NBT Science Symposium

"Where Creativity Meets Innovation"

ABSTRACT BOOK - 2020

Organized by
NBT Science Symposium Committee
(A Service Project of Agraj Seva Kendra)

NBT Science Symposium

We sincerely thank

The Allergan Foundation

For their generous support

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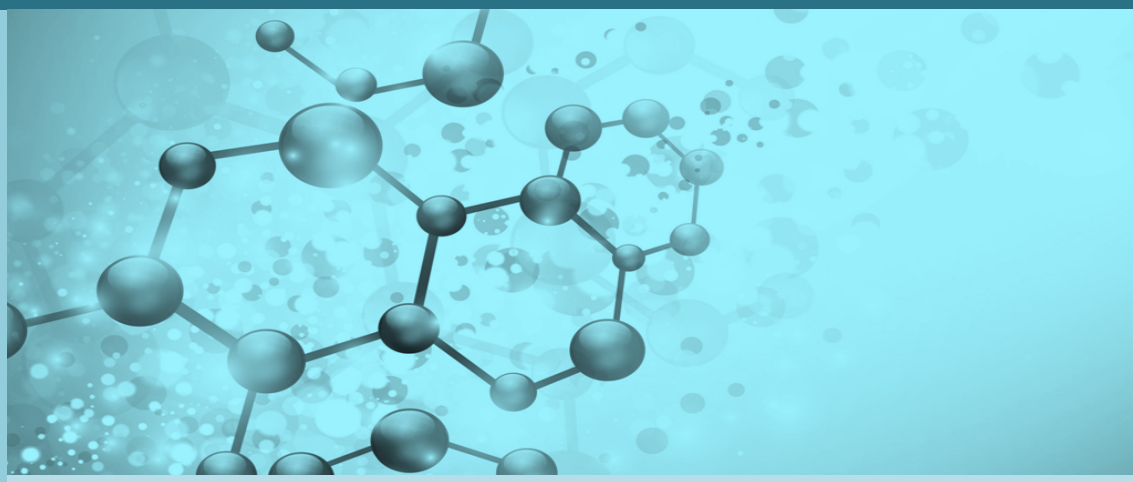
NBT SCIENCE SYMPOSIUM 2020

NBT Science Symposium Executive Committee

Gangadhara Rao Vakkalagadda
Chairperson

Surendar Reddy Revuri
Co-Chairperson

Govinda Rajan
CEO-Agraj Seva Kendra



Message from Chairperson

Dear Friends,

I am honored to invite you to the 5th Annual NBT Science Symposium. This is a platform where children from Grades 3rd-12th in North Brunswick, have an opportunity to present a scientific concept that they have researched, tested and had fun understanding. It is our responsibility to encourage them to pursue science, keep researching and continue learning. I recognize some children may feel intimidated by some of the concepts in science and to them, I would quote the famous scientist Marie Curie, who conducted pioneering research in the area of radioactivity and discovered Radium:

"Nothing in life is to be feared, it is only to be understood. Now is the time to understand, so that we may fear less."

So beautifully said, to inspire the young and old alike, to learn and understand throughout one's life and become less fearful and more confident.

"Understanding" is so important. I am sure during the process of choosing a topic for the science symposium, researching it, learning the concepts behind it, coming up with a hypothesis, discussing it with other team members, and presenting to the judges as well as the audience, all the students learn and understand scientific concepts. This understanding helps them relate science concepts to their day-to-day lives. To me, that is the highest return-on-investment of the time and effort that these students have put in to bring a project to this symposium! I see that parents also play a very active role in supporting the teams with various aspects of the project and I am sure they learn and understand a lot of science during this process too. The circle of learning and understanding is constant and everyone does it differently, which provides one with the unique perspective they have. That's why it's exciting for me to see both the younger and senior teams bring remarkable projects and diverse perspectives and presentations to this symposium. We hope to see many more in the future years.

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 acknowledge the support and a generous grant by The Allergan Foundation to support this Science 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
Chairman, 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 this Fifth Annual NBT Science Symposium.

Our mission is to provide an opportunity for students to apply creativity and critical thinking to the solutions of Science, Technology, Engineering and Mathematics (STEM) beyond the confines of the classroom and excel.

More than thirty teams from Elementary, Middle and High Schools will showcase their talents in this unique competition, thus improving their scientific acumen.

