinks. Lesser the density it floats.

Conclusions/Discussions: Objects that are of the same size/type may have different density. Density is calculated by the formula DENSITY=MASS/VOLUME. In this experiment, you'll notice that the liquids don't mix with each other. The varying densities allow you to form layers of liquids on top of each other, creating the visually stimulating display in your Jar.

Summary: This project explains about the varying densities of liquids and solids.

Team: Dirt Fishing (119)
Title: Spectroscope
Participants: Eesan Natesh and Sibi Thiyagarajan

Objectives/Goals: The objective of this experiment is to study if different light sources produce different color spectrum using a spectroscope.
Introduction:_The light that is visible to our eyes is part of an electromagnetic spectrum that contains a collection of light rays of different colors.
We have built a simple Spectroscope using some household items to split the visible light into its component colors (spectrum). As such, we have used different light sources to compare these spectrums.



Hypothesis: Different light sources produce different spectra of colors.

Materials/Methods: We used the following materials:

- A compact disc (CD) to diffract light and create a color spectrum,
- A cardboard box to act as a dark chamber for light and hold the CD,
- Two razor blades to create a small opening for light,
- A cardboard tube that acts as an eye piece.

A CD is placed inside the cardboard box and a slit is made in the other side of the box to pass the light rays to hit the CD. The light rays get diffracted to produce a spectrum of colors, which is viewed through another opening in the box that serves as an eyepiece.
This procedure is repeated with different types of light sources to record our observations

Result: Various light sources produce different types of color spectrum, confirming our hypothesis.

Conclusions/Discussions: Different light sources produce various color spectra based on the wavelength of the radiation.
This property of light and spectrometer makes it possible for scientists to study chemical composition of various materials. Spectroscope is used by astronomers and scientists to study the chemicals present in stars and planets.

Team: Contagious Intelligence (120)
Title: Which came first, the chicken or the egg?
Participants: Sanjana Pundru and Aliza Lopez

Objectives/Goals: This project is to show that the egg came first, not the chicken, and for those who think that the answer is a paradox, this is to show that their answer is correct in some contexts, and also that there is a scientific way to prove that they are incorrect, and that the actual question that we should be asking is "Which came first, the proto chicken egg or the chicken egg?" There are many ways to prove that the egg came first.

Materials/Methods: Proto chicken DNA, chicken/proto chicken eggs, chicken and proto chicken (diorama) were chosen for this project. We will create a poster explaining that the egg came first and a diorama of proto chicken DNA and its eggs and the chicken itself.

Results: The egg came first.

Conclusions/Discussions: Even though many two out of three people think that the answer to this philosophical question is a paradox, and also that the answer is enough to make your head spin right off your head. Based on research, scientists say that the egg comes first. How? In comparison to humans, many animals have evolved over time; first there were egg laying species, then came proto chickens, and after that there were chickens. So the chicken came first? Put it like this, there are egg species that lead to a proto chicken that lead to a chicken that gave birth to a chicken egg, and there are egg laying species that lead to proto chickens that gave birth to an egg and inside the egg there was a chicken. Now, something that we can all agree on is whether it's a proto chicken or a chicken, the first true chicken came from an egg.

Team: Team Awesome (121)
Title: Volcanoes at home
Participants: Madison Cannon and Laila Albrolisy

Objectives/Goals: The objective is to build a visual demonstration of an active volcanic eruption.

Materials/Methods: You will need a plastic bottle that is at least 20 FL OZ. Then place the bottle on the tray. Line the tray with artificial grass. Then you will need polyurethane to shape the mold around the bottle. The next step is to select terra cotta clay, playdoh or mud to shape around the polyurethane. After this is complete you will need to make the mixture. The mixture requires 2 -3 tbsp. of baking soda, 2-3 drops of liquid detergent, ½ of water,1/2 vinegar, 20 drops of red dye. It is important that all of the ingredients be added in the exact order listed.

Results: The volcano should erupt. If you use too much baking soda a lot of the baking soda will be left on the bottom of the plastic bottle.

Conclusions/Discussions: Based on the research to successfully demonstrate an erupting volcano the correct amount baking soda and vinegar is needed to create the chemical reaction.

Summary: We learned how to build a volcano using household materials that mimic the eruption of an active volcano. This is a fun project that you can do at with your family and friends. The main ingredients of the experiment can be found at home. This experiment demonstrated how different products react when they are combined. Due to using red dye for coloring, this experiment should be performed outside so it doesn't stain anything in your home.

Team: Whizkids (122)
Title: Transformation of Energy
Participants: Aarav Yadav, Rohan Bhatia and Sahil Choudhari

Objectives/Goals: With natural sources of energy available all around us in different forms, our team is working on transforming the energy from one form to another for future use.

Materials/Methods: Wind and Sun were the sources of Energy that we wanted to leverage in our project. We want to transform these sources of energy into commercially consumable energy forms. We used a Mini Generator, Wind turbines, Solar panels, Re-chargeable batteries and Wires. We also used a multi-meter to measure the voltage to ensure successful results.
The Wind Turbines were attached to the generator and the generator was connected to a pack of rechargeable batteries via wires. The Multi-meter was also connected to measure voltage.
Similarly, the solar panels were placed in outdoors to ensure maximum sunlight. The wires from solar panel were also connected to a pack of rechargeable batteries. The Multi-meter was also connected to measure voltage.
The charge (Energy) on the re-chargeable battery was completely drained out to ensure the battery was not functional.

Results: The wind moved the turbines resulting in the generator to transform wind energy into electrical energy. The Energy was then successfully stored into a set of batteries for later use. Similarly, solar panels were able to transform the heat from sun and convert it into electrical energy. The resulting charge on the battery was used to power a torch light and toys.

Conclusions/Discussions: Based on our experiment, it's possible to transform energy and store it for future use. With proper usage of various renewable sources of energy (Solar, Wind, Hydro etc.) we can rely more on natural environment friendly resources and less on fossil fuels. There by keeping Earth Green!!!

Summary:
The experiment successfully used renewable sources of energy to transform Wind and Solar Energy to power a battery.

Team: Innovation (124)
Title: Sodas Effects on Teeth
Participants: Adithi Prasad and Preetesh Shah

Objectives/Goals: It is aimed to find out the different effects on teeth from soft drinks.

Materials/Methods: The most important materials needed for this experiment are soft drinks, the hard boiled egg and the limestone. In the first experiment, we will put each limestone which represents the teeth (because both have calcium) into different types of soda and observe the limestones each day. I read that acids in soft drinks affect tooth enamel, the protecting layer on teeth. This experiment will show effects of drinking too much soda. The second experiment is about how the color of the hard boiled egg (egg shells are similar to teeth) changes color when someone drinks often. We are going to put the hard boiled egg in a soda (coke) and wait for several hours. Then, we will take it out and notice the the change in color. We need to brush the egg

shells gently with a brush & tooth paste. We are doing this experiment to create awareness that we should rinse or brush your teeth after drinking Soda.

Summary: We are trying to help people realize the terrible effects of soda. Soda not only affects your teeth but also its not good for your health because it has too much sugar.

Team: Go Green (127)
Title: GreenHouse Effect
Participants: Jessica Rajasekar and Meera Batra

Objectives/Goals: The greenhouse effect is important for maintaining temperatures and sustaining life on our planet, too much of greenhouse gas, causes global warming. This science fair project was conducted to find out how different surface conditions affect atmospheric temperatures caused by the greenhouse effect. The testing was done using a surface of water, sand, black soil and carpet grass, and to prove that grass surface has the least increase in temperature due to greenhouse effect.

Materials/Methods: The materials required for this science fair project:

- 4 transparent glass jars with small holes plastic covers
- 4 thermometers
- 1 box of clay
- A stopwatch
- Tap water
- Sand and soil for filling 2 cm height in the jars
- Carpet grass for 1 layer in the jars
- 1 ruler

For this science project, the independent variable is the type of base used in the glass jar – water, sand, black soil and grass. The dependent variable is the temperature of the air inside the jar. The constants (control variables) are the size of the jar, the external temperature and the amount of sunlight received.

Four jars are labeled as water, sand, soil and grass. The jars are filled with water (2cm deep), sand and soil and labeled accordingly on the jar. A layer of carpet grass is placed at the bottom of the fourth jar.

The thermometer is then inserted through the hole on the cover. The base of the thermometer should be suspended approximately in the center of the glass jar, ensuring that it does not touch the surface of the water, sand, soil or grass. The clay is used to keep the suspended thermometer stuck to the cover.

