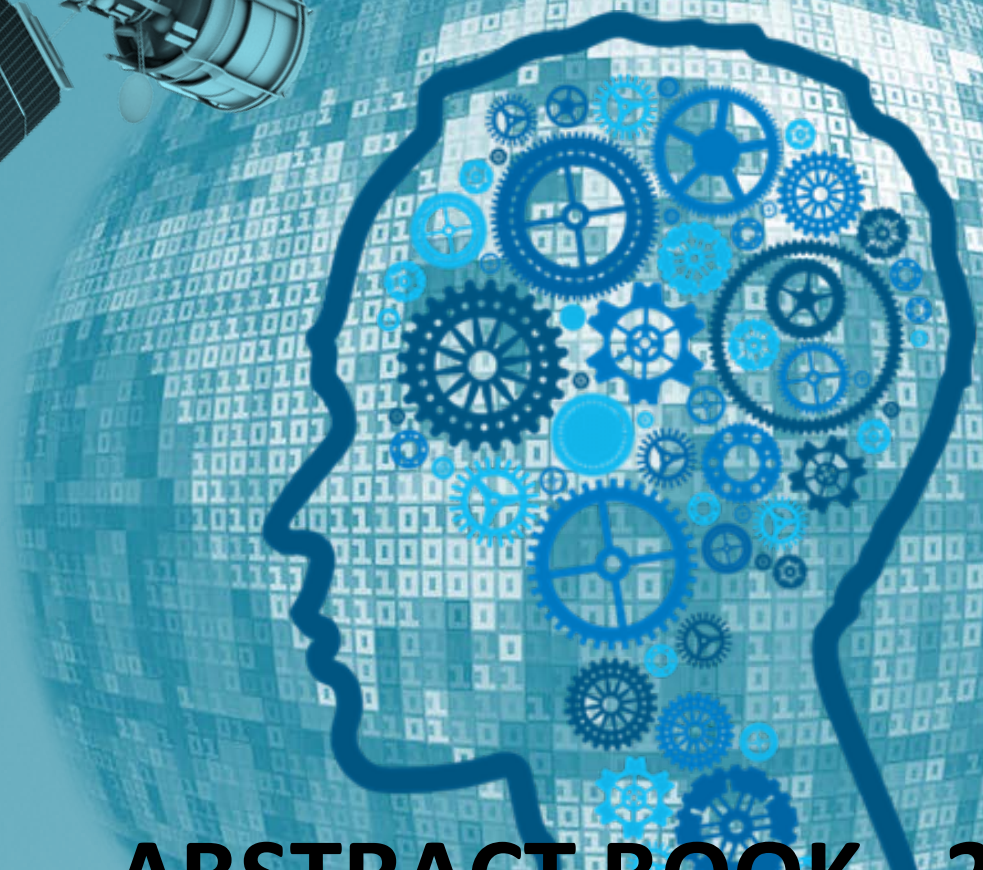
Science Symposium

"Where Creativity Meets Innovation"



ABSTRACT BOOK - 2019

Organized by

NBT Science Symposium Committee

(A Service Project of Agraj Seva Kendra)

Science Symposium

We sincerely thank

The Allergan Foundation

For their generous support

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NBT SCIENCE SYMPOSIUM 2019

NBT Science Symposium Executive Committee

Gangadhara Rao Vakkalagadda
Chairperson

Surendar Reddy Revuri
Co-Chairperson

Govinda Rajan
CEO-Agraj Seva Kendra

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Message from the Chairperson

Dear Friends,

I am pleased to invite you to the 4th Annual NBT Science Symposium. This is a forum where the young minds present a scientific concept that they have researched and tested. It may be an understanding or application of a proven concept, a spark of a new idea, or putting in motion the next invention. It does not matter. We have a responsibility to encourage them to pursue science, keep researching and learning. Thomas Edison made 1,000 unsuccessful attempts before he invented the light bulb. When someone asked Edison, "how did it feel to fail 1,000 times?" Edison replied, "I didn't fail 1,000 times. The light bulb was an invention with 1,000 steps." Hence, the key is to persevere!

Progress in science around the world sometimes make us think about the two sides of the coin. For example, Cell phones and Smart phones have entrenched our lives as if they have existed forever on the face of the earth. There are millions of people who use them every day for running their lives and to connect with others around the world. However, World Health Organization (WHO) classified cell phone radiation as a "possible human carcinogen" due to an increased risk of brain cancer from long-term, heavy use of cell phones and it's also said to be linked to diabetes, obesity, heart disease, and other health problems due to lack of sleep as a result of the constant blue light exposure from the cell phone screens. So even though there are these inventions out there that revolutionize the way we live our lives, there is still research remaining to be done, to make things better than what they are today. Maybe one of you will find a safer Smart phone in the future that will address these long term health issues!

I will end my message by acknowledging the efforts of everyone who helped make this event possible. Mr. Surendar Revuri has worked tirelessly and hand-in-hand with me, to plan and organize this event and I thank him sincerely for all his support. I also want to recognize the continued partnership of NBT Science Symposium Committee with the North Brunswick Board of Education and the North Brunswick Department of Parks, Recreation and Community Services, because their support makes this event unique and successful. We would like to proudly announce that this year, we have received a generous grant from The Allergan Foundation to support this Symposium.

It is extremely motivating and rewarding to see such an overwhelming response by young scientists, and we are humbled to provide them a venue to explore and pursue their interests in science.

Thank you,

Gangadhara Rao Vakkalagadda
Chairperson, NBT Science Symposium Committee

Messages

Govinda Rajan

Dear Brothers & Sisters,

On behalf of Agraj Seva Kendra and NBT Science Symposium Committee, I welcome you all to the Fourth Annual Science Symposium.

More than thirty teams from Elementary, Middle and High School will showcase their talents in this unique competition, thus improving their competitiveness. The students also have an opportunity to listen to speakers who are successful and talented scientists from the community.

By cultivating an interest in Science in elementary, middle and high schools, success in higher education and workforce development can be greatly improved. I wish the participants all success.

I extend my gratitude to the educators and the Board of Education for making this event a success. I thank the sponsors, judges, panelists, volunteers, parents and participants. I heartily congratulate Gangadhara Rao Vakkalagadda and his team for their efforts in bringing out this event. Last, but nor the least, I thank The Allergan Foundation for their generous grant which enabled us to conduct the event.

Sincerely,

Govinda Rajan
CEO, Agraj Seva Kendra

Dr. Brian Zychowski

Dear Community Member,

On behalf of the North Brunswick Township Board of Education, I would like to thank the NBT Science Symposium Committee for facilitating the ***North Brunswick Township Science Symposium***. 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 scientific application.

Thomas Edison once said, “Genius is one percent inspiration, ninety-nine percent perspiration.” The ***North Brunswick Township Science Symposium*** is an inventive environment that inspires students to work hard, to collaborate, and to be imaginative and creative. Students are being challenged to create innovative projects that they must present and defend. This educational endeavor captures the essence of scientific examination.

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 innovative learning.

Sincerely,

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

NBT SCIENCE SYMPOSIUM 2019

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 • Stacie Oliveri • Jenna Delledone-Ballard • Akhileswar Patel Room 2 (Room# 423) Judges • Michael Kestlinger • Madhu Reddy • Aditya Pandyaram Room 2 (Room# 424) Judges • Akintunde Bello • Venkata Nanduri • Sandra Currier
1 PM Program Moderator: Blisse Vakkalagadda	Welcome address by Gangadhara Rao Vakkalagdda Address by Dr. Brian Zychowski Panel Discussion Members: • Stephanie Manning • Nikil Revuri • Frank Sweeney • Janet Ciarrocca • Rajeev Srivastava Vote of Thanks Awards Distribution

Room 1 (Room # 420)

Team #	Team Name	Judging Time
101	Three Positive Ions	10.00 AM
102	Dry Ice and Water	10.10 AM
103	MinDcraft Masters	10.20 AM
105	SAS(Serious About)	10.30 AM
106	Little Einsteins	10.40 AM
107	Hydro Girls	10.50 AM
108	Sour Pair	11.00 AM
109	The Keen Scientists	11.10 AM
110	Team Electrons	11.20 AM
111	Mighty Musketeers	11.30 AM
112	Science Wizards	11.40 AM
113	Masterminds	11.50 AM
114	Science Maniacs	12.00 Noon

Room 2 (Room # 423)

Team #	Team Name	Judging Time
115	Energy	10.00 AM
116	Robostars	10.10 AM
117	The 4th grade	10.20 AM
118	Shiksha	10.30 AM
119	DaV Tech	10.40 AM
120	The double Duo	10.50 AM
121	Chemkids	11.00 AM
303	The Pioneers	11.10 AM
305	EurAsia	11.34 AM
306	Floating 2 Victory	11.46 AM
307	Visual Science	11.58 AM

Room 3 (Room # 424)

Team #	Team Name	Judging Time
202	The wizards	10.00 AM
203	Wacky Weirdos	10.12 AM
204	The Mathemagicians	10.24 AM
205	The Professional Potatoes	10.36 AM
206	Project Poseidon	10.48 AM
207	Kelvin 800	11.00 AM
208	Simple Solutions	11.12 AM
209	Team Emoji	11.24 AM
210	Got Science..We matter!!	11.36 AM

Abstracts

Elementary School Projects

Team: **Three Positive Ions (101)**
Title: The Sprout House
Participants: Akshita Thakur, Nakshatra Vustapali and Mona Farook

Objective/ Goals: Our little DIY sprout house made from sponges combines engineering and science into one awesome project as a motivating way to learn about germination

THE SCIENCE OF SEEDS: Seeds, even the tiniest ones, contain the food and all the instructions necessary to sprout a new plant. All they need are the right conditions: the right temperature, consistent moisture, and a good location.
At first, the plant depends on the energy stored within the seed to grow. As the seed soaks up water, its food stored inside begins to be converted into energy in the form of enzymes. The enzymes trigger the seed to send out roots and germinate.