This year Agraj Seva Kendra has taken a new initiative partnering with the Cancer Institute of New Jersey. We are providing various opportunities to students of High School who have an interest in learning about cellular biology and genetics of cancer, as well as the diverse careers connected to the field.

We conducted a tour of the Labs attached to the Cancer Institute of New Jersey. The students will be participating in Rutgers Oncology Olympiad on March 28, 2020.

Under BOLD (BioCONECT Oncology Leadership Development) Initiative developed by Cancer Institute of New Jersey in partnership with Rutgers School of Public Health, the students will attend summer camps.

I extend my gratitude to the educators and the Board of Education for their help and support in making this event a success. I thank the sponsors, judges, volunteers, parents and participating young scientists. I heartily congratulate Gangadhara Vakkalagadda and Surendar Revuri for their efforts in bringing out this event. Last, but not the least, I thank The Allergan Foundation for their generous grant.

Sincerely,

Govinda Rajan
CEO, Agraj Seva Kendra

Dr. Brian Zychowski

Dear Community Members,

Frank Herbert,, the American novelist stated; *"The beginning of knowledge is the discovery of something we do not understand."* The **North Brunswick Township Science Symposium** is about the challenges of discovery and learning. Students are igniting their curiosity through this process while acquiring new or modifying existing knowledge.

Students are being exposed to this rigorous challenge of creating science projects that they must present and defend. This educational endeavor captures the embodiment of the **North Brunswick Township Science Symposium.**

The North Brunswick Township Board of Education supports *Project Based Learning* and commends the entire North Brunswick Township educational community for generating an opportunity for students to learn and discover while participating in the **North Brunswick Township Science Symposium**. This event continues to stimulate great interest amongst our community because it highlights our students' work. I look forward to discussing the many projects with the student inventors.

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 achieving the highest levels of discovery.

Sincerely,

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

NBT SCIENCE SYMPOSIUM 2020

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 • Venkata Nanduri • Jenna Ballard • Akhileswar Patel Room 2 (Room# 423) Judges • Leanne Barnhard • Martin Kozicki • Aruna Dontabhaktuni Room 3 (Room# 424) Judges • Randy Dockens • Giridhar Tirucherai • Lucille O'Reilly STEAM Tank Presentations (Media Center)
1 PM Program Moderator: Blisse Vakkalagadda	• Welcome address by Gangadhara Rao Vakkalagdda • Address by Dr. Brian Zychowski • "Science Circus Assembly" a science presentation by Liberty Science Center Travelling Program. • Vote of Thanks • Awards Distribution

NBT SCIENCE SYMPOSIUM 2020

Room 1 (Room # 420)

Team #	Team Name	Judging Time
301	Shiksha	10.00 AM
302	Science Sweet Science	10.10 AM
303	Thermal Waves	10.20 AM
304	The Master Minds	10.30 AM
305	NextGen Robotics	10.40 AM
306	Innovative Minds	10.50 AM
307	Solar Kids	11.00 AM
308	SAS(Serious About Science)	11.10 AM
309	Moonlings	11.20 AM
310	Slime Detectives	11.30 AM

Room 2 (Room # 423)

Team #	Team Name	Judging Time
311	Team 2D	10.00 AM
313	Pollution Patrol	10.10 AM
314	Science Girls	10.20 AM
315	The W-Right Friends	10.30 AM
316	Instinctive Thinkers	10.40 AM
317	Young Saviors	10.50 AM
318	Kinetic Duo	11.00 AM
319	Googols	11.10 AM
320	Couple of Polymers	11.20 AM
321	The Science Gems	11.30 AM

Room 3 (Room # 424)

Team #	Team Name	Judging Time
601	Fabulous Five	10.00 AM
602	Team Solar	10.10 AM
603	Soil Scientists	10.20 AM
604	The Survivors	10.30 AM
605	Climate Scientists	10.40 AM
606	The Keen Scientists	10.50 AM
607	AJ Squared	11.00 AM
901	Touch the Stars	11.10 AM
902	The Noisemakers	11.20 AM
903	Simple Solutions	11.30 AM
904	Super Scientists	11.40 AM
905	CPS	11.50 AM

Media Center (STEAM Tank Presentations)