The 4 jars are placed directly under the sun for an hour. A temperature reading is taken every 10 minutes and recorded in a table.

Observation: It was observed that the jar containing water had the fastest increase in temperature and the jar containing the layer of grass had the slowest temperature increase.

Team: Innovation (129)
Title: Balloon-Powered Car Challenge
Participants: Rajeev S Achar and Justin Moore

The Goal of this project is to design & build an air-powered car. Air can be captured in a balloon which when escapes could propel a car. It is an engineering design project which means that design requirements need to be specified & followed for successfully building the designed car.
This study also aims to describe & demonstrate forms of Energy & laws of motion.

Design Requirements/Methods/Materials:
The design requirement of this demonstration is to build a car:

- That is sturdy & not fall apart
- It should go straight
- It should go as far as possible

Materials/Methods:

- Build a body of a car using a plastic bottle or a cardboard box
- Use bottle caps or round discs to construct the wheels.
- Pencils or chop sticks to build the axles.
- Plastic straws
- Balloons to hold air

Use a shoebox or a plastic bottle as the body of the Car. Make holes on the body – both front & back side. The holes need to align perfectly. Insert Pencil or chopsticks in to the holes to build the axles. Makes holes into the bottle caps or round discs & insert into the axles. Make necessary arrangements using straws & other items to securely attaché the balloon to the body & also have an easy way to inflate the balloon.
Now it is time to test the car with a possibility of redesigning it to make improvements!
Inflate the balloon by blowing through the straw. Pinch the end of the balloon shut, or put your finger over the end of the straw, to prevent air from escaping. Put your car down on the floor, and let go of the balloon.

Does the car go straight?
How far does the car go?
Did any parts of the car fall apart?
Repeat steps 1–4 a few times until you are comfortable handling your car and seeing how it works.

Results: After many iterations & change in design, we made improvements to the model & made it work:
The Car travels straight.
It remained sturdy – no falling parts!
It travelled a reasonable distance.

Conclusions/Discussions: The demonstration helps us to understand engineering design, forms of Energy & Laws of motion.

Summary: With this simple experiment we learn the engineering design process – a step by step procedure to design, test & construct to improvise & accomplish the task.

Team: Science Sisters (130)
Title: Child-in-Car Safety Alert System
Participants: Shriya Simha, Rana Morsy and Korrina Kourmoulis

Objectives/Goals: Since 1998, over 665 children (on average 37/year) have died from heat stroke when left alone in a vehicle. The Child in Car Safety Alert System (CICSAS) is designed to detect a child left in a vehicle at an unsafe temperature and alert the driver and passersby of the critical situation car by tracking their presence and alerting an alarm once the temperature exceeds the limit and a child is detected inside a car through the use of various sensors. It is an innovation that could save many lives and bring peace of mind to parents.

Materials/Methods: The objective is to use a development board attached with sensors and a switch. When the baby is placed in the car seat, the CICSAS is activated. The temperature sensor senses the ambient temperature inside the car and the code checks if it is above the threshold set. When the temperature is out of range, the Doppler/Photo sensor, which uses microwave frequency signals to detect a moving object, checks if a living body is in the car seat. As soon as both conditions are met, the alarm is sounded.

Results: The device will be tested in a hot car with a model baby. A computer connected to the device will capture the output of all the sensors. The device will sound an alarm when all parameters are met.

Conclusions/Discussions: The device is inexpensive and small, when mass-produced, and can be attached to any car seat when commercially produced. It can be extrapolated and configured to send texts/phone calls to loved ones, alert car alarm or dial 911 with geo-location information.

Team: Anuva and Gowri (132)
Title: Gravitational Pulls
Participants: Anuva Kota, Gowri Bajagur and Lavanya More

Objectives/Goals: The objective of our science research is about the kind of gravitational pulls and forces, such as friction, weight, magnetic forces, and electric forces. As well as, experimenting with how balls come down and bounce back up using the same forces mentioned above.

Materials/Methods: The materials we are going to use will make the effects these forces have on objects very clear. Different kinds of balls like size, shape, and weight, such as: soccer balls, ping pong balls, field hockey balls, tennis balls, and many more. Each ball has a different type of bounce, with varying heights, making it important for us to analyze why one ball bounces higher than the other.

Results: We found out that the heavier ball and the ball that was pushed with less strength bounced lower, also, the lighter and the ball and the ball pushed with more strength bounced higher. The ping pong ball bounced 9 times in the air, and the soccer ball bounced only 6 times in the air with not so much strength for both balls.

Conclusions/Discussions: Based on the info we gave you, the forces and gravity is used for many things. As you can see weight and strength matters for forces and gravity, and as experimenting if you want a bouncy ball make sure you use a lighter ball but make sure it's not flat and push the ball with your strength, and if you want a less bouncy ball make sure your ball is heavy. So next time you bounce a ball you experiment how the ball bounces.

Summary: Overall, our experiment demonstrated how the different forces acting on these various balls affect their ability to bounce, when dropped from an initial height.

Team: Brains of Steel (140)
Title: Illusion Confusion
Participants: Miranda Byszynski and Vedika Sengar

Objectives/Goals: This project aims to display and show the science behind optic illusions, as well as showing some popular ones.

Materials/Methods: Various materials have been used for our presentation: self-made hologram device, 2D and 3D models/illusion, and audio/video presentation

display. Firstly, for our 2D illusions, we used various mediums and papers of different thickness to match to the mediums. Despite this, the mediums aren't what create the illusion**.** What really makes the illusion is how the mediums are arranged on the paper. By arranging them in a certain way they affect the eye to see things differently, creating the illusion. Now, with the 3D hologram, we used scraps of different materials, mostly plastic, among other things, along with a digital device to project images. All together it makes an astounding sight, the main point of optical illusions.

Results: We learned that different shapes put together can create a mass that affects the eye to disbelieve reality, and cause it to see something happening when it's not.

Conclusions/Discussions: Based on our research, optical illusions don't work on some eyes. For example, "The Dress" became a viral phenomenon in February 2015. In this, some people saw the dress white and gold, and others saw it colored black and blue. This is just one example. According to newer research and science, youth and infants can see optical illusions better. A study in the U.K. tried showing an optical illusion to adults and the line in the center in the image stayed still. But when they showed it to toddlers, they moved their finger up and down where the line was "moving". Many optical illusion can be used in daily life. For example, if somebody needs to address a large crowd, but they cannot be there at that moment a hologram could be used to show them. Also, in the Dubai museum, a hologram was used to show a fort and how it was built. This could be much cheaper for museums and other tourist attractions, rather than having a model built and brought in. Optical illusions and holograms can have various uses.

Summary: This projects attempts to show the uses and wonders of mesmerizing optical illusions, while explaining how they function.

Team: 3 Awesome Girls (142)
Title: Electric Motor
Participants: Abhigna Sala, Parthivi Chauhan, and Ila Ranade

Objectives/Goals: To build a simple electric motor and study about the motor's rotation.

Materials/Methods: The materials used for this project are : copper wire, 2 paperclips, a magnet, 1 battery, hobby knife, and tape.
The procedure for making the electric motor are:

- Wrap the copper wire around the battery 8 ½ times tightly and neatly. There should be excess wire on both the edges.
- Make sure the excess wire on the battery is even.
- Carefully slide the copper wire off of the battery. Then use the excess amount of wire to make knots at either end of the coil/motor.
- Remove the insulation from both sides of excess wire. The insulation is removed with the help of the hobby knife.
- Take both of the paper clips. Take the shorter part and bent it upward until that part is at a 12:00 position. Do this to both paperclips.
- Take 1 of the paperclips and tape it to the positive side of the battery.
- Take the other paper clip and tape it on the negative side of the battery.
- Take the coiled wire with the excess sides that we made earlier and put the excess sides in the holes that are in the paper clips.
- Place the magnet on the battery so that it is centered underneath the coil.
- Give a little spin to the coil.

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Results: The copper coil connected to a battery was spinning when placed in a magnetic field.

Conclusions/Discussions: The copper coil placed on the copper wires connected to the battery forms a closed circuit that can carry current. Current flows from the negative terminal to the positive terminal through the closed circuit. It creates its own magnetic field. This magnetic field created by the current in the wire is not perpendicular to the magnet placed on the center, this causes the coil to repel and start spinning. The coil uses the attracting and repelling properties of magnets to create motion.