First the roots break out of the hard-protective outer layer of the seed called the seed coat. This is called Sprouting. They grow downwards and begin to anchor the plant and absorb water and nutrients.

Next, the seed begins to grow a stem, a process called germination. Once germination takes place, the plant grows, eventually making its own food from nutrients it takes in from the soil and through photosynthesis.

Methods: This project is done in two stages:

1. Building the house using sponges
2. Planting the seeds and letting the sprout.

For the first stage, we used sponges and then tried various models for the house. To hold the 'walls' and the 'roof' of the house, we used toothpicks.

We then 'planted 'different seeds like wheat, chia, alfalfa and moong beans. All we now do is wait and watch as the seeds 'sprout'. We kept on watering and misting the sponges from time to time to provide ideal conditions for sprouting.

Results: Within days, the seeds started sprouting.

Conclusions: Different seeds need different time and moisture content to germinate.

Team: **Dry Ice and Water Scientists (102)**
Title: The Reaction Of Dry Ice And Water
Participants: Eva Patel, Sunidhi Mitikiri , Yashvi Patel and Stephanie Biju George

Objective/ Goals: Our goal is to determine the reaction between dry ice and water with an experiment. We could use the result to find answers to other questions about the combination of gases and water. This observation could lead to more breakthroughs in the field of chemistry. Unwanted gas could be cleared from the Earth by breaking it down into chemical reactions.

Our hypothesis was that when in contact, a solid and a liquid may produce a gas or vapor. We chose this hypothesis because we were sure that dry ice was different than regular ice, causing a different reaction when in contact with other things. We will see if our hypothesis is correct with our Dry Ice and Water experiment.

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Materials/Methods:

1. Fill a bowl with warm water
2. Apply a small amount of bubble solution around the edge of the bowl.
3. Deposit 3 medium-sized chunks of dry ice into the bowl.
4. Observe your findings!

Results/ Conclusions: We found out that CO2 gas , the gas form of carbon dioxide, pouring out of the bowl was the resulting chemical reaction of the contact of dry ice and water. So, our hypothesis was proven correct. The water's contact with the dry ice produced a gas called carbon dioxide because of the surface tension, which is the attraction of particles. This gas is the result of carbon dioxide and water vapor.

This experiment gave us a better understanding of the various chemical reactions you can uncover when performing such an experiment. We now know the chemical reaction between dry ice and water. Finding the chemical reactions of different solvents could affect the way vapors and gases are harming the earth.

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Team: **MinDcraft Masters (103)**
Title: Hydraulic Jack
Participants: Daivik Shah and Madhavan Raja

Description: A hydraulic jack is a device used to lift heavy loads. The device itself is light, compact and portable, but is capable of exerting great force. The jack is based on Pascal's law that the pressure of a liquid in a container is the same at all points.

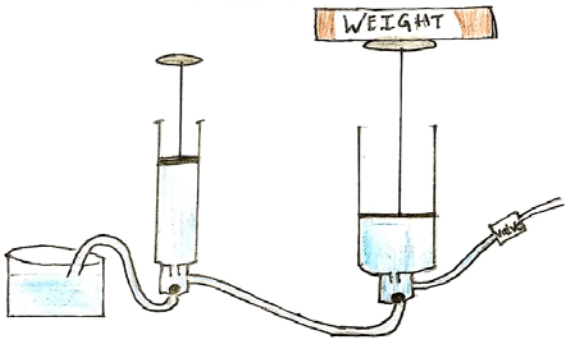
Objectives/Goals: To demonstrate how a hydraulic jack lifts heavy objects with little effort.
Examples of Hydraulic Systems:

Garbage Truck, Car Parking Lift, Car Jacks, Cranes

Materials:

- Large and Small Syringe
- Water Tubes
- 2 Ball Bearings
- Cup of Water
- Valve / Stopper
- Hot Glue

Construction:
Connect the syringes, tubes and the value as shown in the picture.
Ball bearings are used to block the water from flowing out.
Remove all air bubbles from the design as air can compress and affect the efficiency of the system.



Methods: Close the valve connected to the large syringe Lift the piston of the small syringe to fill it with water As piston is pushed down, ball bearing blocks the water from escaping back in the water container.
This pushes the piston of the large syringe up, lifting the weight

Principle: Pascal's principle states that pressure applied in a closed container is same in all directions.
Pressure = Force / Area
Therefore if you have two cylinders connected together, a small one and a large one, and apply a small Force to the small cylinder, this would result in a given pressure. By Pascal's Principle, this pressure would be the same in the larger cylinder, but since the larger cylinder has more area, the force generated by the second cylinder would be greater.

Conclusions:
Large weights can be lifted with very little effort

Team: **SAS (Serious About Science) (105)**
Title: BIOGAS – How to Reuse Kitchen waste to produce Gas
Participants: Saanvi Singh and Mahati Vemula

Objectives/Goals: Reuse kitchen waste and produce gas, primarily Methane gas, which can be used for cooking, heating, and lighting.

Materials: Two Large Empty Soda Bottles, Kitchen waste (Compost), Clear Pipes- Connector, Nozzle, Synergies, Black Construction paper, Glue Gun, Candle and Lighter.

Methods: Took two large Gatorade Bottles and emptied them. Connect the two caps with the clear pipes. One end of the pipe is inserted into the bottle, which contains kitchen waste, and the other end is inserted into the empty container, which is kept for the Methane Gas to be collected. These 2 pipes are connected with T-Connector, and the end of the third pipe is attached to a nozzle.

Next, cover the bottle, where the kitchen waste is placed, with a black construction paper. Then crush the kitchen waste, pour it into one empty bottle, add little water, and seal the cap of both the bottles with glue gun. It is then left aside for 10 days, in a dark place, so that it helps in formation of methane gas. The methane gas is generated in anaerobic conditions.
After 10 days the liquid is collected at the bottom of the bottle and the degenerated compost bubbles appear at the top. When the nozzle is opened and light it with the lighter a flame emerges. This is because of the methane gas which is collected in the empty bottle.

Results: Biogas was generated using kitchen waste.

Conclusions: Our goal was to light up candle from the biogas

Summary: Renewable energy can be created from the kitchen waste.

Team: **Little Einsteins (106)**
Title: Artificial Photosynthesis
Participants: Jay Pindipol, Manaswi Mantena, Tarun Yamarthy and Vishwa Swamy

Objectives/Goals: The purpose of studying artificial photosynthesis is to find more efficient methods/ways to produce fuel from sunlight that can be stored conveniently and used when sunlight is not available, by using direct processes, that is, to produce a solar fuel.

Methods/Materials: Artificial Photosynthesis is still under research. As the term “artificial photosynthesis” stems from mimicking natural photosynthesis, we can learn from nature's strategies which have evolved over 3.4 billion years. Artificial photosynthesis research applies the fundamental scientific principles of the natural process to the design of solar energy conversion systems. Researchers of artificial photosynthesis are developing photocatalyst. Photocatalytic water splitting converts water into hydrogen and oxygen and is a major research topic of artificial photosynthesis. Photosynthesis provides a blueprint for solar energy storage in fuels. Indeed, all of the fossil-fuel-based energy consumed today derives from sunlight harvested by photosynthetic organisms. Artificial photosynthesis research applies the fundamental scientific principles of the natural process to the design of solar energy conversion systems

Results: Practical, cost effective technologies for conversion of sunlight directly into useful fuels do not currently exist, and will require new basic science. Research shows its possible to create solar fuel. But researchers need more time to develop devices to generate clean, renewable energy on larger scale.

Conclusions/Discussions: Fossil fuels are in short supply and they're contributing to pollution and global warming. Coal, while abundant, is highly polluting both to human bodies and the environment. Wind turbines are hurting picturesque landscapes and current solar-cell technology is expensive and inefficient. Artificial photosynthesis could offer a new, possibly ideal way out of our energy predicament.

Water and sunlight would ultimately be the only needed sources for clean energy production. The only by-product would be oxygen, and production of a solar fuel has the potential to be cheaper than gasoline. The ability to produce a clean fuel without generating any harmful by-products, like greenhouse gasses, makes artificial photosynthesis an ideal energy source for the environment. Artificial photosynthesis has been devised and investigated in pursuit of solving the 21st century's energy problem

Summary: Artificial photosynthesis is a chemical process that biomimics natural process of photosynthesis to convert sunlight, water, carbon dioxide into carbohydrates and oxygen. Artificial photosynthesis could offer a new, clean renewable energy resource which also reduces harmful greenhouse gas CO2 from the environment, which is a WIN-WIN Situation.

Team: **Hydro Girls (107)**
Title: Rooftop Rainwater Harvesting
Participants: Poorna Thoguluva, Ridhi Boggavarapu, and Anagha Meda

Objectives/Goals: Can you imagine life without water? Rainwater harvesting is a simple and proven method that can be used to self-supply water to households. This study’s objective is to determine what the best roof type is for rooftop rainwater harvesting.

Methods/Material: Here are the items: Cardboard boxes, Hot Glue, Paper, Straws, Tape, Plastic Containers, and Tin Cans. We will be able to put a display of images for different roof types and the pros/cons of those roof types. We will create a model to demonstrate the rain water harvesting with the best roof type. To create a model here are the steps, 1. Use cardboard boxes to build a base for the house. 2. Now use the tin can to build the roof. 3. On the side of the roof have a collection area to capture the water from the roof. 4.You need a conveyance system to transport the water to a storage area.

Results: The results of our research proved that tin is one of the best rain-water harvesting roof material.

Conclusions/Discussions: We researched on different roof types such as asphalt shingles, tin, wood, and clay tiles. There is very little water loss with tin as there are no porous, and no worries of contamination or rusting.

Summary: Building a rainwater harvesting model with the best rooftop definitely shows that households can be self-sufficient.