School	Idea	Judging Time
HS	AGE-O	10.00 AM
HS	Trash Compactor	10.10 AM
HS	The Photovoltaics	10.20 AM
HS	Backer-upper	10.30 AM
HS	Newview	10.40 AM
MS	Backpack Jacket Combo	10.50 AM
MS	Zipper Zipper	10.58 AM
MS	Anti-Pick Pocket	11.06 AM
MS	Silky Smooth Brush	11.14 AM
MS	Suction Hanger	11.22 AM
MS	Animal Tracker	11.30 AM
MS	Magnolaces	11.38 AM
MS	More Than Clean Toothbrush	11.46 AM

Abstracts

Elementary School Projects

Team: Shiksha (301)
Title: Cardiovascular System and Health of Children
Participants: Rishika Giriraddi, Anish Batra, and Amishi Batra

Objective/ Goals: The goal of this study is to show how healthy habits from an early age help in lowering several diseases later on in life especially cardiovascular diseases. According to Center of Disease Prevention, there is approximately 18.5% obesity prevalent in the United States of America and affect 13.7 million individuals that includes children and adolescents. Promoting heart health at early age is a key component of healthy adulthood according to American Heart Association.

Materials/Methods: The heart model is used to explain functions of the heart and how unhealthy food choices increase the risk of building up cholesterol in arteries. Lack of exercise and poor diet increase atherosclerosis in arteries and result in conditions like high blood pressure and other cardiovascular diseases. The poster board is utilize to depict Heart anatomy, its functions, and the pictures of clogged arteries. The audience may be asked to identify healthy food choices to assess their knowledge on different food options.

Results: The model represents heart anatomy and its functions in the whole body system. Additionally, it represents healthy habits in early childhood increases heart health and prevent cardiovascular diseases in adulthood. Exercise is another key component that needs to be added on a daily basis. Family history of cardiovascular disease is another component that puts individual at cardiovascular risks. However, it becomes extremely important for anyone to make healthy choices at early childhood.

Conclusions: The study model shows there is an increased risk of clogged arteries in the body when consumed high fat diet. Making healthy choices from an early age help decreased the risk of atherosclerosis. Henceforth, it will lead in decreased risk of cardiovascular diseases in later part of adulthood.

Team: Science Sweet Science (302)
Title: Eco Toys For Playful Pups
Participants: Sofia Kabir, Juliana Mars and Haylie Park

Objective/ Goals: The goal is to find less toxic and more environmentally friendly alternatives for dog toys that can also help consumers save money.

Materials/Methods: We looked up existing dog toys online and in stores. In our research we discovered that common dog toy materials include:

- Plastic
- Rubber
- Nylon & other synthetic materials
- Wood
- Food
- Bone

Not all materials listed here would be considered nontoxic and biodegradable. We decided to use recycled eco-friendly materials from our houses, such as socks, cloth, rope, handkerchiefs, and rags, to make our own DIY toys.

Results: After we created our DIY prototype (ball toys made with stuffed socks and scarves), we tested it on one of the participant's dog, who liked playing fetch and chasing it, and the toy proved to be more durable than most store bought toys after multiple uses.

Conclusions/Discussions: There are some dog toys that are eco-friendly but most are not. This is a problem because some materials can harm dogs and the planet. While doing research online and in stores, such as PetSmart, we realized that certain toys were replicable and others were not. Certain toys, such as fetch/chew toys and tug toys, can be easily made at home using readily available materials, such as mismatched socks, old t-shirts, etc. For toys that are difficult to recreate at home, consumers should remember to avoid toxic materials, such as BPA plastic and synthetic rubber, when purchasing a toy.

Summary: This project will demonstrate how easy it is to replicate dog toys by using recycled materials, and show that, by being more informed consumers, we can help the planet, keep our pups healthy, and save money at the same time.

Team: Thermal Waves (303)
Title: Heat Transfer
Participants: Christopher Sudah, Earl Dziekpor and Ethan Dziekpor

Summary: In winter, we try to keep ourselves and our houses warm. Our parents make us wear hats and gloves and keep doors and windows closed in our houses. We looked at some of the gloves and asked ourselves how do gloves give the hands warmth and how do the walls in our houses keep the house warm? We started by looking at 2 different gloves and wanted to know whether the thickness of the material or the type of material help give us warmth. Our curiosity led us to investigate into how gloves keep us warm. We did three experiments following safety rules and using basic materials such as plastic cups, hot and cold water, soda cans, wool, tissue, food coloring, ice cubes, metal and plastic pans, gloves, and thermometer. We tested food coloring in warm/cold water, ice cube melting on different surfaces and tested a combination of material to keep a soda can cold. Our findings for the experiments showed that, insulators such as wool, plastic and cold water allows heat to travel slower compared to good conductors of heat such as bare soda can (aluminum). We also observed that it is the type of material that helps keep us and our houses warm and not the thickness of the material. We also researched natural material that could save energy and is eco-friendly.