Summary: Electric Motor is an electrical machine that converts electrical energy into mechanical energy. Electric Motors operate due to the interaction between an electric motor's magnetic field and winding currents to generate a force within the motor. The electric current in a magnetic field will experience a force. Our electric-motor project uses electro magnetism to make the coil spin.

Team: Guardians of the Reef (143)
Title: Coral reefs: Benefits, Threats and Solutions
Participants: Anjali Vellanki, Keerthi Prabhu and Udgita Pamidigantam

Objectives/Goals: Due to the recent El nino effect, reportedly over 90 percent of the Great Barrier reef is bleached. Our goal is to analyze ways to save coral reefs from global warming and other possible threats like pollution.

Materials/Methods: We will consult different sources such as websites, books, and databases. Then we'll analyze our data, and organize it on a tri – fold.

Conclusions/Discussions: Coral reefs are the jewels of ocean. We have to save them from bleaching and eventual dying.

Team: Angels from Space (145)
Title: Crops on Mars?
Participants: Evelyn Yeddu and Zahra Imran

Objectives/Goals: In this project we will explain how to grow crops on Mars.

Materials/Methods: For this project, a very important material is needed. This is soil because it contains Calcium Perchlorate. It is important because the Perchlorate provides water and oxygen for the crops. And the great thing is that you don't have to look for it, as it is all over the big red planet, Mars. Also if you drain out all of the water from the Perchlorate you can use that for soil because it has all of the required nutrients in it. But sometimes it depends on where you land on Mars.

Results: None because it is a research project.

Conclusions/Discussions: Based on our research we learned that there is a material that does double jobs and does a big part in making plants grow on Mars. It provides water, oxygen, soil, and nutrients, these are almost all of the necessities for any plant to grow.

Summary: This project attempts to explain how there is a way crops can grow on Mars.

Team: Energy Saving Musketeers (149)
Title: Solar Powered Oven
Participants: Anjali Gupta and Poojitha Kalasapati

Objectives/Goals: Our goal is to show that solar power can be used to save electricity by demonstrating the solar oven. This way we can save energy while doing a cool experiment.

Materials:

- Cardboard Box
- Aluminum foil
- Clear Tape
- Black Paper
- Plastic Wrap
- Newspapers
- Cooking Ingredients

Method:

- Draw a square an inch from the edges of the top of pizza box and cut three of the four sides of the square.
- Make a crease along the uncut side of the square to create a flap that stands up.
- Cut a piece of aluminum foil large enough to cover the inner side of the cardboard flap.
- Wrap foil tightly, and secure with tape.
- Place black construction paper at the bottom
- Cut two pieces of plastic wrap that are the same size as the top of the pizza box.
- Use tape to secure the plastic wrap to the inside edges of the square that cut into the box.
- Roll up newspaper pages into tubes to stuff into the sides of the box and start cooking !!!

***Tip*-** Best time to use oven is when it's sunny.

Results: Our oven could reach 200 degrees F. We noticed that food takes longer to cook in a solar oven than a regular one.

Conclusions/Discussions: We created a solar powered oven using sunlight reflected by the foil. We found out that solar energy comes from the Sun and it can give out so much heat, that we can cook nachos or s'mores. Sunlight travels an average of 8 minutes and 20 seconds to reach Earth. Recently an airplane flew around the world using only solar power. Solar energy is a clean energy and it will save earth from global warming.

Middle School Projects

Team: Team Hydra (105)
Title: Eco Friendly Motorized Car
Participants: Cris Colon, Clyde Cohen, Aidan Keefe and Harmen Both

Objectives/Goals: This project is aimed to show how using a basic motor and a 9Volt battery is able to power an eco-friendly car using common household materials.

Materials/Methods: DVD player motor, 2 small plastic soda bottles, bamboo skewers, straws, 4 water bottle caps, cardboard box, and a 9 volt battery.

Results: When the battery is attached to the motor, the motor propels the car to move.

Conclusions/Discussions: Using everyday common household materials is an ecologically friendly and affordable alternative to purchasing store bought items. This alternative helps the planet by reusing materials which most people throw away without a second thought. When people are able to reuse ordinary items to create various items such as a battery powered car, it helps reduce waste and in turn lessens the amount of trash that sits in landfills and pollutes the Earth.

Summary: An eco-friendly car that is powered by a motor and battery.

Team: Ardonauts (106)
Title: NFC/RFID Vending Machine
Participants: Cavin Saravanan, Dakshal Panicker and Nikhil Ramavenkat

Objective/Goals: Everyone's gone through the frustrating experience of sticking a bill into the slot and being rejected by the vending machine. We aim to fix that problem by using a more convenient form of payment that everyone uses on a daily basis: smart phones. Our objective is to make a prototype thatproves that NFC/RFID payment can be integrated into a vending machine.

Materials/Methods:

- Arduino Mega 2560
- Stepper Motors with Driver.
- RFID/NFC Detector
- Infrared-Sensor
- Infrared Beam-Emitter
- Lego Clippable Treads
- Lego Blue Pins

We connected all of the materials to the microcontroller. To start, the consumer taps their phone/tag on the device. The microcontroller detects the tap through the NFC/RFID sensor, then moves a conveyor belt which delivers the product. Different numbers of taps equal different products. When the product falls into the dispenser slot, an infrared emitter and sensor detect whether it has fallen or not. This acts as a failsafe to ensure the consumer gets their product and leaves satisfied with their purchase.

Results: We successfully constructed a device that functions as a vending machine which can use NFC/RFID to activate it.

Conclusions/Discussions: To conclude, we will be able to create a vending machine that is easy to use and hassle free. Just pull out your Smartphone, tap, and plop—there's your product. This device can be enhanced to potentially accept apple pay/android pay payments, or to charge your phone carrier. So, you no longer have to search through your wallet for change or see your dollar bill get rejected by a vending machine. Ultimately, our innovation revolutionizes the way you use a vending machine, making it more convenient to get what you want, when you want it.

Team: BOT- Brains of Tommorow (107)
Title: Shots with Bots
Participants: Shrey Jain and Ohm Jariwala

Objectives/Goals :Our objective in the BOT team is to help kids understand robotics by using STEM and robots to solve everyday problems.

Materials/Methods:

- F.I.M robot
- Hollow orange balls(will be used to show a better understanding of the robot)
- Floor (the floor we will use is meant to let the robot ride more smoothly)

- F.I.M robot controller

One main factor we will be talking about gear ratios. Gears are very important and used in our robot. We will be showing the kids the robot shoot some hoops and let them make some simple code too. We first will be shooting hope with the robot. Then we will be teaching about the gear ratios and different parts. At last, we will be letting the audience code. Our gear ratios will be including things like "How many rotations per minute will a 12 tooth and 6 tooth gear have if they are aligned together."

Results: Our results would be knowing the gears and how many rotations per minute for each one so 12 tooth and 6 tooth would be 9.

Summary: In summation, the F.I.M robot will demonstrate the key aspects to robotics in a fun and child friendly manner. This experiment will be backed up with logical scientific explanations with easy to understand vocabulary. We will also take questions at the end of the session.

Team: 3SG (Scientific Geniuses) (110)
Title: Hydraulic Arm
Participants: Sprihaa Singh, Akil Anthony and Gauri Banginwar

Objective/Goals: We started brainstorming, without a clue about what we'd work on for our project. As we talked about problems in the world that need solutions, we came across a few - improving life in developing countries, something that could back us up in case our reliance on technology fails, something eco-friendly. Our idea is the hydraulic arm! The arm fits all of these conditions and solves many problems.

Materials/Methods: Our arm is made of repurposed cardboard- from old pizza boxes and boxes. We reinforced the model with duct tape. The syringes hold 5ml, and only 8 are used per model. The syringes won't need to be replaced, and the tubing is made of thick, strong plastic that lasts for a long time!! The arm can use any type of water, from filtered to raw ocean water. Much of the earth's water will be put to good use.

Conclusions/Discussions: We chose this idea for many reasons. First, it is good for the environment, since we are reusing most of the materials. Next, it is easily useful everywhere. Also, it was interesting to see how such a simple thing that we've been using our entire lives is useful for much more- water! We never thought hat hydro power could control an arm with movements.

The hydraulic arm can have many uses. As we progress in technology, we become more and more dependent on tech. In the near future, if something happens that puts our tech out of commission, (eg. power outages, equipment breakdowns, factory hijacks, and natural disasters) we need a backup. With this, people can continue their lives without change! Furthermore, the arm is good for the environment, releases no fossil fuels, and is a better, cheaper alternative for developing countries. It doesn't matter what liquid is in the arm, as long as it does not have any blockages. The possibilities are endless!