Team: **Sour Pair (108)**
Title: Lemon Battery
Participants: Adithi Suresh and Kanishka Duna

Objectives/Goals: In this experiment, we are using a fruit to generate a small amount of electricity in order to light up a tiny LED bulb. The general source of power being a battery, here lemons are used in the place of it.

Materials: We have Zinc and Copper strips as electrodes, a tiny LED bulb, and the juice inside the lemons with its citric acid components acts as a natural electrolyte.

Methods: The Zinc electrode is the anode (where oxidation occurs) which releases electrons, and the copper electrode is the cathode (where reduction occurs) that gains the electrons. The anode is the negative end of the battery gathering up the free electrons and the cathode is the positive end encouraging the electrons to move towards it, thus causing the flow of electric current. This simple chemical reaction helps in making the electric current flow through the external circuit lighting the bulb.

Results: The Zinc strip inserted in the lemons looses electrons as a result of the oxidation reaction. These electrons will be accepted at the Copper strip, as Copper likes to gain electrons which is the reduction reaction.

We create an external path by wires for these electrons to flow from anode to cathode. When a small bulb or a LED light is connected with the wires, it will glow as current passes through. The LEDs also have positive (cathode) and negative (anode) ends to be connected in the circuit. The cathode of the LED should be connected to the Zinc and the anode to the Copper.

Conclusions/Discussions: When compared with other fruits lemons have more acidity and the more lemons we connect in series, produce more voltage.

Team: **The Keen Scientists (109)**
Title: How Hyperglycemia Affects Various Systems of the Human Body
Participants: Prahas Ramidi, Aanya Muniyappa, Peyton Mikita and Anusha Vakkalagada

Hypothesis: High levels of glucose in the blood has a negative effect on major body systems.

Objectives/Goals: The objective of our project is to inform people to watch out for their daily sugar intake. We will notify on often consumed foods and their glucose levels. Our goal is to help people control their glucose levels. We are researching the effects of hyperglycemia on various major body systems including the nervous system, cardiovascular system, immune system, and renal system.

Methods/Material: We will be demonstrating a model of the effect of hyperglycemia on the immune system. Another one of our demonstrations is a guessing and matching game informing people of the amount of sugar in common foods and drinks consumed by kids and adults. We are using this to help people choose the right foods to stay healthy.

Results and Conclusions: In conclusion, we want to let people know of their high glucose intake so, watch out for the quantity of food that has high concentrations of sugar.

Team: **Team Electrons (110)**
Title: Citrus Current
Participants: Bhargav Patri and Pranav Patri

Objectives/Goals: To make the light bulb glow using a citrus current created by the lemons.

Methods/Materials: The materials that were chosen for this study are lemons, a voltmeter, light bulbs, copper nails or pennies, alligator clips that are attached to the copper wires (at least 10) and galvanized nails. We first started by rolling the lemons so the lemon juice will flow easier. Next, we pushed the galvanized and copper nails into the lemons. After that, we attached the alligator clips to the nails, leaving two wires detached which are positive and negative ends. Lastly, we connected the last two detached wires with the alligator clips to the two ends of the light bulb.

Results: After we attached the wires to the light bulb, the light bulb started to glow and when we detached the wires, the circuit was not complete so the light bulb did not glow.

Conclusions/Discussions: Instead of using batteries to power the light bulb, we used copper nails and galvanized nails. We used lemons as our conductor, which creates protons and electrons to create a circuit as a battery does. This experiment proves that batteries are not the only sources of energy to generate electricity and that lemons too can also create a

complete circuit. Vegetables such as potatoes and onions can also conduct electricity. Also, like the lemon, there are many other citrus fruits that conduct electricity, like grapefruit, oranges, and limes. Tomatoes have a very high acidity level, thus making them good conductors. Acids make ions, charged particles when placed in a solution like water, which many types of fruits and vegetables contain in abundance.

Summary: There are many ways to light a light bulb. In this experiment, we lit the light bulb using a citrus current.

Team: **Mighty Musketeers (111)**
Title: Smart Plant Watering System
Participants: Mukilan Chidambaram and Milan Virdi

Objectives/Goals: Plants play an important role in our life and there are countless benefits we get from plants. It is our social duty as well as the responsibility to take care of them. The biggest challenge we face is taking care of them all the time given the busy lifestyle especially, when we go for vacation. Our project is to build a smart plant watering system using Arduino Uno which will get rid of this problem.

Materials: The different materials used for this project are listed below:

Arduino UNO is an open source hardware and software, compatible board that has an eight-bit microcontroller, programmable hardware, USB programmable interface, input-output pins along with excellent processing capability to connect the computer to the physical world. This material is the crucial part of the project since all the programming/coding related to switching the water pump is done here. We have programmed the code logic within Arudino UNO through the Arduino integrated development board (IDE) to automatically turn on/off the pump. Arduino interacts through sensors with the environment and process according to the program stored in it and performs output operation.

- High Voltage high current Rated Diode
- General purpose Transistor NPN
- Male/Female Jumper Wires
- Breadboard
- Resistor 221 ohm
- Water tube and container
- Glue Gun

Soil Moisture Sensor consists of two leads that are used to measure volume of water content in soil. These leads allow the current to pass through the soil and in return calculates the resistance value to measure the moisture level. If there is more water in soil then soil will conduct more electricity, means less resistance value along with high level of moisture. In the same manner if there is less water in soil then soil will conduct less electricity, means high resistance value along with low level of moisture.

Methods: In this system, we have used a soil moisture sensor which senses the moisture level of the soil. If soil will get dry, then sensor senses low moisture level in the soil according to the stored code in Arduino UNO and automatically switches on the water pump to supply water to the plant. As the plant gets sufficient water and the soil will gets wet then the sensor senses enough moisture in the soil after which the water pump will automatically get stopped.

Results: The automatic plant watering system was successfully built and poured the right amount of water when plant was dry.

Conclusions/Discussions: Plants need varying amounts of water depending on the type of plant and growing conditions. It is not always possible to monitor the plants at all times, and this project attempts to solve the watering issue by detecting the moisture level of the soil and automatically waters the plant when needed.

Team: **Science Wizards (112)**
Title: Hydraulic Scissor Lift
Participants: Yajat Sharma and Nishaad Venkatesh

Objectives/Goals: To apply the principles of hydraulics in building a working model of a hydraulic lift, and also to understand how it can be used in different examples than the little model itself.

Methods/Materials: For this project we will need cardboard, 2 syringes, a flexi-tube, skewers, straws, colored water and hot-glue. To build this project, take the cardboard and cut out 12 strips of cardboard. Now pierce 3 holes on each strip with 2 on the sides and 1 in the middle. Arrange the strips in a criss-cross manner with 6 strips on each side. Now take skewers and pass them through the holes on the strip to create a scissor like structure. Create a cardboard base and a platform top and attach it to the lift. Next take syringe A and fill it up with colored water. Attach it to syringe B with a flexi tube. Glue syringe B to the base of the

scissor lift. Test it out by pushing and pulling syringe A to make the lift go up and down.

Results: Our results show that when we push the liquid in syringe A, the pressure flows through syringe B to lift the object. It can also make the object go down by using the same concept, but instead, you pull back syringe A.

Conclusions/Discussions: Hydraulic lifts are cheaper to install than other elevator types. They occupy less space in a building, requiring almost 10% less area for the lift shaft. They are highly effective with heavy loads, as the hydraulic power provides a far greater lifting strength.

Team: **Masterminds (113)**
Title: Airplane Launcher
Participants: Ayaan Narale, Om Nangia and Aaron Ling

Objectives/Goals: To instigate the principle of lift and identify how the design of the airplane affect the lift.

Methods/Materials: The material utilized for this object includes a wooden base on which the whole project was kept on, two smaller wooden bases to indicate a runway, four wooden poles to hinge the runway.

It also includes two dc motors, two wooden wheels, two wooden blocks to hinge the motors.

The first step is to make a hole at the center of the wooden wheel, hinge the dc motors to the upper half of the wooden blocks using a glue gun. We connected the dc motors to the batteries using alligator clips, and the other end connecting to the wooden wheels. We did a preliminary test to make sure the wooden wheels are rotating in the opposite direction by switching the alligator clips connection thereby creating an air pressure for the airplane to lift.

The next step was to create a runway by hinging the two wooden bases to the four wooden blocks using a glue gun, along with building an airplane of different shape and shape using a variety of paper.

We took great care in finding the center of the wheel as well as glue the blocks and runway at an equal distance along with multiple trials to conclude our findings.

Results: The shape of the wing (rounded or sharp) and weight of the wing does affect the amount of lift

Conclusions/Discussions: The project was an attempt to demonstrate the effect of varying airplane design on the lift.

The results show that as long as the plane is moving quickly, the wings will redirect air downwards and that will generate an equal and upwards force, i.e., lift. The lift provided by the air supplied by the dc motor is enough to bear the weight of the plan against the gravity pull.

Our demonstration concludes that the paper airplane works just like any regular planes as it redirects the air to keep themselves airborne and by adding elevators to the plane does create a slowness in generating the lift. Further future experiments using varying sizes and material could provide more concluding results to impact the future of the airline industry.

Summary: This project was to understand the principle of lift and the impact of the airplane design on it.

Team: **Science Maniacs (114)**
Title: Should you drive after watching a screen?
Participants: Maharsh Khatri and Samarth Sharma

Objectives/Goals: We have been noticing a problem all around the world, screens, whether its a phone or any other device. For the past weeks, we have been thinking about how screen time affects our reaction time. We, the Science Maniacs, want to raise awareness for this problem because it is affecting drivers and pedestrians all around the world. This project will show you how screens affect reaction time.

Methods/Materials: For our project, we used simple materials such as, a stopwatch to record the times, a Crazy Cart as substitute for a car, and a Ipad to record us doing the trials. There will be 6 trials each, 3 for showing reaction time before screen time, and the other 3 being after screen time. We will record the reaction times of both and see the differences.

Results: The 2 reaction times before the screen times, were less than the 2 reaction times after the screen times.