Team: The Master Minds (304)
Title: Take a Break
Participants: Aaron Ling, Ayaan Narale and Om Nangia

Objective/ Goals: This study aimed to showcase how electronic devices affect your eyes and overall reaction time.

Materials/Methods: Our project is called Take A Break! In our project, we showcase how watching things on devices for an extended period affects your reaction time, brain, and, most importantly, your eyes. We show you how it can not permanently affect your eyes but can have very annoying and painful side effects. In our project, we give facts on various ways on how to help keep your eyes healthy and in good shape. Some of our strategies consist of the “20 20 20” strategy and how to limit your time on a popular app Youtube. We will show you a picture of an eye test, and we will see how much you can read to see how good your eyes are. We are also going to show you how glasses can help you but why you get glasses and what are the causes of getting glasses. Also, in our project, we explain the symptoms of watching or reading things for a much more extended period than an hour like headaches and dry eyes and more. After we show you that, we will then explain how electronics affect your reaction time and your speed. We also are going to show you how staying up working for a long time, and not getting enough sleep affects your motor skills and your hand-eye coordination.

Results: Staring at a screen for a longer duration can damage the eyes but there are ways one can protect.

Team: NextGen Robotics (305)
Title: Rise of Robots – Smart Farming
Participants: Arya Salem and Steven Galvan

Objective/ Goals: This project aims to bring efficiencies to agriculture industry through Future Farming techniques using Robotics and smart Circuits using Microprocessor.

Materials/Methods:

- Laptop
- Microprocessor
- LED Indicators
- Breadboard
- Jumper wires
- Sensors
- VEX Robotics

Results: We were able to build an autonomous cum remote controlled robot for Agriculture industry like Corn Farming.

Conclusions: This project shows that our robot prototype shall assist farmers and the agriculture industry by using the robots in day-to-day farming, Benefits include improved speed, efficiency and saving hard work of farmers

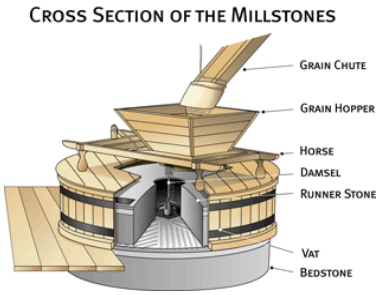
Team: Innovative Minds (306)
Title: Stone Flour Mill
Participants: Meryl Patel and Ishaan Iyer

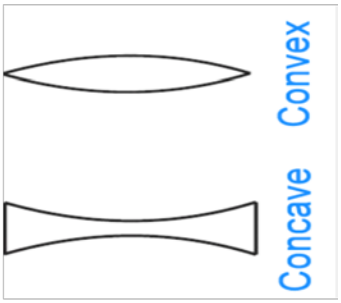
Objectives/Goals: My project is about *Stone Flour Mill.* Did you ever wonder how a field of grain converted into the bread or chapatti that we eat! Here is the truth…After harvesting, Farmers would sell their grains to the mills in the area where the grains goes through process of milling. Flour Mills crush, grind or pound whole grains into smaller, powdery pieces that are called flour. There are many different types of mills. Mills are powered by wind (windmill) or water (watermill). Today they are usually powered by electricity and instead of stone it uses steel rollers. For my project I have demonstrated how a stone flour mill works and the benefits of flour made by stone crushing.

Methods/Materials:

- Cardboard
- 2 Ball bearings
- Pipe
- 2 Grinding Wheels
- Electric motor
- Rice puffs

A Stone Mill uses Millstones which are stones used for grinding wheat or other grains. Millstones come in pairs. The base or bedstone is stationary. Above the bedstone is the turning *runner stone* which actually does the grinding. A runner stone is generally slightly concave, while the bedstone is slightly convex. The runner stone spins above the stationary bedstone creating the "scissoring" or grinding action of the stones. The grain hits the bedstone and fans out, the rotation of the runner stone forcing the grain outward, between the small gap in the stones to the outer edges of the stones where it can be gathered up.