To conclude, the hydraulic arm opens a door to a whole new world of viable uses worldwide!

Team: The Cool Scientists (112)
Title: Magnus Effect on Different Shapes, Sizes and Texture
Participants: Aarav Hathirimani and Aarav Gupta

Objective/Goals: The goal of this project is to find out whether Magnus Effect will work on discs just as the theory works on objects like balls and tubes. Also, we will aim to understand if different shapes, sizes and texture of these objects will affect the Magnus effect and if so, in what way.
Hypothesis: In our experiment, we predict that the discs with certain shapes, sizes and textures will not follow the Magnus theory as compared to objects such as balls and tubes.

Materials/Methods: Different size bike wheels, pot lids, frisbee, cardboard lids, compact discs, tennis ball, cricket ball, golf ball, baseball, basketball, paper towel roll, plastic tubes, metal tubes and scotch tape.

We will conduct a series of experiment to see what object follows the Magnus theory and what does not. We will use different shapes, sizes and texture of these objects to see how each individual object affects the Magnus Effect and in what way. Our dependable variable will be the height and drop, while the independent variable will be the different objects, their sizes and texture. Experiments will be conducted at the same location, in the same weather condition and at the same day and time.

Summary: Do you know how far would a basketball with a backspin go and what force is used to make the ball go forward? Welcome to the Magnus effect, a lift force important and used in many ball sports. The Magnus effect is the commonly observed effect in which a spinning ball (or cylinder) curves away from its principal flight path. Golfers, baseball pitchers, soccer,

tennis, and table tennis players all employ this effect to curve the flight path of the ball. We have taken this further and tried to see how Magnus effect works on discs. The Magnus effect may also have potential applications in energy harnessing and within the transportation industry. Come to our booth to learn more about this amazing force called the Magnus effect and observe how it will spin your world when you realize the extent of this power.

Team: Serious About Science - Einstein Divas (113)
Title: The Smartphone Microscope
Participants: Tanya Bonde, Ritika Anthony, and Kusum Gandham

Objective/Goals: Our objective for this project is to create a microscope using the cell phone that is affordable and easy to use. We will aim to create a microscope under 20 dollars by making a stand on which you can place a phone or tablet.

Materials/Methods: The materials used in this project were a cheap laser point, plexiglass, a wooden plaque, a LED light, wooden skewers, and tape or playdoh. This project was done in two parts. After creating the microscope, we compared it to a high power laboratory microscope. We used regular blood smear and Malaria blood smear slides and plant cells from a fruit peel. The second part was to create a survey which we distributed to a sample of the student population in North Brunswick school.

Result: The microscope we created has almost matched the performance of our other microscope.

Conclusions/Discussions: In summation the affordable cell phone microscope is both scientifically accurate and will save schools a lot of money. The microscope will allow students in remote areas to get access to a microscope, schools to invest more money in labs, and students to self-study with a cheaper microscope.

Summary: The project shows cell phone microscopes are an affordable and sufficient option.

Team: Cedar hill (116)
Title: Solar Power Blender
Participants: Anush Raghav Polamraju and Agni Rajnikanth

Abstract: Have you ever wondered ever about how solar power is made? Have you ever tried to power a blender with solar power? In this research we will discuss of how solar power is more useful than fossil fuels. We are going to explain what are solar power's benefits and how it can power a blender.

Solar power is not a waste of time and money. Solar power is useful to the environment and costs less and ratings show that if you invest in solar power it will be a good time for you(What are the benefits of solar power?, horizon-solar.com). Solar power is eco-friendly, using solar power preserves the use of fossil fuels, minerals, and other nonrenewable substances which are unhealthy to the environment (*Snedden, p.20*) You can save a lot of money with solar power. Investing in solar energy will cost 15,000- 40,000 dollars while fossil fuels would cost 700,000,000-1,000,000,000,000 dollars, That is a huge difference! (*The High Cost of Fossil Fuels*). Now scientists are also trying to improve PV cells by making it more cheap and improved(*Snedden, p.22*). There are already 20,000 homes across the United States that are powered by solar power(*Snedden, p.22*).

Suppose you are craving for a nice, cold smoothie to drink and if I ask you what are the things you used you might say fruit, knife, and a blender. The key word is blender in this section I will talk how a blender works and how it is made. A blender is a kitchen appliance that are geared to crush ice and liquefy soft foods such as fruit and yogurt (*How A Blender Works*). To start off of how a blender works you will need to know what makes a blender, here are the items housing, blade, jar, gasket, jar base, and lid(*How A Blender Works*).This how it works, you push the button and start the blender the blade spin in a circular motion which is called a vortex, the vortex is kind like a tornado ,but in a blender then the ingredients begin to liquefy when they are drawn near the axis which liquefies the ingredient on all sides and mixes air with it(*How A Blender Works*). Then you whip up a nice cool and delicious smoothie for yourself.

Team: Team MC Square (128)
Title: Renewable Energy Sources
Participants: Jaitin Chirra, Nidhish Madda, Pannun Raina, Anjali Reddy and Ashna Sinha

Our Goals:
Our main goal is to find the cheapest and most adequate renewable energy source. The objective is to identify cost of energy production while still getting the most watts and which sources would have the smallest carbon footprint. We researched three known sources to power - Solar, Wind and Hydro.

Materials/Methods: We used three kits for our demonstration. This helped us demonstrate what renewable energy can do. We also modeled a dollhouse to illustrate a house that was powered by renewable electricity. With this we were able to show what it would take to power a regular house that was with renewable energy.

Results:
It is important to start seeking renewable energy and identify the ones that are most efficient.

Conclusions/Discussions:
We were able to clearly identify the costs and carbon footprint of each energy source and concluded that there is a lot of work needs to be done for people to start shifting to alternate energy sources. We learnt costs, benefits and challenges of each alternate energy source. We researched how energy is produced which is key to researching how to improve and advance the technology. There is a lot more that needs to be done to make these energy sources more affordable and efficient.

Summary:
We can conclude that when we use renewable sources we can conserve the earth and make sure we have enough energy when fossil fuels run out. Humanity is slowly starting to shift towards using clean energy but need a little push. To wrap it up, our project shows how clean energy could power a house we also learnt that this field would see a lot of technical advancements in the next 10-20 years..

Team: The Nefarious Wizards (131)
Title: Gravitational Waves
Participants: Varun Chari, Pramod Mitikiri, Abhitej Bokka, Ethan Lee and Sidharth Bejugama

Objective: To prove the importance of gravitational waves in discovering new depths of our universe and what can be done with those findings.

Materials/Methods: We will be building a model of the LIGO observatory, where gravitational waves were first directly observed.
- Transparent mirrors
- Normal mirrors
- A laser pointer
- Rubber bands / Springs

The laser will be a pointed at a transparent mirror. Because this mirror is a transparent mirror, the laser beam will be split into two by the law of reflection. One beam will continue on, while the other will be diverted perpendicularly. After some length, both beams will be reflected back by normal mirrors. The beams will then converge at the transparent mirror. The way the waves interfere is dependent on the length that the light travels to and from the mirror.

Results: When the two lasers are reflected back at the transparent mirror, we saw that the images were the same. As a result, they complimented each other and produced a bright image. This shows that the beams of light were in sync with each other. If we increased the length of one arm, or shortened the other, we noticed that the beams of light produced different images. This discrepancy in the waves showed that the arms were not congruent. If a gravity wave passed by, this same effect would occur, showing a similar interference pattern. Although our representation may not be as accurate as LIGO, the basic principles are the same.

Conclusions/Discussions: Gravity waves stretch matter in one direction, while compressing it in the perpendicular direction. This is why devices like LIGO are extremely sensitive to gravity waves. The detector doesn't have to be perfectly aligned with the waves, because the measured effect will just not be as strong. Gravity waves have applications where telescopes cannot be used. Light can be blocked by opaque objects, or it may be distorted by the gravity of larger objects. In addition, small differences in light (like from planets) can be insignificant when compared to the light coming from stars. Gravity cannot be blocked by objects and permeates through all matter, as opposed to light. This proves how the relationship between gravity and light to be counteractive which shows how we can use gravitational waves to explore their most powerful source-black holes. Gravity waves also tell us key characteristics about their source, like mass, distance, and composition. Gravitational waves are ripples in space, as said, which means that they function just like any other wave such as sound waves. By converting gravitational waves to sound waves, scientists can now echomap masses in space to expand on their compositions. As you can see, gravitational waves have opened doors to hidden corners of the cosmos and their characteristics offer multiple methods to unlock the universe's biggest secrets.