Conclusions/Discussions: In summation, after we did this experiment we realized that screen time negatively affects your reaction time, in turn, affecting how you drive.
Suggested Solution: Do not watch screens before driving, as in it might affect people on the road and even you.

Team: **Energy (115)**
Title: Energy Generator
Participants: Charan Ganta, Pranet Godavarty and Pranay Salikuti

Hypothesis: If the lemon/potato contains enough electrons, then the lightbulb will light because the lemon/potato can generate electricity.

Objectives/Goals: The objective of this study is aimed to understand the electricity generated by different sources.

Materials:
4 lemons, 4 Potatoes
Four 4" pieces of copper
Four 4" pieces of Zinc
6 alligator clips
1.5V mini light bulb and holder
Multimeter

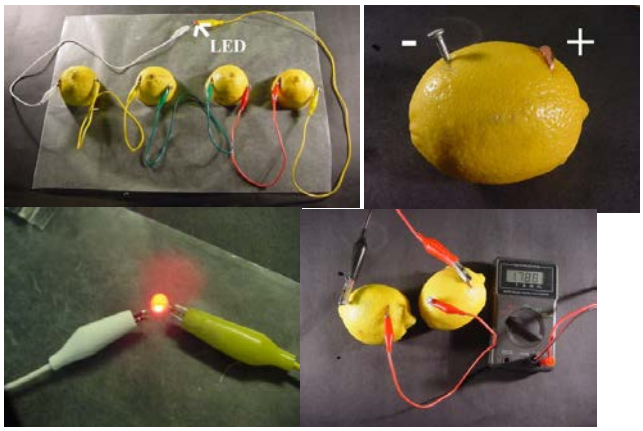
Methods: Carefully use a sharp knife to cut two slits in each lemon/potato about 1/2" deep. Insert the copper plate into one slit and the Zinc plate into the other slit for each lemon/potato.

Now, attach an alligator clip to zinc plate in the first lemon/potatoes, attach the other end of this wire to the light bulb.

Connect an alligator clip from copper plate of first lemon/potatoes to zinc plate of second lemon/potatoes.
Connect an alligator clip from copper plate of second lemon/potatoes to zinc plate of third lemon/potatoes.
Connect an alligator clip from copper plate of third lemon/potatoes to zinc plate of fourth lemon/potato.
Lastly, attach copper plate of fourth lemon/potatoe to the light bulb.

Results: When we connected the alligattor clip from copper wire of fourth lemon/potatoe to light buld and alligator clip from zinc plate in the first lemon/potatoe, we noticed light glowing.
When we touched both the ends with finger instead of light, felt a tingle. Four lemon batteries create a voltage of 3.50 volts. We should be able to light up a small device like an LED (Light Emitting Diode).

Conclusions/Discussions: In this experiment, we compared electricity generated by lemons and potatoes using a multimeter. Observed that lemons which has slightly more electrolyte than potatoes generated more electricity compared to potatoes.



Summary: The zinc and the copper are called electrodes. The lemon juice is called electrolyte. All batteries have a "+" and "-" terminal. Electric current is a flow of atomic particles called electrons. Certain materials, called conductors, allow electrons to flow through them. Electrons will flow from the "-" electrode of a battery, through a conductor, towards the "+" electrode of a battery. Volts (voltage) is a measure of the force moving the electrons.

Team: **Robostars (116)**
Title: ROBOTICS - Fire Detecting Robot
Participants: Ayush Sharma and Nethra Gujja

Objectives/Goals: This study aimed to make a prototype robot which can automatically detect if there is fire in the area, more to closure to fire and run water automatically until the fire is off.

Methods/Materials: Below material are used for making the overall Robot prototype
Fire Sensors - these sense the file and send a signal to the mail unit
Robot Chasis - enables building robot and helps move it next to the fire
Robot Pump - Pumps the water on the fire in case of fire
Robot brain (Uno Circuit Board) - This unit accepts the signals, does the processing for next actions and provides instructions to the vehicle to move and

provides instructions to pump for spraying water until the fire is off.
Programming Code - Provides directions to the UNO processors to take action when fire is detected.
Results: Robot is able to move in the direction of fire based on the signals from the fire sensors and put the fire off by pumping water on it..

Conclusions/Discussions: Based on research, different components together are able to communicate and do a certain function. This robot is able move and spray water based on signals. Robot can be very well extended to even detect the GPS location where the fire is detected and send a message to fire department to enable quickest actions. How about making automated fire fighting drones which can reach the fire location and put off fire. Should that be a model we can implement in california forest? However the challenge remains how Drones will be able to take that much of water of fire extinguishing material. However, the Robot can selectively put off the fire in our homes. If equipped in each home, our homes would become much safer.

Summary: This project attempts to automate fire detection and put it off. It also enables us to think what different dangers it can sense and take safety actions automatic

Team: **The 4th Grade Engineers (117)**
Title: Tower Bridge London
Participants: Devanya Charles, Saneev Karmakar and Arya Salem

Objectives/Goals: This project was to show people what the Tower Bridge of London does to show its variables of how it works.

Methods/Materials: We used cardboard materials and some popsicle sticks to show a representation of what the Tower Bridge looks like and to show how the Tower Bridge moves and to show what the science is behind the Tower Bridge of London. The Tower Bridge has a lot of science behind it because cars have to cross while the Tower Bridge is moving so the Boats, Cargo Ships, speed boats, or other water vehicles can cross River Thames. The bascule pivots and operating machinery are housed in the base of each tower. Instead of chains pulling up the bascules from the towers, the hard work of opening and closing the bridge is left to eight large cogs about 1m in diameter, four on each side, which rotate to open and close the bridge. Overall the bridge is a iconic landmark that will be remembered for centuries to come.

Results: It takes Tower Bridge one minute and fifteen seconds to open/lift to allow boats and ships through, so two and a half minutes to open and close in total.

Conclusions/Discussions: From the minutes of how long the Tower Bridge opens this tells us what science is behind the Tower Bridge. We now know that it takes 1:15 to open and lift to allow the boats go under the bridge which in total is 2:30. Now we know how and what the Tower Bridge does in real life and in our model with Popsicle sticks and cardboard to make a great model of the Tower Bridge.

Summary: This Project attempts to determine what the Tower Bridge does and how it works in real life and in a model out of cardboard. Also it shows what science is behind the Tower Bridge.

Team: **Shiksha (118)**
Title: Robot Butler
Participants: Rishika Giriraddi, Anish Batra and Amishi Batra

Objectives/Goals: Our goal is to make a mini robot butler to do your everyday chores and help around the house. Also you can cool off when it is hot in the house using the fan.

Materials/Tools: The tools we plan to use are Lego weDo motor, a fan, rubber, and lego bricks.

Results: (not available yet)

Conclusions/Discussions: (not available yet)

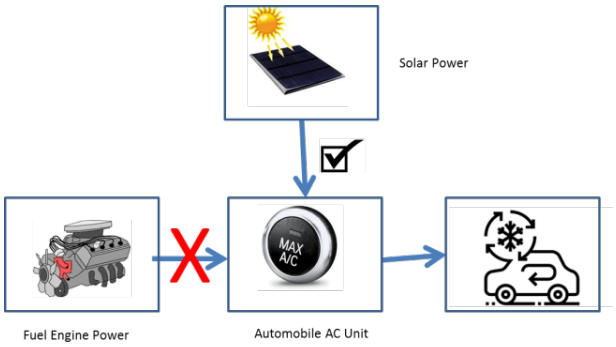
Summary: Our project is fun, helpful and also helps you relax. It helps to blow away little specks of dust that is on the floor. It will make it easier to clean up. This will be done by the fan.

Team: **DaV Tech (119)**
Title: SPAC – Solar Powered Air Conditioning for Automobiles
Participants: Dhruv Patil and Vedant Joshi

Objectives/Goals: Prevent pollution by using solar power to operate air conditioning units of automobiles instead of fuel engines. Reduce use of non-renewable

energy. Promote use of non-polluting renewable energy sources

Methods/Materials: The aim is to bypass / replace the use of engines in automobiles to power the air conditioning unit. For this purpose we will be using solar panels as the energy source. The solar panel will absorb the heat from the sun's rays and charge the batteries. The batteries are wired to the control unit which is a switch to choose between hot or cold air. Once the batteries are charged enough, we can use the power stored in them to operate the air conditioning unit. For project demonstration purposes only, we have used the following materials - solar panel, wires, batteries, fan and a switch.



Conclusion / Results : We strongly believe that we can make a positive contribution to reducing pollution levels by using solar energy to operate air conditioning units in automobiles. Our online research led us to the following facts and figures:

- Generally an idling car uses somewhere between $1/5^{th}$ to $1/7^{th}$ gallons of fuel per hour. Compact cars that carry a 2 liter capacity engine burn around 0.16 through 0.3 gallons of gas per hour. A large sedan on the other hand with a 4.6 liter engine burns approximately 0.5 to 0.7 gallons of gas.
- Air conditioning cooling is calculated on the volume of air that needs cooling – A car interior is roughly about the size of an apartment bathroom. Most cars are about 1 ton AC capacity. SUVs can range 1.5 to 3.0 tons
- A gallon of gasoline produces 20 pounds of carbon dioxide. As you can see from the numbers the pollution levels are very high and dangerous to the environment. By using solar energy and avoiding idling times, we will be able to reduce the pollution levels to a great extent.
- To operate an AC unit on a standard sedan we estimate we will need 5 to 6 solar panels. Each solar panel costs around $400. With an investment of around $2000 today we will be able to realize benefits of a larger magnitude in the long run.

Team: **The Double Duo (120)**
Title: Super Duper Cleaner Uppers
Participants: Simran Amarnani and Tanvi Jadhav

Objectives/Goals: Our goal/objective is to build a robotic garbage can that stops people from littering and polluting the environment and also makes the environment a better and safer place for everyone to live.