Process of Milling on Large Scale: The grain goes into the hopper where it falls into the shoe (a wooden trough). Grain drops from the shoe into a hole in the runner stone and spreads out over the bedstone. The grain is ground into flour as it moves outward until it reaches the edge of the stones. The movement of the stones crushes the entire grain, which gives the flour a nutty flavor and retains all the vitamins, enzymes, amino acids and fiber contained in the grain. The friction between the stones heats the flour up gradually preventing the loss of the enzymes and the vitamins in the flour without compromising the baking quality. The freshly ground flour is then will be taken it to the next stage of the process. The grain is ground once and then sifted to remove large parts of leftover grain. These pieces can be milled once again to even out the size of the flour.

Results: A stone mill grinds a variety of grains using stones instead of steel rollers. Because the millstones grind at a slow speed and cool temperature, the inherent nutrients and flavor of grains are preserved, a production "secret" that allows us to seal in the freshness and bring you wholesome, quality foods, just as nature intended.

Conclusions/Discussions: Stone-ground flours are thought to be more nutritionally sound because they contain the germ and bran. Incidentally, these are the parts that hold a lot of flavor and vitamins, enzymes, amino acids and fiber contained in the grain. Because of the volatile fats in the germ and bran, stone-ground flours spoil more quickly; it's best to use them within three to six months of their milling. Some mills will even stamp or write the milling date right on the bag.

Today most of the mills are Roller-Mill to facilitate production on large scale but the flour made through this process lacks the proteins, fat, vitamins, and mineral constituents present in the original grain, providing only an emasculated substitute which is not merely inefficient, but also directly harmful.

Summary: Stone milling was the only way to make grain into flour for millennia. Flour made through the stone mill gives the flour a nutty flavor and retains all the vitamins, enzymes, amino acids and fiber contained in the grain and because the stones heat up the flour gradually it prevents the loss of the enzymes and the vitamins in the flour without compromising the nutritional quality.

Team: Solar Kids (307)
Title: Solar City
Participants: Nethra Gujja and Joanne Rajasekhar

Objectives/Goals: Using solar power to generate electricity.

Summary: Solar power systems derive clean, pure energy from the Sun. Installing solar panels on your home helps combat greenhouse gas emissions and reduces our collective dependence on fossil fuel. A house generally needs about 16 panels to completely cover electrical power needs. If you are looking to heat water for the average family of four, two solar thermal panels would be needed. Sun power is also considered to be one of the best solar panel manufacturers, with module efficienciences close to 23%. In almost all cases, the best solar panels are made with premium monocrystalline solar cells.
The pros and cons of Solar Energy are listed below:
Pros:

1) Renewable Energy Source
2) Reduces Electricity Bills
3) Diverse Applications
4) Low Maintenance costs
5) Technology Development

Cons:

- Weather Dependent
- Solar Energy Storage is Expensive
- Uses a lot of space

The average homeowner will pay around $20,000 for solar panel installation for the common size needed to power an average 1500 sq ft home. Residential solar panels are usually sized at 3KW to 8KW and can cost between $18,000 and $40,000.

The average cost of solar panel installation is $17,000 in the U.S., through tax breaks and other discounts can make it as low as $5,000 in some states. The savings you earn by going solar can take anywhere from seven to 20 yrs to cover the initial cost.
There are three types of Solar panels

- Monocrystalline
- Polycrystalline
- Thin-film

Crystalline panels are usually guaranteed for 20-25 yrs, while film panels are generally guaranteed for only 2-5 yrs. The regular warranty for photovoltaic solar panels lasts 25 yrs.

Team: SAS (Serious About Science) (308)
Title: Water Filtration System
Participants: Mahati Vemula and Saanvi Singh

Objectives/Goals: Cost efficient Water Filter system.

Materials:

- 1 Large soda bottle
- Activated charcoal
- Sand
- Gravel
- Scissors or knife
- Cotton or tissue
- Clear Glass Cup to Collect Clean Water
- Impure water
- TSD Purity Meter

Methods: Take one large bottle and cut the top portion and flip it upside down. At the opening of the bottle place cotton/tissue. We will start layering the filtration system- by adding the Activated charcoal, sand, fine gravel and lastly we use the pebbles. Add in your unclean water, observe that the unclean water turns into clean water, thus filtering all the impurities. To check the Purity of the water we can also use the TDS meter.