Team: 32 Marshmallows (133)
Title: Tree Free Paper
Participants: Aayushi Naik and Diksha Chavan

Objective/Goals: One of the main elements that a trash can is composed of is tissues. However, have you ever considered that tissues could be something more useful? Yes, it can, and that's our goal: to turn used tissues from your trash can into useful paper. Recyclables already get turned into paper. We decided to find something we could turn into paper. We found tissues, and they worked well.

Materials/Methods: We needed supplies to turn tissues into paper. We put together an entire list, along with steps of how we turned tissues into paper.
- 10 used tissues
- 1 ½ cups water
- ¼ cup craft glue

First, we boiled the tissues for five minutes. We ripped the tissues after letting them cool. Next, we put our ingredients into the blender for two minutes. Then we strained and let it dry.

Results: Our paper dried after a week, and the results were positive. We got paper that looked and felt normal. We wrote on it and it didn't fall apart.

Conclusions/Discussions: We came to the conclusion that we could create paper out of tissues. We saved a lot of trees from being cut down, rainforests, and natural habitats of animals. Although our attempt was successful, it was our last try that got proper results. Our first try was to make paper out of Styrofoam. The paper had little pieces of Styrofoam, and it wouldn't dry. Our next try was successful, because we decided not to include Styrofoam.

Summary: This science project is our attempt to create paper out of trash. We tried to use tissues to make paper, so that trees would not be cut down. Our experiment was successful, and we made paper out of tissue.

Team: Whovirgent (134)
Title: Rube Goldberg machine - Watering a flower plant
Participants: Anjali Aravindhan and Mariam Farook

Objective/Goals: A Rube Goldberg machine is a contraption, invention, device or apparatus that is deliberately over-engineered to perform a simple task in a complicated fashion, generally including a chain reaction. Our goal is to demonstrate Rube Goldberg machine to water a plant.

Materials/Methods:

- Pegboard
- Connectors
- Water
- A Plant
- Balls
- Pulleys
- Toy car
- Ramp
- Plastic Cup
- Blocks
- Thick yarn

We set up an over engineered device with a toy car standing on an inclined ramp to start the chain reaction. This toy car will roll over, knocking the blocks down and hitting the plastic cup attached with a pulley which will trigger another chain reaction with the ball. Various simple tasks will be involved as part of this chain reaction where the ball will hit the water dispenser placed in the end to squirt out water onto the plants.

Results:
We have demonstrated a complex and compound machine to perform a simple task of watering a flower plant.

Conclusions/Discussions: Rube Goldberg designs are meant to show the unnecessary complexities in machines. Through his cartoons, Reuben Lucius Goldberg, a cartoonist, demonstrated his belief that the machines were a "symbol of man's capacity for exerting maximum effort to achieve minimal results". Here we demonstrated how a simple task of watering plants can be broken into series of simple tasks compounding to a complex task in the end. We also demonstrated Newton's Laws, Kinetic energy and friction using these simple and fun tasks.

Team: Team Aurora (136)
Title: Northern Lights
Participants: Chinmayee Latkar and Meghana Chintla

Objective/Goals: This study is aimed to determine the main cause of the scintillating, interesting, and mysterious Aurora Borealis, also known as the Northern Lights.

Materials/Methods: Using a variety of household materials (such as milk, rubbing alcohol, etc.) we will demonstrate the beauty of the aurora borealis by carefully analyzing the chemical reactions of these substances when combined. For example the bizarre reaction when dish soap interacts with milk can represent how similarly the solar particles from the sun behave when entering the Earth's atmosphere. Likewise, we will demonstrate the unique appearance of the aurora borealis with melted crayons on a canvas. Similarly, the wispy yet attractive streaks of the lights will be demonstrated by a Sharpie and rubbing alcohol technique, which shows the chemical reaction of how the solar particles interact with the atmosphere of the earth to create a colorful light display in the sky, in our case, on the canvas. Finally, our last project will demonstrate triboluminescence, the effect of light rubbing, which is what causes the Northern Lights.
Results: The colors and reactions of the attempted experiments were surprisingly similar to that of the Northern Lights.

Conclusions/Discussions: Based on our research and experimental analysis, we have concluded that the northern lights truly are a mysterious, yet astounding display put on by the perplexing effects of nature. The many experiments go onto show how the appearance of the northern lights is like a huge chemical reaction in

the sky when solar particles enter our earth's atmosphere. For example, the strange way that the ink of a sharpie disperses when rubbing alcohol is smeared onto it, resembles the way the phenomenal aurora borealis are created, forming curtains of light for miles along the thermosphere.

Summary: This project determines the causes of the Northern Lights with simple experiments that involve household materials.

Team: Rugrats (137)
Title: Ice melting using Solar Energy
Participants: Rohan Desai, Simon Chernobilsky, Aanya Subhedar and Akshay Muniyappa

Objective/Goals:

- To determine what direction the solar energy is the highest
- To build a Solar Oven
- To determine if the shape of the ice cube affects the speed it melts using the solar oven

Materials/Methods:

- 4 Different shaped Ice cubes made with equal amount of water
- 4 Dishes
- Small time clock
- Compass
- Empty tissue box
- 4 thermometers
- Sand or Other weights
- Plastic wrap
- 4 Pizza boxes
- Aluminum foil
- construction paper (black)
- News paper

First, a basic tissue box weighed down with sand and a thermometer wrapped in plastic wrap was used to determine which direction was the most efficient in trapping the most heat/energy. Then we created a solar oven using pizza boxes, aluminum foil and black construction paper. Keeping the solar oven in the direction of the most solar heat, we tested four different shaped ice cubes to see if the shape of the ice cube impacts the speed of melting.

Results: After testing the solar oven in all different directions, it was determined that when placed in the southern direction, it recorded the highest temperature on the thermometer. It was further determined that the ice cube with the largest surface area melted the fastest.

Conclusions/Discussions: The direction of solar energy and the surface area of the ice cube impacted how fast the ice cube melts.

Summary : This project attempts to determine the best direction of solar and the surface area of the object that is the most efficient in solar systems. It can be used in designing size and shape and placement of solar panels in thermal energy generating systems.

Team: Scientific Superminds (138)
Title: The Better Battery
Participants: Pranav Rana, Praney Hirpara, and Karan Choudhari

Objective/Goals: This experiment's purpose is to determine which brand of the battery lasts longer and performs better than other.

Materials/Methods: To conduct this experiment you would need 4 flashlights, and the 4 chosen battery brands. In our case, it is: Duracell, Rayovac, Panasonic, or Energizer. Next, you need to put each brand of battery in a flashlight. So one will be for Duracell, one will be for Rayovac, one will be for Panasonic, and one will be for Energizer. Next, you keep all the flashlights on overnight, along with a timer. If a flashlight dies at night, then just repeat the experiment with that flashlight, during the day and check every half hour to see if it died out. If any flashlights are still on when you wake up, do what you would do if it had turned off at night by simply checking every half hour to see if it died out.

Summary:
This science project determines which battery lasts longer than the rest.

Team: ANN's Science Lab (139)
Title: Matchbox Microphone
Participants: Nancy Prasad, Anushka Menon, and Neha Menon

Objectives/goals: The objective of this project is to make a microphone using simple household items and communicate through it.

Materials/Methods: The Items we used in this project are:

a. Battery
b. Copper coins
c. Sheet of cardboard
d. Foil sheet
e. Pair of crocodile clips
f. 2 small pieces of wire
g. Multi-meter
h. Matchbox (empty)
i. Pencil lead
j. Headphones or speaker

First, we traced the coins on a cardboard and cut the circles. We then soaked them in vinegar. Then we trace the coins on a foil sheet and cut the circles. After all the cutting is complete, we put the coins in a bowl of vinegar and salt to clean them.

Then we start the process of assembling them in a particular fashion. We place a coin first, followed by a vinegar soaked cardboard, then a circle shaped piece of foil, then again a coin and process is repeated around 10 times till we have a stack of coins with vinegar soaked cardboard and foil between the coins. The battery is ready now. We checked the output with a multi-meter.

Crocodile clips are used to attach the microphone made using lead and matchbox to the battery and headphone. Your microphone is ready!