Materials:

1. The rubbish cart kit
2. Batteries
3. A screwdriver
4. Tape
5. Wire
6. Googly eyes
7. Scissors

Methods: First, we got a rubbish cart robot kit. Next we assembled the parts with the help of instructions and a screwdriver. Then we attached the wires with tape and scissors. Afterwards, we attached the wheels and eyes and hands. Finally, we put the batteries in the case and the robot started walking and moving, all ready to collect trash!

Results: We were able to make a robotic trash can that should help other people to stop littering and keep the environment clean.

Conclusions/Discussions:: We picked this project because if we litter, a lot of germs and diseases will spread and living beings will suffer or die.
We were able to build a robotic trash can that will help stop people from littering and polluting in the community!

Summary: The environment will be much better and cleaner for us to live on with the robotic trash can robot.

Team: **Chemkids (121)**
Title: Filtering Water Naturally
Participants: McKenna Rizk and Arya Nair

Objectives/Goals: Filter dirty water naturally and compare the quality of water pre and post filtering
Ingredients: water bottle, fine charcoal, fine sand, wet small pebbles, 2 inch by 2 inch paper towel

Methods/Materials: First, we cut an inch off the bottom of a plastic water bottle with an x-acto knife and threw the bottom piece out. Next, we placed a 2 inch by 2 inch piece of paper towel on the bottom of the bottle. Next, we put in fine charcoal about one inch thick. Similarly, we put in the fine sand about two inches thick. Then, we added a 1 ½ inch layer of small, wet pebbles. Next, we placed a cup underneath the bottle for the clean water to drip into. We poured water from a pond into the bottle. We waited forty-five minutes for the water to fully pass through the filter. Lastly, we boiled the water to sterilize it.

Results: It is important to understand the difference between filtering water and purifying water. The natural method of filtering the water helped to extract the impurities that were in the water such as dust, fine sand, clay, dirt, and biological contaminants. While our natural filtration system was able to filter out these particles, the water was still not safe to drink since filtration will not get rid of viruses. In order for that to happen, we disinfected the water by boiling it for one minute. We confirmed our results using a commercial water testing kit.

Conclusions/Discussions: In today's world, the lack of clean drinking water is a major issue. By experimenting with natural ways to filter and purify water, we learned that just a few natural ingredients and methods can filter and purify water when you need it the most.

Scientific Fun Facts

- The longest living cells in the body are brain cells which can live an entire lifetime.
- The human eye blinks an average of 4,200,000 times a year.
- Sound travels about 4 times faster in water than in air.
- No matter its size or thickness, no piece of paper can be folded in half more than 7 times.
- If you could drive to the sun -- at 55 miles per hour -- it would take about 193 years
- Hawaii is moving toward Japan 4 inches every year.
- The human brain is 80% water.
- The brain uses more than 25% of the oxygen used by the human body.
- Ants do not sleep.
- There are 60,000 miles (97,000 km) in blood vessels in every human.

Source: http://www.hightechscience.org/funfacts.htm

Middle School Projects

Team: **The wizards (202)**
Title: Drones and Aero Dynamics
Participants: Madhav Narendra, Tejas Krishnan and Kailash Aravindhan

Objectives/Goals: This project explores how helicopter flight is possible and how drones (or quad copters) have impacted our world. In addition, we explored forces that make helicopter flight possible, and learn about how material choice and shape can also have an impact on flight.

Materials: Sample templates, scissors, paperclips, ruler, tape, paper and cardboard in a range of thicknesses, foam sheets, and other materials such as markers, crayons, stickers. Additional tools: pencil, safety scissors, and a ruler or measuring tape.

Methods: We would construct a rotor using a sample template as a guide. To flight test, we drop each rotor from a height of ten feet and measured the amount of time it takes for each copter design to reach the floor. Each rotor can be tested three times and the slowest flight of the three is used for team. We would design more rotors using different materials like card board and foam, then repeated the same experiment. We would also try to fine-tune the design and see its impact.

Summary: We conclude the impact of various forces on drones and how material choice with shapes can have an impact on flights.

Team: **Wacky Weirdos (203)**
Title: Magnetic Levitation: What the future holds?
Participants: Anay Choudhari, Naina Choudhari and Yash Choudhari

Objectives/Goals: Magnetic Levitation is a technology in which an object as a whole is lifted up from the ground by inducing some magnetic force which counteracts the gravitational force or any kind of acceleration. Our Study and experiment will throw light on this and the future.

Methods/Materials:

- Powerful neodymium magnet
- String or thread,
- Paperclip
- Tape
- Test materials
- Testing platform

Results:

- The study revealed that Magnetic Levitation – has great use for transportation, medicine and many other uses.
- Saves energy, overcomes friction & reduce time.

Conclusions/Discussions: There is still a long way to go before this becomes a reality – but, our research and interest by the top scientists, companies and governments proves that – this is going to be something to watch out for!

Team: **The Mathemagicians (204)**
Title: Energy-Efficiency Using Automated Robotic Arms
Participants: Hael Raj and Sibi Thiagarajan

Objectives/Goals: Our objective is to educate the general populace about how useful robotic arms can be in the many fields of professions that are currently occupied by humans around the world. We will demonstrate the efficiency of robotic arms, through a series of interactive demonstrations that can grow the public interest in our topic. In summation, our team wishes for a greater presence of technology in our future, and this robotic arm is one method of achieving this goal.

Methods/Materials:

- 3D Printed Pieces
- Arduino
- Wires
- Battery

Discussion/Presentation:
We will illustrate the efficiency of robotic arms by using interactive demonstrations. We will use the robotic arm to perform rudimentary tasks, to prove its dexterity. After this, we will expand on the usage of said arm in several occupations (i.e. medical, military, and other scenarios where precision is key)

Conclusions/Discussions: In conclusion, our presentation encompasses, not only the efficiency of robotic arms but also how beneficial they would be to society. Our presentation also sheds light on the productivity of these robotic arms, which we strive to introduce to the public. This is important as the world is a developing place, where technological careers are becoming all the more prevalent. Illustrating this principle to the audience would generate interest in the subject, and increase readiness for the future.

Team: **The Professional Potatoes (205)**
Title: The Flying Train
Participants: Aulani Davion, Aylin Perez and Michelle Lopez

Objectives/Goals: Our objective is to recreate the MagLev Train from East Asia. The MagLev Train is the first train ever to float across a track using magnetism.

Methods/Materials: Plexiglass and cardboard were used to make the train track. Powerful Neodymium bar magnets were attached to the track and the train. The train is made of cardboard. The magnets were placed so the same polls were facing each other on the train and track. In lieu of a motor or propeller on the cardboard train we used a 9-inch high velocity fan to create an air current to move the train along the track. Precision was key, all magnets and measurements had to be exact because the magnetic attractions was so strong. Multiple attempts were necessary and the track was re-built twice.

Results: Plexiglass (Thick, Polycarbonate) had to be placed between the magnets to prevent a magnetic pull on the sides of the magnets. The train was able to hover.

Conclusions/Discussions: The MagLev Train interests us because it is a great step into faster, futuristic transportation. It was interesting to discover how it works. As well as, the MagLev Train is great for the environment. It has half the CO2 emissions than a regular car. It also creates less friction, so it can move even faster than a regular train. It causes less noise pollution so it is much quieter instead of scraping across regular tracks. From our studies we discovered that it's more difficult to control.

Summary: In summary the MagLev Trains are good for future transportation. But, a lot of care and precision must be accounted for to ensure safety.

Team: **Project Poseidon (206)**
Title: The Tsunami Wall
Participants: Ameya Gobburu, Steven George, and Schyata Sharma

Hypothesis: That our new and more efficient Tsunami wall will be more effective against city-destroying tidal waves.

Objectives/Goals: With our new tsunami wall we look to find a better and more efficient way to end the threat of tidal waves to many coastal communities.

Materials:

- One tub (Approximately a yard or so in length)
- Popsicle sticks, or any type of small building material that can be bought in bulk
- Water (Approximately 3-4 gallons)
- Blocks, plastic buildings, figurines, trees
- A flat plate
- Sand
- Some sort of building medium to recreate the island
- Waterproof coating
- Film camera (x2)
- Notes/Journals

Methods: To study the exact exacts of the wave and its general motion, we first built a small model depicting the topography of areas struck. The big cities more inland while the very poor beach communities made up of mainly huts and flimsy shacks sat closer to the shore. We then used a large flat board to simulate the tectonic plate, which we used to displace water and simulate waves. As suspected, the beach communities were the most damaged while the city took a massive amount of the torrent, the huts by the shore were utterly obliterated. We filmed this experiment for scientific research, and this very film will be used to present our theories. After the original event, precautions were taken based on what scientists could learn from the Tsunami, that could save lives in the near future.

Results: By the end of the tests and experiments, we're hoping to prove our theory about the Tsunami wall, and we're also hoping that this disaster-prevention tool can be put into effect to save the lives of millions.

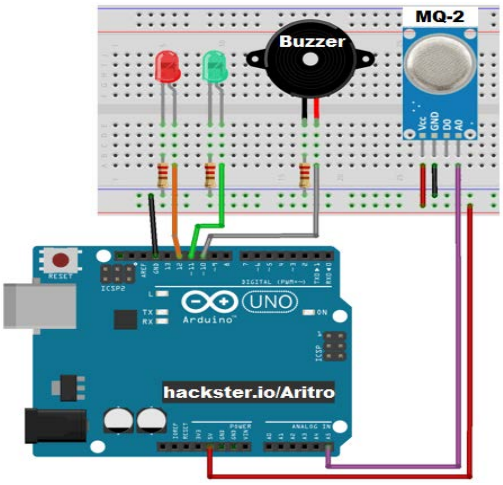
Team: **Kelvin 800 (207)**
Title: First Alert device for hazardous gases
Participants: Saifuddin Abbas, Rajeev Achar, Shiv Patel, Srikar Patri, and Sheev Shah

Objectives/Goals: The goal of this project is to develop a gas and smoke sensing device that triggers a buzzer and sends an alert to a mobile device using a pre configured ARLO mobile App .