Results: By doing this experiment we were able to make our own clean water. This is very helpful for people who are in rural areas, since it is very cost effective, simple and easy.

Summary: We can get clean filtered water from the unclean water using cost effective filtration system.

Conclusions/Discussions: Our Goal was to make a water filter system.

Team: Moonlings (309)
Title: Phases of Moon
Participants: Sai Vishnu Harihara, Sritanvi Aitha and Nischal Polanki

Objectives/Goals: This study is about how much the moon appears to us on the earth to be lit up by the sun, except during an eclipse.

Methods/Material: Card-board, styro foam ball, acrylic paint are used to make the model. There are 8 phases of moon. The model explains about waxing and waning of moon. Lunar eclipse occurs when the earth's shadow blocks the sun.
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Results and Conclusions: You will get to understand about the moon and its phases. From Earth, we always see one side of the moon; the other side is always hidden. The moon is the only extraterrestrial body that has ever been visited by humans.

Summary: Lunar calendar is based on the orbit of the moon. Lunar month (29.53 days) is slightly shorter than an average standard month (30.44 days). If you only had 12 lunar months then you would end up around 12 days shorter of a year, hence very few modern societies use lunar calendar or month.

Team: Slime Detectives (310)
Title: Slime Solvers: The case of "What make slime the fluffiest?"
Participants: Nishka Ramidi and Diya Sanghvi

Objectives/Goals: Our project looked at which ingredients makes the fluffiest slime.

Methods/Materials: We made 3 slimes using water, glue and different activators. We looked at which ingredients were easy to make slime with. After we made the 3 different slimes we added

shaving cream to see which made the fluffiest slime.

- For Slime #1 (SS/BS) we mixed: Glue, water; saline solution and baking soda.
- For Slime #2 (borax) we mixed: Glue, water; borax.
- For Slime #3 (LS) we mixed: Glue, water; liquid starch

We asked ourselves some questions to solve the case:

1. Which slime was the easiest to make?
2. Which slime was the best starting base for the shaving cream to make fluffy slime?

Results: We thought the Slime #1 made the fluffiest slime.

Conclusions/Discussions: We thought that Slime #1 (SS/BS) and Slime #3 (LS) were the easiest to make. Slime #2 (borax) was very hard because even a little too much of the activator messed up the slime a lot. We then thought about which slime was a good starting point when we added the shaving cream to make fluffiest slime. Slime #1 (SS/BS) was already very soft. Slime #2 (borax) was stiff and felt like rubber. It broke easily. Slime #3 (LS) was soft and stretchy. We found that adding shaving cream to Slime #1 (SS/BS) made the fluffiest slime. It felt and looked fluffy, like a cloud of air. Slime #2 (borax) felt like a pizza. It was very stiff so when we added the shaving cream the slime did not become fluffy. Slime # 3 (LS) became more fluffy but we did not think it was the fluffiest because it felt to have less air bubbles so it did not feel as fluffy as Slime #1 (SS/BS).

Team: Team 2D (311)
Title: Holography (3D Images)
Participants: Anagha Meda and Poorna Thoguluva

Objectives/Goals: Isn't it wonderful to see 3D images pop up in movies??!! These are nothing but holograms which are formed by interference of light beams. Holography is the science and practice of making holograms. Our objective is to create a hologram.

Results: We will be creating a 3D image structure which is a hologram.

Conclusions/Discussions: Holograms are used in many ways, such as movies, concerts, military mapping for battle spaces, information storage - saving of images or data, identifying fraud, medical so we can visualize patient data to train students and creating illusions.

Summary: Building a model to create a hologram showed us how this technology gets used in the real world

Team: Pollution Patrol (313)
Title: Solar Powered Carbon dioxide (CO2) Scrubber
Participants: Jay Pindipol, Tarun Yamarthy, Charan Ganta and Vishwa Swamy

Objectives/Goals: Find the best and inexpensive way to bring down the CO_2 atmosphere level.

Methods/Materials: CO_2 scrubber can be easily built by modifying Solar water heater.

Inlet - By exploiting the passive heat exchange based on the thermosiphon principle,we let ambient air rise up the sloped glass case and bubble into a water container.

Absorption - Next, by exploiting the varied solubility of gases, we separate carbon dioxide from the rest of the gases that constitute air. At 40^0C and normal pressure conditions, about 600 ml CO_2 can dissolve in 1L of water while the solubility of nitrogen and oxygen is mere 10 ml/20 ml respectively. So when air is bubbled into water, CO_2 will dissolve while the rest of the air bubbles out.