Results: One of us spoke into the microphone and we could hear it from the headphones

Conclusions/Discussions: We can use simple household items to create useful things.

Summary: This project is about creating a communication device from things lying around in one's house.

Team: The Clone Queens (146)
Title: GMOs: Boon or Bane
Participants: Sandy Chennavajjala, Sanjana Vellanki and Ujjayi Pamidigantam

Objectives/Goals: This research project aimed to determine whether the GMOs has more positive or negative impacts.

Materials/Methods: We will present our research on a Tri-fold

Results: After concluding research, we found that there are more negative impacts of GMOs, than positive.

Conclusions/Discussions: Based on literature research, we concluded that GMOs heavily impact the world in a critical perspective. Though our information consisted of both pros and cons, the cons affect our lifestyle in a deeper way. Scientists have said that only in decades to come will we ever be able to reverse the damage of GMOs. In fact, unless GMOs and their technology are kept in check, the very existence of all live species as well as our planet may be in jeopardy of destruction. Moreover, the chemical factories that created GMOs essentially created a destructive product, from the degradation of microorganisms in the soil, to the food we buy and eat. As we look into future decades, we can only hope that we will be able to reverse the immense damage that GMOs have caused.

Summary: This project attempts to determine whether the evolution of GMOs will lead to a better world, or if the making of GMOs will lead to eternal destruction. Excluding organic foods, the entire American food supply has been systematically hijacked by chemical companies, not bent on trying to feed the world; not providing healthy alternatives, but rather for profits that they reap from the chemicals that are used by thousands of farmers that grow GMO crops. Though this sounds deficient and low-lying, this is the only option some people have, next to starving. The contradiction of pros and cons on the popular issue of GMOs. Moreover, the momentous question remains; are GMOs a boon or bane? Through research, as with the help of historical happenings, it is a cinch to conclude whether GMOs are blessings in disguise or a curse upon us.

Team: Excalibur (150)
Title: Electromagnetic Dynamic
Participants: Abhaysai Vemula, Robert Cannuni and Roshan Vardhan

Objectives/Goals: The objective is to recreate the Excalibur theory. This theory states only the worthy person is able to lift the weapon out of the rock.

Materials/Methods: Using the Microwave Transformer as an electromagnet to keep the hammer immoveable. As the electromagnet is shut off the hammer can be moved. To shut off the electromagnet there will be a switch to stop
the current. As long as the current is turned on the hammer is immoveable, but if the electricity is turned off the hammer can be picked up. The hammer is a metal rod attached to a metal block. The block will be attached to the electromagnet keeping it in place which would render it immovable.

The Myth: The story of Excalibur was that it was a sword stuck in rock. People came from all over the world but could not pull the sword out of the rock. Then one day a young boy named Arthur pulled the sword out of the rock. Using the concept of the myth and the knowledge of powerful electromagnets the myth has come true...at least partially.

Conclusions/Discussions: Using electromagnets to recreate the Excalibur theory was a successful project. The powerful Microwave Transformer held the hammer down rendering it immovable. Switching off the current the hammer could be picked up. In the end we learnt many things throughout this project, especially on electromagnetic technology, and enjoyed creating it.

Thank you for this amazing opportunity you have given us!

High School Projects

Team: The Generators (115)
Title: CCC (Cooler Carpet Conductors)
Participants: Anudeep Revuri and Ashwin Gokhale

Objectives/Goals: The idea for this year's science fair was to make an invention that was helpful for the environment. We succeeded with the CCC, a product that generates electricity. This product can help the average home in the long run, and can save a family's frustration of not having electricity.

Materials/Methods: To create the model of the CCC, we used a thermoelectric generator, a special type of glue and a small sampling of carpet. We used the thermoelectric generator because we needed to find some way to convert our energy into electricity. Then we used Circuit board glue to contain the heat. The overall cost was about $45 and it took about 10 days to assemble the thermoelectric generators and making sure we used a correct ratio from the thermal adhesive to the carpet.

Results: It functioned the way it was supposed to, however, it generated a low voltage. There is a very interesting way of how our product works. The bristles in the bottom of the carpet move back and forth underneath the carpet as one walks on it, creating friction. The thermoelectric generator absorbs the little amounts of heat generated by the friction, and the generator converts the heat into electricity and sends it to a battery to be stored.

Conclusions/Discussions: The project's goal was to generate small amounts of electricity over a long period of time. In short, our project had worked out great. There were many faults that had occurred throughout the project making. We discovered that carpet and regular glue would not conduct heat to the thermoelectric generator. As a result, it would not generate any electricity, rendering the device useless. To solve this, we used some special thermal paste, which conducted the heat more efficiently, as it had metals in the substance. This was able to power the device, generating a voltage. In our project, we had many successes in it. We were able to generate a small voltage to something that normally needs near-fire temperatures to charge a phone. On a large scale, this could charge and store energy in a backup battery for usage in the house, in case the power was to ever go out. Also, it is reusable among several generations, and will never die out. The cost currently around $250-$500 per square foot but can be lot cheaper if manufactured on large scale.

Summary: This is a device that conducts heat caused by friction when you walk and converts it to electricity. Since each step won't generate enough electricity to power a house; we will store these small amounts of energy in a battery. The CCC generates electricity using friction. Since we use a thermoelectric generator, any heat or cold source will manipulate energy.

Team: Ephyra (123)
Title: Expansion of Human Potential and Bypassing the Constraints of Genetics
Participants: Julian Maceren and Saumya Tomthundyil

Objectives/Goals:
This study aimed to seek out ways to maximize efficiency so that more can be accomplished in less time.

Materials/Methods: Our research looks at ways we can maximize our productivity by doing more in less time.
We based our research on the fact that the average human can only focus for twenty to thirty minutes at a time, and designed various tests to see which methods of studying and working produces the best results. Using test subjects that included young children, adolescents, and adults, we analyzed the effects certain study habits had on us. These included:
Studying/working for two-hour long sessions with no breaks
Studying/working for two one-hour long study sessions with one 5-10 minute break*
Studying/working for four thirty-minute long sessions with four 5-10 minute breaks*

* During breaks, test subjects did either exercise, a fun activity of choice, or switched to studying something else

Productivity was measured based on a self-evaluation done by each test subject and any practice tests/review questions scores that show proof of the effectiveness of each study/work method.

Results: The best way to memorize and learn large amounts of information is through study sessions of 25-30 minutes long with 5-10 minutes breaks in between of either physical activity or a fun activity.

Conclusions/Discussions: Based on our experiments and research done by other scientists, we have concluded that in order to expand our potential, we have to realize how our brains function. Ridiculously long study or work sessions minimize our efficiency and will not generate the best results. Keeping in mind that the average human can only focus for 25-30 minutes long and that the brain works for incentives, we can study and work more effectively and efficiently. In the long term, good work habits can expand our brain capacities and we will find ourselves able to store more information and focus for longer periods of time. A larger pool to test on and further self-evaluation and experimentation with different working methods would allow for the development of more effect and efficient working techniques.

Summary: This project aims to find the most productive way to rest in between study or work sessions.

Team: The Cheating Team (126)
Title: The Effects of Cheating Through The Moral Compass
Participants: Trinity Mills and Bryan Valderrama

Objectives/Goals: To see how cheating affects the person who is taking the test. Also analyze how effective the teacher is at spotting the cheaters.

Materials/Methods: We are going to have 5-6 participants that will be -most likely- cheating on a fake test. The teacher will not be told of what is happening and will think they are just over seeing a test. We will tell the participants that the school board does not know about the test -they actually will- and that they will be written up and suspended for being caught cheating. They won't actually get in trouble but they don't know that. It will show their thoughts about cheating before and after the test. It will also show some video of during the test and the methods they used. We will most likely show the videos on a laptop. There mostly people who have never cheated to get some fresh emotions. This will be a whole new experience.

Results: Most subjects felt anxious during the test but afterwards they were relax. The teacher did not caught all of the cheaters.

Conclusions/Discussions: As we see were are not as perfect as we think we can be. This experiment can prove it. Teachers can not spot all of the cheaters. This is because they have not experienced some types of cheating. An example that we will not get to is the use of nail polish to record some answers with their nails. We could have been more organized setting up the test as we needed the approval of the principle to give the test without giving the cheaters a punishment. This is why cheating is bad.