Methods/Materials:

- Arlo motion & audio sensing device
- Mq2 gas sensor
- Arduino Uno R3 IDE
- Buzzer
- LED indicators
- Resistors
- Jumper Wires
- Breadboard
- LCD Display

Using the materials listed above, we set up the hardware components as per the diagram shown above. A software program to calibrate a MQ2 Sensor was uploaded into the Arduino Uno. By various trial and error readings, we determined the sensor threshold value to be set in the software code. This setting is accomplished by using the built-in potentiometer that helps accurately deduct gas levels. The theory is greater the gas concentration, the greater the output voltage. The voltage output can be an analog or digital signal that is read through the Arduino component and helps trigger a buzzer. This sound is captured by the Arlo monitor to send alerts to a mobile device.



Results: As the smoke levels began to increase and reaches the threshold, the output voltage increased triggering a loud buzzer sound.This sound is captured by the ARLO monitor to activate an alert to the mobile device.

Conclusions/Discussions: This project strives to build upon pre-existing ideas of smoke/gas detection. Based on available gadgets & electronic IDEs constructing a simple yet innovative solution to send timely first alerts to the homeowner helps a long way to avert a serious accident while one is away from home.

Summary: In This project attempts to teach home automation using simple yet sophisticated set of electronic gadgets & software programming.

Team: **Simple Solutions (208)**
Title: Spanish Chatbot
Participants: Isha Shrivastava, Poojitha Kalasapati, Reina Fukahori and Roshni Raghuraman

Problem Statement: Many parents will not be able to comprehend the fully-English chatbot, or have Facebook in order to access it. Consequently, we're trying to create a simple solution to solve these problems.

Objectives/Goals: Now that we have this cognitive and interactive club chatbot, we are working to expand it into another language. Thus, we will not only have English, but be able to provide Spanish! This newly added part uses AI features like NLP and language translation.

Methods/Materials:
Collect data from website
Translate it into Spanish
Enter it into our program
Use SMS platform to make it accessible
To do all this, we need:
-Spanish knowledge and data collection
-A Laptop
- Internet Connection to access the service
-A phone (SMS)
-IBM Cloud
-IBM Watson Assistant Service
-IBM Watson Language Translation
-IBM Watson Tone Analyzer

Results: A chatbot which effectively and efficiently provides updated information about Linwood Middle School's after-school clubs, in a responsive question and answer mode, now in Spanish and English. The bot will also be available for use through SMS. Furthermore, the service will be able to analyze different tones and emotions.

Conclusions/Discussions: We believe that this is easier to use than our school's website because it will contain all the necessary information and will easily know what you are looking for. Now that we can provide this comfort in Spanish it will be able to reach and benefit a wider range of people. Conversation will be smoother and rather efficient due to the additional emotional intelligence.

High School Projects

Team: Team Emoji (209)
Title: The Effects of Different Light Sources on a Solar Panel
Participants: Vedika Shah, Aruhi Vakkalagadda, Stacy Rappolt, Alyssa Mikita, Gabriella Seiden

Hypothesis: If you place a solar panel charging a battery pack under artificial light, it will charge slower than the solar panel under sunlight.

Objectives/Goals: Installing solar panels as an alternate electricity source is becoming increasingly popular in today's society. A solar panel's main purpose is to turn the sun's light and energy into electricity. It was intriguing for us to see if solar panels worked as efficiently given artificial light sources rather than sunlight. Therefore, our team is trying to test if sunlight is the best source to charge a solar panel, compared to other artificial light sources.

Materials/Methods: For our experiment we will use a few different artificial light sources such as : fluorescent, LED, blue light, black light, and red light. We will compare these artificial light sources acting on a solar panel, against sunlight.

Conclusions: The comparison of artificial light sources and sunlight acting on a solar panel will be displayed at the science symposium. We look forward to sharing our results derived from our collected data at this event.

Team: Got Science? ..We matter!! (210)
Title: Smoke and Vape Myth busters
Participants: Nimmat Sukhija, Tisha Subhedar, Krish Tiwari, Atharv Rege and Mohit Pradhan

Objectives/Goals: News coverage of novel tobacco products including e-cigarettes has framed the use of these products with both positive and negative slants. Conflicting information may shape public knowledge, perceptions of e-cigarettes, and their harms. The objective of our project is to raise awareness about the effects of the use of these products on health and general lifestyle of people using these products and also how it impacts people around them.

Materials/Methods: We conducted a detailed survey within our contacts and coworkers and friends of our parents on a variety of questions pertaining to vaping and smoking. Participants were from all age group and ethnicities.

Results: We will analyze these findings along with associated experiments and present it during the science fair.

Team: The Pioneers (303)
Title: Redefining Frontiers: The Settlement and Inhabitation of Venus
Participants: Abhaysai Vemula and Ujjayi Pamidigantam

Objective/Goals: Analyze the possibility of creating a sustainable living environment on the planet of Venus, while addressing these circumstances in comparison to the colonization of Mars.

Methods: The creation of water: water can be created using a neutralization or acid and base reaction. The existent sulfuric acid droplets in the atmosphere when combined with sodium hydroxide (brought from earths) will produce water and sodium sulfate.

Materials: Custombuilt chamber to decrease acid and water reactions but maximizing the production of water along will minimizing acid and water "burns" and distillation equipment to isolate water.

Results: (H_2SO_4 + NaOH >Na_2SO_4 + H_2O); Distillation isolates water

Conclusions/Discussion: The design of the study was split into two parts— one being the issue of sustainable life and the other being housing. Experiments were performed to create water using chemicals available in the Venetian atmosphere. As water serves as the basis of life it is vital that this issue be at the forefront of the agenda. The study concluded that the use of acidbase reactions would be the easiest and most efficient way to generate water on Venus. The next issue addressed was the lack of oxygen and reliable food sources. These introduction of photoautotrophic species that use the aforementioned synthesized water and carbon dioxide in the Venetian atmosphere solve this issue. Undergoing photosynthesis, the species generate oxygen and food for future settlers. The final obstacle faced was the creating sustainable living units in hostile Venetian conditions. To overcome this problem the study finds it necessary to create sustainable units (designed after blimps) that float 5070 kilometers above the surface. At this height the pressure drops to around one earth atmosphere and the temperature drops to around 158°F. These conditions can be managed using equipment designed for firefighting and scuba diving.

Summary: Life on Venus is survivable if certain precautions are taken and water, oxygen, and food are produced (using methods previously discussed)

Team: **EurAsia (305)**
Title: Bluetooth Beacons
Participants: Robert Cannuni, Canaan Matias, and Akshay Muniyappa

Objectives/Goals: To enable the transfer of emergency messages and information to mobile devices without the use of Wi-Fi or cellular data.

Methods/Materials:

- An Eddystone-enabled beacon, configured for use with mobile devices
- An iOS or Android smartphone
- Eddystone app

Users will download an app to set their device up so it could be recognized by the beacon. A primary user will send a message through Bluetooth, which will be relayed by the beacon. The relayed message will be sent to any known Bluetooth-enabled mobile device within range of the beacon.

Results: Using a mobile smartphone, users were able to rapidly send messages without the need for Wi-Fi or cellular data and were also able to contact multiple people at once.

Conclusions/Discussions: Upon implementation of this technology, messages could be transferred in a quicker and simpler manner. This would allow users to receive these messages without outside sources or third party services (applies to Android only; iOS requires the use of an app). Messages can be successfully sent via Bluetooth and to numerous parties the beacon recognizes, thus excluding unwanted persons or anyone who may serve as a potential threat. The beacon provides users with the ability to send messages during an emergency with approximately one-hundred percent efficiency, and in situations when it is not feasible to use entities such as a PA system.

Summary: This project aims to provide a method of communication during emergency situations, as well as in the event traditional communication methods fail (lack of Wi-Fi, cellular data disabled, etc).

Team: **Floating 2 Victory (306)**
Title: Vessel Buoyancy
Participants: Prakash Nayak and Lukas Siernos

Objectives/Goals: The objective is to find out what type of hull can hold the most weight.

Methods/Materials: There were four boats with differently shaped hulls constructed: The Flat Bottom Hull, the circular hull, the double V hull, the single V hull. We made these to see which one can hold the most weight. The way we did this was by making a boat out of popsicle sticks, duck tape, and hot glue. We made the boats have the same surface area so that all the hulls have an equal chance. We also made the boats be consistent in the amount and same material used for each boat. From then, we set down the boat in the water and put a 500-gram weight on each boat. We measured how much water the boats will displace after we put the 500g weight in. Based on the amount of water displaced, we will be able to determine which hull will be able to hold the most weight. We do this by saying whichever hull disperses the least amount of water can hold the most weight.

Results: This table indicates how far above each boat's hull was from the bottom of a body of water before and after a 500-gram weight was added

Flat Bottom Hull	Circular Hull	Double Triangle Hull	Huge V Hull
Before: 4 inches After: 3.75 inches Δ: 0.25 inches	Before: 3 inches After: 1.5 inches Δ: 1.5 inches	Before: 3 inches After: 2.5 inches Δ: 0.5 inches	Before: 2 inches After: 0 inches Δ: 2 inches

Conclusion/Discussions: As you can see, boats with a hull that had a flatter design were able to withstand more weight. Using the Archimedes Principle, we can infer that boats with flatter hulls will hold up more weight. The Archimedes Principle states that when something is resting in or on water, it feels an upward force equal to the weight of the water that it displaces. If an object is completely submerged, this upward force effectively reduces its weight. When something is floating on water, it feels an upward force equal to the weight of the water that it displaces. This means that boats with flatter hulls were able to displace more water when being loaded with weight. In order to sink, much more water had to be displaced compared to the

other boats. But boats in real life don't have flat hulls. Most of them use rounded hulls. This is because boats aren't made to stand still. If a boat was flat, pushing it forward would instantly make it go underwater as a result of friction. To counteract this, boats use rounded hulls that glide across the water, even though they may not hold as much weight. In conclusion, this experiment proved the law correctly and successfully showed how a flatter hull will hold more weight.

Summary: This project finds out which hull can hold the most weight. Based off of our results, we were able to tell that the flat hull boat was most effective at handling the weight of 500 grams. By being able to displace the most water when handling a weight, the flat bottom boat was able to generate the most upward force from the water. When the weight was put on the boat with the V-shaped hull, it did not have to displace much water to sink, which explains why it sank by 2 inches. When compared to the flat bottom boat's 0.25 change in distance from the bottom of the container after the weight was added, the difference is clear. In conclusion, our project was to find out which hull can hold the most weight, and based on our results, it was the flat bottom hull.

Team: **Visual Science (307)**
Title: Neuronal Gene Expression In Mice, and its Potential Application In Therapy
Participants: Sidharth Bejugama and Varun Chari

Objectives/Goals: The three main neuronal subclasses are nociceptors (receptors for pain stimuli), mechanoreceptors (receptors for mechanical stimuli), and proprioceptors (receptors for spatial ability). Proprioceptors are further differentiated into Group IA Muscle Spindle Afferents, Group IIA Muscle Spindle Afferents, and Group IB Golgi Tendon Organ Afferents (GTOs). In our experiment, we detail molecular (including single cell RNA sequences), genetic, and computational strategies to define the molecules that drive proprioceptor subtype specification, to map the proprioceptive connectivity patterns in spinal cord, and to assess the behavioral consequences of the loss of proprioceptors through genetic (proprioceptor) inactivation studies through the use of the mouse as a model system. Our project was to identify how genes can most efficiently be characterized as part of proprioceptor development and be assigned to the development of Muscle Spindle Afferents versus GTOs and from a developmental standpoint, how the lineage of the pairwise correlation of clustered genes varies from the embryonic to adult stage.

Methods/Materials: The methods used include Plate-Sequencing, Gene/Cell Clustering, differential gene analysis using computational methods, and in-situ hybridization. Materials were used from the Columbia Motor Neuron Center such as all laboratory chemicals and materials, mice, tissue culturing environments, PCR machines, gel trays, and other mechanical necessities. Plate-Sequencing was done to extract individual cells from embryonic and adult mice tissue into individual well plates. After lysing cells, the cDNA was compiled for gene analysis. The genes were clustered according to relative expression levels in the mice using a process called Weighted Gene Coexpression Network Analysis (WGCNA). Following this, using edgeR software, a manual statistical analysis, and JAVA code, a differential gene analysis was done to hand select the genes we wanted to study further. Finally, in-situ hybridization was done to verify the expression levels of the genes in our own mice and develop probable conclusions for gene lineage.

Results: Following a very thorough statistical analysis in the embryonic and adult mice tissue, we narrowed down the genes presumed to be influential in differentiating between different proprioceptor subtypes and our work yielded fruitful results when analyzing gene expression in different ages of mice. Our work showed that genes in embryonic mice that differentiated the afferents were Spry4, Igf1, and Pcp4 and in adult mice were INA, Pcdh10, Ptprd, Sorcs3, and Kcnmb4.

Summary: So what does this mean? At the heart of molecular biology lies a bridge to translational medicine. Our work directly ties into finding gene-therapy based solutions for neuropathological disorders that constrict spatial ability, such as Chemotherapy Induced Neuropathy and Friedreich Ataxia. We hope that our significant results can be used in future studies for developing refined gene clustering to further improve model systems for human sensory neurons and better model peripheral neuropathological conditions. Something like this would change humanity as we know it today and create endless possibilities for studies in clinical neurology.

Judges At A Glance

Stacie Oliveri

Stacie has been teaching in North Brunswick School District for almost 20 years. She has taught second, third and currently fourth grade. She is on both the math and science committees for the district. She is also in her fourth 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.

Akintunde Bello

Dr. Akintunde Bello is currently the Head, Clinical Pharmacology & Pharmacometrics at Bristol-Myers Squibb. He is a pharmaceutical professional with more than twenty-five years of experience in the fields of Clinical Pharmacology, Preclinical Pharmacokinetics (PK) & Drug Metabolism with international pharmaceutical companies. He has managerial and leadership roles in early and late stage clinical development across multiple therapeutic areas (oncology, infectious diseases, CNS, CV, metabolic and respiratory diseases). He has had interactions with various regulatory authorities; end of phase 2, pre-NDA/BLA, scientific advice (EMA), FDA advisory board and post approval activities.

Dr. Bello has recruited, trained, mentored, and developed colleagues. He has earned many awards throughout his career and to list some: The Rhone Poulenc Rorer PhD Studentship (King's College, University of London), Bristol-Myers Squibb Triumph Award, Pfizer Nextgen Leader Program and the PowerList top 100 most influential Black People in The UK. He currently chairs the Innovation and Quality Consortium Clinical Pharmacology Leadership Group (IQ CPLG), he has coauthored more than 85 articles in peer-reviewed scientific journals.

Dr. Bello has a Ph.D. in Pharmaceutical Sciences - King's College, University of London, Department of Pharmacy, London, UK, MSc. in Instrumentation and Analytical Science - University of Manchester Institute of Science and Technology (UMIST), Manchester, UK and BSc. (hons) in Biomedical Sciences - Portsmouth Polytechnic (University) Hampshire, UK.

Aditya Pandyaram

Aditya Pandyaram grew up in North Brunswick. He attended John Adams Elementary School, Linwood Middle School, and North Brunswick Township High School. While at NBTHS he was a captain of the school's Robotics team, which went on to win several competitions and engineering accolades between 2005 and 2007. Following NBTHS, he pursued a Bachelor's degree in Electrical Engineering at the University of Illinois at Urbana-Champaign, and a Master's degree in Computer Science from the Georgia Institute of Technology. During his college years he was involved in artificial intelligence and distributed power systems research.

Aditya has worked in a variety of roles throughout the years, ranging from large companies to startups. While at General Electric he worked in several industries including Smart Power Grids, Oil & Gas, Locomotives and the Internet of Things (IoT). He's held roles in software development, data science, embedded systems design, and product management.

Currently in NYC, he is the CEO of Code Ahead (www.codeahead.io) - where he helps K-12 students learn the fundamentals of computer science to prepare them for a future in our increasingly technology driven world. In addition to Code Ahead, he also serves as a Venture Partner at Indicator Ventures (www.indicatorventures.com), a seed stage venture capital firm with technology investments across the US. Outside of work, he has a deep passion for the democratization of STEM education, which led to the development of Intellection Institution (www.intellectionnj.com) - a 501(c)(3) NBTHS alumni founded nonprofit that provides underprivileged students with the requisite supplies, mentorship, and financial support to succeed in STEM careers.

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.

Jenna DelleDonne-Ballard

Jenna DelleDonne-Ballard is a fourth grade teacher at Livingston Park Elementary School. Ms Ballard attended Ramapo College of New Jersey from 2007-2011, where she double majored in Elementary Education and Psychology, and she is currently in pursuit of Master's Degree in Educational Leadership with a minor in Curriculum/Instruction. Over the past six years, she had taught on multiple elementary grade levels and truly loved being a part of the North Brunswick Township School District. Being an active and integral participant within her school community is something she find joy in and to be rewarding.

Venkata Nanduri

Dr. Venkata Nanduri has been with pharmaceutical industry for 28 years and is currently employed at Bausch Health as Director of Global Regulatory Affairs. In this role, he manages regulatory filings for biological and small molecules for new drug approvals.

Dr. Nanduri obtained Masters Degrees from National Dairy Research Institute, India, and Auburn University, Alabama, USA, and a Ph.D from University of Medicine and Dentistry, New Jersey in Biochemistry and Molecular Biology.

Following graduation, he has joined as a post-doctoral fellow at Roche Institute of Molecular Biology, and then at Bristol-Myers Squibb studying protein-protein interactions by chemical modifications, signal transduction in oncogenes. Following post-doctoral research, he joined Process R&D at Bristol-Myers Squibb working on preparing chiral molecules by enzymatic and microbial conversions. He then moved into regulatory affairs preparing CMC documentation for clinical/commercial pharmaceutical drug products. In his free time, he enjoys playing golf, reading, and traveling. He lives in East Brunswick, NJ.

Michael Kestlinger

Michael Kestlinger is a teacher at North Brunswick Township High School. He has been in the district for 4 years teaching CP and Honors level Physics. During college, he doubled majored in Chemistry and Secondary Education from Monmouth University. He recently went back to college and graduated with a Masters in Educational Leadership through Montclair State University. He also have been fortunate to work in many others aspects of STEM outside of the classroom. During summers and after school, he has taught small classes of Scratch Programming and Lego Robotics. These types of experiences have lead him to become one of the advisers of the most successful teams in North Brunswick history; Team 25 Raider Robotix. Being involved in this past season of Robotix has been the pinnacle of his career in North Brunswick. It has given him the opportunity to be around not just a class of students interested in science, but a network of people whose soul goal is to develop STEM across the world. He has been judge for NBT Science Symposium for the past 3 years.

Akhileswar Patel

Dr. Akhilweswar Patel, completed his Masters and Ph.D in Physics and from National Institute of Technology, Rourkela, India. He then came to United States to do his Post-Doctoral training at Stevens Institute of Technology, Hoboken NJ. He has served as the Head of Quality Control at Electrocatalytic, NJ. He specializes in Small-Angle X-Ray and Neutron Scattering and has published four articles in four books and contributed scientific papers in more than 35, mostly in internationally recognized journals. Dr. Patel was awarded Hind Ratan Award as the first and only Indian to represent SAX and SANS international seminar at Berlin (West) in 1980.