Team: Drosophila melanogaster (141)
Title: Enhancing lifespan and stress resistance in Drosophila melanogaster through further heart-specific downregulation of Rpd3 protein
Participants: Kristen Park, Isha Chavva and Rashi Bhatt

Objectives/Goals: This study is aimed to determine whether greater Rpd3 downregulation in the heart would maintain or even improve stress resistance and/or lifespan.

Materials/Methods: Flies with desired genotypes were created by crossing the wild flies with homozygous mutant flies that had the transgene of interest, which were the tinG4, rpd3-/+, UAS-rpd3- dsRNAi, UAS-sir2, Gal4 flies, and the UAS-loco- dsRNAi flies were. The resulting flies, all heterozygous, were then crossed again to create homozygous flies. This was done to equalize genetic background.
The virgin yw flies and virgin mutant flies were then collected and kept in bottles filled with standard cornmeal medium with yeast to induce mating. After mating, the resulting progeny male flies were collected and used for our experiments.

We performed three tests based on aging, oxidative stress, and heartbeat. For the aging assay, 200 male virgin flies from each genotype were counted and collected accordingly into 10 standard cornmeal vials without yeast and kept in a 25C incubator. Flies were transferred into new vials without any CO 2 gas or anesthesia every three to four days. This process continued until all the flies of each genotype were dead.

We performed oxidative stress tests to examine and compare the responses of flies with varying levels of Rpd3. An equal number of vials were prepared beforehand with two filter circles soaked with 300 µl paraquat in 5% sucrose solution. Unlike in the aging test, flies were kept in the same vial throughout the experiment. The process was repeated until all flies were dead.

Flies from 1-week aging tests were collected for heartbeat measurement. Flies from each genotype were anesthetized before being mounted onto glass slides with double-sided tape.

Since the abdomen of the fly is partially clear, the heartbeat is visible when under the microscope. After positioning the fly under the microscope, 20 second videos were taken of each fly. Heartbeats were counted through observation of the video clips. This process was repeated every 2 weeks until the flies turned 7-weeks old.

Quantitative PCR

To measure gene expression of anti-aging genes in flies, quantitative PCR (qPCR) was conducted. Around 15 to 20 male flies from each desired genotype were anesthetized with CO 2 and grinded up with disposable homogenizers to obtain as much RNA is possible. After obtaining purified RNA from the flies, cDNA was made from the RNA. This cDNA was used for our qPCR.

Results: Further heart-specific Rpd3 downregulation enhances more resistance to oxidative stress. Further heart-specific Rpd3 downregulation increases more expressions of anti-aging genes. Further downregulation of Rpd3 increases cardiac function. Further downregulation of Rpd3 increases lifespan.

Conclusions/Discussion: The culmination of all following data reveals that rpd3 down regulation in the heart plays a significant role in different type of anti-aging mechanisms – all of which likely have relationships to one another. Higher gene expression of anti-aging genes such as sod2 and Foxo are thought to have enhanced stress resistance, which in turn, has been reported to possibly extend lifespan of Drosophila. Furthermore, as previously reported enhanced cardiac function has been reported to similarly have the ability to extend the lifespan of Drosophila. Additionally, previous experiments conducted in our lead us to speculate that another possible mechanism which combats oxidative stress is higher cardiac function as survival rates of the flies with rpd3 downregulation not only exhibited a higher survival rate after exposed to paraquat for a given time period but also higher heart rates at the same time frame. However it is important to note that this previous experiment had been conducted using rpd3Ri/tinG4 mild Rpd3 downregulation rather than further Rpd3 down regulation using an additional UAS-Gal4 transgene. This leads us to inquire whether or not the content of Rpd3 downregulation would impact a possible relationship between oxidative stress resistance and cardiac function – although current data suggests that the content has no effect upon oxidative stress resistance.

Team: B0ss (144)
Title: Go-kart Mechazen
Participants: Alessio Ardita, Brian Linares, Chris Ehrlich and Paul Robles

Objective: Creating a working go-kart from scratch out of recycled materials.
Summary: Owning a go-kart has always been a dream of mine. Thanks to my knowledge in mechanics and supporting friends, I've finally managed to construct one from scratch. Instead of wasting money and buying one, I decided to build my own personal motorized kart.

When I started this project, I had at least two years of prior research and designing. Many problems such as how to reverse the steering direction or how to lock everything onto the live axle came up in the drawing phase and came back during the building phase itself. After all the issues were solved, the only trouble I had was finding the tools needed. That's where my friends came to help. This project would have never come to life if it weren't for Brian's mechanic shop, Chris's constant availability, and Paul's financial generosity. I also would like to credit other people that unfortunately couldn't make the date of the Science Symposium such as Lex and Nick. Although being busy with their own lives, they took time out of their day to help me, so they deserve as much credit for this machine as I do.

This project all started with a Predator 212cc engine, a couple of tires, and a threaded rod. People already at this point criticized the fact I mostly planned to use parts found around the house or recycled (found in the trash or being thrown out by people in my neighborhood). Believe it or not, the base of it is an old closet and a bed frame found in my garage, the steering shaft holder is my old bike, and the seat came from the back of the high school trash. The only things that were even made for go-karts are the torque converter, break drum and band, and the jig welded spindles.

This go-kart was named *Mechazen* after my old dog Zen, who died Christmas morning of 2015. I named this kart after him in remembrance of his quick and loud personality. While bringing my dream to life, we can all share a bit of my old friend Zen.
After a couple of failed crashes, the go-kart worked great. The break stops the kart almost immediately while the acceleration and speed are beyond imagined. This project was deemed a success.

Team: Falzon B (151)
Title: Understanding the Chemistry behind Hand Warmers
Participants: Arnelle Bio, Alexis Dominguez, Zariyah Griffin and Joel Hernendez

Objectives/Goals: The primary purpose of this study was to determine which chloride salt makes the best catalyst in the oxidation of iron.

Materials/Methods: Four different chlorides, barium chloride, calcium chloride, magnesium chloride and sodium chloride were tested to determine which is the most effective catalyst in the oxidation of iron. The chemistry behind hand warmers lies in a very common reaction, namely rusting. It is a highly exothermic reaction producing enough heat to make it an ideal reaction. In this study, jelly crystals, initially saturated with water were allowed to come in contact with iron filings to start off the rusting process. However, the process is naturally slow, so a chloride salt was introduced to catalyze the reaction. One gram of each salt was added to 4 g of iron filings in a zip-lock bag, and mixed well. In experiment 1, jelly water crystals were used as the source of water, in the second experiment 5 mL of distilled water were added directly to the mixture.

Results: Liquid water was found to be more effective in initiating the oxidation of iron than the jelly crystals. In addition, the best catalyst in promoting rusting was calcium chloride, followed by sodium chloride. Both barium chloride and magnesium chloride were not effective as catalysts under the conditions used.

Conclusions/Discussions: This study demonstrated that (I) a salt is required to initiate the oxidation reaction, and (II) calcium chloride acts as a better catalyst than the other three salts.

Summary:
Rusting is speeded up in the presence of a salt. Calcium chloride was found to be the most effective catalyst for the oxidation of iron among the four salts tested.

Team: Falzon A (152)
Title: The Science of Alginate Polymer
Participants: Lindsey Gonzalez, Jaislinn M. Salgado and Elena Vargas.

Objectives/Goals: The purpose of this study is to study the effect of chloride concentration on the formation of alginate polymer.

Materials/Methods: Sodium alginate, a salt of alginic acid, an anionic polysaccharide is found abundant in the cell walls of brown algae. It has numerous applications including tissue engineering, drug delivery and in the food industry. The gel of sodium alginate is formed when a solution of sodium alginate comes in contact with calcium chloride. In this investigation, different concentrations of calcium divalent ions varying from 0 to 4 g of calcium chloride per 100 mL of water were used to study the effect of calcium ions on the formation of alginate polymer.

Results: As the concentration of chloride ions increased from zero to 0.09 M the elasticity of the polymer increased, and the gel became firmer. At 0.03 M of calcium ions, the gel was more fluid-like and much less rigid than at 0.18 M calcium chloride.

Conclusions/Discussions: Increasing the concentration of calcium ions increases the elasticity of the polymer, making it more water resistant.

Summary:
This study proves that calcium is essential for the formation of the alginate polymer, and that as the concentration of calcium ions increases, the gel becomes firmer and more elastic.

"A man who dares to waste one hour of time has not discovered the value of life."
- Charles Darwin

"To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science."
- Albert Einstein

"An expert is a person who has made all the mistakes that can be made in a very narrow field."
- Niels Bohr

Meet the Speakers

Ryan Catalano

Ryan Catalano is currently a senior at North Brunswick Township High School.