Sandra Currier

Ms. Sandra Currier is a 7th grade Life Science teacher at Linwood Middle School. From a young age, Ms. Currier always knew she wanted to be a teacher. Her mother is a teacher and her father is an engineer so it only felt natural to combine her love of science with her love of teaching. Ms.Currier went to Judd, Linwood and NBTHS. After graduating high school, she went to Kean University for her undergraduate majoring in Psychology and minoring in Sociology. She took classes at Kean University for her Post- Baccalaureate to get her certification in Education. Ms. Currier started substitute teaching in 2005, from there she worked as a paraprofessional, as well as long term substituting between the elementary schools and Linwood Middle School. Ms. Currier has always been interested in finding out why and how things worked. She embraces the opportunity to convey her excitement of learning each day. Ms. Currier wants her students to know how important it is to never stop learning. “Science is fun. Science is curiosity. We all have natural curiosity. Science is a process of investigating. It's posing questions and coming up with a method.” Sally Ride

Meet the Panelists

Frank Sweeney

Frank Sweeney is a R&D Process Engineer for the Chemours Company. A graduate of North Brunswick Township High School, Frank went on to attend Johns Hopkins University, graduating with a degree in Chemical and Biomolecular Engineering. Upon graduating, he joined the DuPont Field Engineering Program, before spinning off with Chemours to work in their Fluorochemicals business, working on low global warming potential, zero ozone depletion potential chemicals.

Stephanie Manning

Stephanie grew up in North Brunswick where she attended Livingston Park Elementary School, Linwood Middle School and North Brunswick Township High School. While at NBTHS, Stephanie was the varsity cheerleading captain for football and basketball where she received the NBTHS Coaches Recognition Award. She was also a member of the National Honor Society and a volunteer Pop Warner cheerleading coach. Stephanie continued her education at Hofstra University where she graduated Cum Laude with a Bachelor of Business Administration in Finance and Marketing. During her time at Hofstra, she was a member of Beta Gamma Sigma; The International Business Honor Society. Today she is a Research and Development (R&D) Finance Manager at Allergan where she supports several global functions across the organization. In her current role she is responsible for managing the operating expenses and external project spend costs related to the R&D Medical and Global Evidence and Value organizations which consists of several functions including Publications, Medical Education, and Medical Science Liaisons. In addition, she works cross functionally with the R&D Project Management team to support several Early Stage development programs for Alzheimer's Disease and Ulcerative Colitis

Rajeev Shrivastava

Rajeev Shrivastava is IBM Watson's Thought Leader Level Chief Solution Architect, with more than 25 years of global experience in leading the large and complex delivery of end-to-end solutions in the area of Artificial Intelligence, Machine Learning, and Deep Learning. He completed his Master of Philosophy in Computer Science and Masters in Applied Mathematics, from India. He is also involved in various community services such as the P-TECH program that helps high school students build the skills they need in tomorrow's careers. Mentoring middle school kids for problem solving skills as well as coaching soccer for young children in North Brunswick.

Nikil Revuri

Nikil Revuri spent most of his childhood in North Brunswick, attending both Linwood Middle School and North Brunswick Township High School. While at NBTHS, he was varsity captain of the tennis team and achieved the rank of 3rd singles. He was also a member of the National Honor Society, and was recognized as a National Merit Scholarship Finalist. He then was accepted into the 7 year BS/MD program at Drexel University, from which he graduated summa cum laude with a BS in Biology, and then went on to attend Drexel University College of Medicine. During his time in college, he was involved in Alzheimer's and multiple sclerosis research using fruit fly and cell models respectively. He is set to graduate with his medical degree and start his residency at Tufts Medical Center in Boston in June 2019.

Janet Ciarrocca

Director of Curriculum, North Brunswick School District, New Jesey.

2018 NBT SCIENCE SYMPOSIUM WINNERS

Team#	Team Name	Category	Participants	Award
22	Wacky Wizards	Elementary School(3-5)	Yash Choudhari	1st Place
22	Wacky Wizards	Elementary School(3-5)	Naina Choudhari	1st Place
12	The Wise Trio	Elementary School(3-5)	Aanya Muniyappa	2nd Place
12	The Wise Trio	Elementary School(3-5)	Anusha Vakkalagadda	2nd Place
12	The Wise Trio	Elementary School(3-5)	Prahas Ramidi	3rd Place
25	Team Geo Kids	Elementary School(3-5)	Adithya Mysore	3rd Place
25	Team Geo Kids	Elementary School(3-5)	Nethra Gujja	3rd Place
25	Team Geo Kids	Elementary School(3-5)	Jay Pindipol	1st Place
43	Simple Solutions	Middle School	Isha Shrivastava	1st Place
43	Simple Solutions	Middle School	Reina Fukahori	1st Place
43	Simple Solutions	Middle School	Roshni Raghuraman	1st Place
43	Simple Solutions	Middle School	Poojitha Kalasapati	1st Place
37	Mathemagicians	Middle School	Hael Raj	2nd Place
37	Mathemagicians	Middle School	Sibi Thiagarajan	2nd Place
40	Whiz Kidz	Middle School	Sahil Choudhari	3rd Place
40	Whiz Kidz	Middle School	Aarav Yadav	3rd Place
40	Whiz Kidz	Middle School	Rohan Bhatia	3rd Place
57	Robosmart	High School	Laasyasri Sandy Channavajjala	1st Place
52	Team Rocket	High School	Surya Ananthu	2nd Place
52	Team Rocket	High School	Kunal Bhatt	2nd Place
52	Team Rocket	High School	Yechan Kim	2nd Place
54	S.T.A.U.N.C.H	High School	Abhaysai Vemula	3rd Place
54	S.T.A.U.N.C.H	High School	Ujjayi Pamidigantam	3rd Place
16	Magneto	Elementary School(3-5)	Bhargav Patri	Outstanding Research
16	Magneto	Elementary School(3-5)	Pranav Patri	Outstanding Research
16	Magneto	Elementary School(3-5)	Yajat Sharma	Outstanding Research
18	Science Buddies	Elementary School(3-5)	Ridhi Boggavarapu	Outstanding Design
18	Science Buddies	Elementary School(3-5)	Poorna Thoguluva	Outstanding Design
24	Team Manat	Elementary School(3-5)	Atharv Rege	Outstanding Presentation
24	Team Manat	Elementary School(3-5)	Nimmat Sukhija	Outstanding Presentation
24	Team Manat	Elementary School(3-5)	Tisha Subhedar	Outstanding Presentation
24	Team Manat	Elementary School(3-5)	Advait Gattu	Outstanding Presentation
24	Team Manat	Elementary School(3-5)	Mohit Pradhan	Outstanding Presentation
20	Science Maniacs	Elementary School(3-5)	Samarth Sharma	Outstanding Creativity
20	Science Maniacs	Elementary School(3-5)	Maharsh Khatri	Outstanding Creativity
39	Bio-Bot	Middle School	Manish Vankadhara	Outstanding Research
39	Bio-Bot	Middle School	Steven Biju George	Outstanding Research
35	Fantastic Duos	Middle School	Prakash Nayak	Outstanding Design

2018 NBT SCIENCE SYMPOSIUM WINNERS

35	Fantastic Duos	Middle School	Suryan Srivastava	Outstanding Design
36	Masterminds	Middle School	Karan Choudhari	Outstanding Creativity
36	Masterminds	Middle School	Praney Hirpara	Outstanding Creativity
36	Masterminds	Middle School	Pranav Rana	Outstanding Creativity
36	Masterminds	Middle School	Shrey Jain	Outstanding Creativity
53	The Planet Protectors	High School	Kirtana Krishnan	Outstanding Design
53	The Planet Protectors	High School	Aanya Subhedar	Outstanding Design
55	New Point of View Crew	High School	Kusum Gandham	Outstanding Creativity
55	New Point of View Crew	High School	Nyjah Howard	Outstanding Creativity
55	New Point of View Crew	High School	Khushi Patel	Outstanding Creativity
24	Team Manat	Elementary School(3-5)	Atharv Rege	Popular Choice Award- 1st place
24	Team Manat	Elementary School(3-5)	Nimmat Sukhija	Popular Choice Award- 1st place
24	Team Manat	Elementary School(3-5)	Tisha Subhedar	Popular Choice Award- 1st place
24	Team Manat	Elementary School(3-5)	Advait Gattu	Popular Choice Award- 1st place
24	Team Manat	Elementary School(3-5)	Mohit Pradhan	Popular Choice Award- 1st place
43	Simple Solutions	Middle School	Isha Shrivastava	Popular Choice Award- 2nd place
43	Simple Solutions	Middle School	Reina Fukahori	Popular Choice Award- 2nd place
43	Simple Solutions	Middle School	Roshni Raghuraman	Popular Choice Award- 2nd place
43	Simple Solutions	Middle School	Poojitha Kalasapati	Popular Choice Award- 2nd place
25	Team Geo Kids	Elementary School(3-5)	Adithya Mysore	Popular Choice Award- 3rd place
25	Team Geo Kids	Elementary School(3-5)	Nethra Gujja	Popular Choice Award- 3rd place
25	Team Geo Kids	Elementary School(3-5)	Jay Pindipol	Popular Choice Award- 3rd place

Thank You !!

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

Abhitej Bokka
Aliza Lopez
Anudeep Revuri
Archana Sengar
Blisse Vakkalagadda
Chandradev Ramidi
Jerry Wang
Kavitha Muniyappa
Padma Garla
Madhumurthy Kunisetty
Murali Muniyappa
Naachammai Ramu
Neetu Gupta
Rajireddy Komatireddy
Sanjana Punduru
Sanjay Sengar
Saanvi Kunisetty
Srini Garla
Vedika Sengar
Velumani Krishnaswamy

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Commemorates a Historic World Event – 72st Independence Day of India

"Tomorrow Together: Promoting Unity, Empathy and Service among the youth thus building peace, harmony in the community, Nation and the World"

Join us for an entertaining and educative event

August 10th, 2019

10 am – 1 pm

North Brunswick Township
High School Auditorium

Organized By

NBT India Day Committee (A service project of Agraj Seva Kendra)
North Brunswick Township High School

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