He was initially inspired to pursue research after reading an article in Popular Science magazine about the International Thermonuclear Experimental Reactor (ITER) during his middle school years at Linwood. One of his proudest accomplishments was achieving his first successful fusion on April 11, 2015 with a fusor he researched and built in his parent's basement. The project was a culmination of four and a half years of work.

He furthered his love for physics while interning at the Princeton Plasma Physics Laboratory (PPPL) where he was given an opportunity to work on the LTX fusion research project. He will be continuing as an intern at PPPL again this summer.

Ryan was selected to be a semi-finalist and regional finalist in the 2015 Siemens Competition in Math, Science & Technology for his project on The Characteristics of a 2-Grid Inertial Electrostatic Confinement (IEC) Fusion Device Operating at High Pressure. He plans to study nuclear engineering at MIT this fall.

Carlton Hoye

Carlton Hoye is a Senior Engineer and Vice President in Goldman Sachs Private Wealth Management Technology. He was born and raised in Detroit, Michigan, and once won 1st place in a Detroit Public Schools Regional Science Fair.

Carlton graduated from the United States Naval Academy, with a Bachelor of Science Degree in Economics, with heavy course work in Naval Engineering. Once commissioned as an officer, Carlton served for several years aboard the Destroyer USS THORN and Guided Missile Cruiser USS ANZIO, holding positions in Gunnery, Engineering, Missiles and Navigation.

After completing his MBA at the University of Maryland, concentrating in Finance and Information Systems, Carlton joined Goldman Sachs, in the Technology Division's central project management group. He worked in several positions at Goldman Sachs and he currently manages a program to implement a new Trading platform for the Private Wealth Management business.

He is an Eagle Boy Scout and the Scoutmaster of North Brunswick's Boy Scout Troop, and has three daughters who attend North Brunswick Township schools. Carlton has also run eight full marathons, and is in training to become a licensed Dive Master for SCUBA.

Dr. Vijay Reddy

Vijay Reddy, PhD, is a Principal Scientist in the Department of Pharmacokinetics and Drug Metabolism, Merck Research Labs, Kenilworth, NJ. Dr. Reddy obtained BSc degree from Osmania University, Hyderabad, MSc degree from Kakatiya University, Warangal, and PhD degree from the Indian Institute of Science, Bangalore.

Following post-doctoral research at Oregon Health Sciences University, Portland, OR, Dr. Reddy joined drug discovery group at Merck Research Labs in 2000. His research is focused on the discovery of novel therapeutics for the treatment of diabetes, obesity and other metabolic diseases.

In addition to his research activities at Merck, Dr. Reddy is also passionately involved in health education, disease prevention and exploration of alternative treatment options.

Judges At A Glance

Dr. Madhusudan Reddy

Dr. Reddy obtained M.Sc.in Chemistry from Osmania University, Hyderabad and Ph.D. from National Chemical Laboratory, Pune, India in year 1990. He has worked at Imperial College, London and University Laval, Quebec as post-doctoral fellow on projects to develop the selective absorbents and catalytic materials for fine chemical processing. He moved to USA in 1994 and served as a research faculty at Energy & Fuel Research Center, PennState University where has taught graduate course on catalytic materials and also worked on multiple research projects in the development of catalysts for fuel processing. All through his research career Dr. Reddy has published multiple research papers in international journals and filed patents in various countries. The Council of Scientific and Industrial Research (CSIR), India has recognized him for his patent on the material and process for the selective cracking of hydrocarbons for the dewaxing process of petroleum processing. Dr. Reddy is currently working at the Consolidated Edison of New York.

Kelly Streko

Kelly Streko is a teacher at Judd Elementary School here in North Brunswick. When she is not watching the Weather Channel for the latest storm front, she is actively engaging her students in science activities and experiments throughout the year. From geology to entomology, to the study of design technology, Mrs. Streko enjoys getting her students to work hands with these disciplines as much as possible. She is looking forward to seeing all the great experiments created and implemented by these students of science!

Rajeev Mohan

Rajeev Mohan holds a MBA from Cornell University, a Doctorate in Chemical Engineering from Polytechnic University (NYU), NY and Bachelors in Chemical Engineering from Osmania University, India. Rajeev Mohan has extensive experience in product development, scale-up, manufacturing, business strategy, product lifecycle management, alliance management and product commercialization. As a part of the Executive Team for Vensun, Rajeev currently oversees business development including portfolio evaluation and licensing activities for generic pharmaceutical pipeline across all dosage forms. In his earlier role, he supported the marketing and sales at URL Pharma (now Takeda) including the commercial assessment of business development projects. At URL, Rajeev was successful in transitioning from a technical to business role. Prior to URL, he served in various technical and operational roles at Andrx Pharmaceuticals (now Actavis). Rajeev's research included designing and implementing methods to characterize hard to synthesize drugs as well as enhance the properties of existing drugs. Rajeev has published and reviewed several research articles.

Ed Szemis

Ed Szemis has been programming since his first day of high school in 1972. He was valedictorian of his high school class in 1976, and graduated with honors from Clarkson University with a BS in computer science. He has worked on Wall Street since graduation, first as a consultant, and later for Merrill Lynch and Bank of America. During his time working with computers and financial systems he has seen—and been at the forefront of—many changes, including Ethernet based local area networking, distributed processing, relational databases, and object oriented programming. He lives in West Windsor, has been married for over 30 years, and has three sons ages 25, 22, and 18.

Michael Kestlinger

Michael Kestlinger is a physics teacher at NBTHS and have been teaching for five years. He graduated from Monmouth University with a Bachelors in Chemistry and Education along with and a Minor in Physics. He plan to continue his education in graduate school this fall. His experience extends beyond the classroom through running summer science enrichment programs for middle school students and participation in competitive Science Olympiad teams. He takes pride in calling himself a "science geek" - bring on the Star Trek trivia. In his down time, He loves solving Sudoku and reading scientific biographies.

Dr. Aruna Dontabhaktuni

Aruna Dontabhaktuni has a PhD in Pharmacokinetics from the Long Island University. She has 20 years of experience in corporate research and academia, and more than 30 publications.

Her work helps in designing better clinical trials to obtain maximum results, particularly in cancer research. Such well designed clinical trials not only require fewer cancer patients for a study but also reduces the number of draws from a patient, resulting in cost savings as well as improvement in the quality of life of patients.

Presently she is the president and CEO of her own consultancy firm which advises corporations on design and reporting of clinical studies.

Stacie Oliveri

I have been teaching in North Brunswick for 19 years. I have taught second, third and currently fourth grade. I am on both the math and science committees for the district. I am also in my third year with the CNJ PEMA project where our district has partnered with Rutgers University taking graduate classes to enrich both math and science in our classrooms.

Daniel Bachalis

Dan Bachalis is an Informatics Analyst in the Translational R&D IT department of Bristol-Myers Squibb, supporting Clinical Pharmacology and Pharmacometrics. With a bachelor's degree from Rutgers University in Chemistry and Biology, Dan has worked across the pharmaceutical industry starting as an analytical chemist, through instrumentation and automation, validation and regulatory work, to his current position in IT and informatics. In his downtime, Dan enjoys motorcycle riding, skiing, amateur carpentry and home improvement.

Giridhar Tirucherai

Giridhar Tirucherai (Giri) graduated with an interdisciplinary PhD in Pharmaceutical Sciences and Pharmacology from the University of Missouri-Kansas City in 2002. His doctoral research was in the area of ocular drug delivery and pharmacokinetics of antiviral prodrugs of ganciclovir. Shortly after graduation, Giri joined Quintiles Kansas City, a global contract research origanization, as an Associate Scientist in the Clinical Pharmacology department. He worked at Quintiles for 8 years and had leadership of the Early Clinical Development function at Quintiles. Giri joined Bristol-Myers Squibb in Lawrenceville, NJ in 2010 and has since served in various scientific leadership roles. Giri is currently Director of Clinical Pharmacology and pharmacometrics, leading research and development efforts in the area of genetically defined rare diseases. Giri is widely published and is a recognized expert in the area of cardiovascular safety evaluation in clinical research. Giri enjoys spending time with family and friends, and is an avid crossword and Sudoku enthusiast.

Thank You Volunteers

The NBT Science Symposium Team would like to thank all the youth and adult volunteers who helped make this community event possible.

Anudeep Revuri
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