Outlet - The CO_2 rich water then trickles back down the sloped glass tubes where it is heated by the sun and rises up again. In this heating process, the solubility of CO_2 drops drastically and the gas bubbles out. At this point it can be tapped and used.

Results: This solar-powered appliance can be installed anywhere, preferably in locations with high CO_2 levels such as traffic congested areas or industrial areas.

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Conclusions/Discussions: Cleaning up the atmosphere through CO_2 scrubbing needs considerable improvement but has a promising future.This infamous harmful gas has its positive side and can be recycled/used in chemical processes. E.g. Greenhouses, Pharmaceutical, household items like making soda water or in fire extinguishers.CO_2- scrubbing could easiest ways to reduce emissions without any lifestyle changes.

Summary: Global warming is already affecting us & environment in a negative way due to the increased gas emissions mainly CO_2. Scrubber aims in dramatically reducing this issue.

Team: Science Girls (314)
Title: Marble Roller Coaster
Participants: Mahek Sharma and Sahasra Cheruku

Objectives/Goals: We can investigate the conversion of potential energy to kinetic energy with this project. We'll use foam pipe insulation to make a roller coaster track. For the roller coaster itself, We'll use marbles. There are as many possible variations to this project as there are twists and turns on a great roller coaster ride, but a good place to start is to see how much initial height we need in order to have marble successfully navigate a loop in the track.

Methods/Materials: At least two 6 foot (183 cm) sections of 1-1/2 in (about 4 cm) diameter foam pipe insulation, glass marbles, utility knife, masking tape, tape measure, bookshelf, table, or other support for roller coaster starting point

Results: We will be building a roller coaster track for marbles using foam pipe insulation and masking tape, and see how much of an initial drop is required to get the marble to "loop the loop".

Summary: Learn about how stored energy (potential energy) is converted into the energy of motion (kinetic energy).

Team: The W-Right Friends (315)
Title: Aerodynamic Fuel Efficiency and Stability in Vehicles
Participants: Akshay Jagannathan, Dhruhith Vanga and Yash Patel

Objectives/Goals: The objective of our research is to understand and educate how a car designed with good aerodynamics will help increase the fuel efficiency and how accessories like spoilers or the dams help increase the safety of vehicles.

Summary: ***Aerodynamics principles and impact on cars:*** Aerodynamics is the way air moves around objects. As an object moves through the atmosphere, it displaces the air that surrounds it. Every object is subjected to gravity, drag and lift forces. Drag is generated when a solid object moves through air or water. Drag increases with velocity. Perfectly aerodynamic shapes also create lift in objects. Lift force can cause lifting of car's wheels and make it unstable at high speeds. These two forces – drag and lift – need to be kept under check and understanding of two important air properties is vital in controlling these forces

- Air moves from high pressure area to low pressure area
- Bernoulli's principle: The principle in hydrodynamics that an increase in the velocity of stream of fluid results in decrease in pressure. This applies to air too.

Drag and how it affects fuel efficiency: The aerodynamic drag coefficient is a measure of resistance to a car's movement through air. A low drag coefficient implies that the shape of the vehicle's body will enable it to move easily through the surrounding air and less fuel is burnt to achieve high speeds. Car companies use wind tunnels to calculate drag coefficient for the cars and publish them as part of the car specifications. Cars/SUVs/Trucks with different drag coefficients and associated fuel efficiency (Miles Per Gallon) have been compared to understand how better drag coefficients improve fuel efficiency. Reducing the drag coefficient of car by just 0.01 can result in a 0.2 Mile per gallon.

Controlling lift to improve safety: During this research it was found that many high-performance cars have parts that move air smoothly across the underside of the car. They include spoilers to keep the air from lifting the car's wheels making it stable at high speeds.

Conclusions/Discussions: Cars with better aerodynamic design improve fuel efficiency. Accessories such as Spoilers improve stability of vehicles at higher speeds and should be mandatory on vehicles operating at high speeds.

Team: Instinctive Thinkers (316)
Title: I Wet My Plants
Participants: Ojas Shrivastava and Pranav Naveen

Summary: We expect for the plant with water come out the best. We think that all the liquids will help the plant at first, but most will not grow completely. This is because there might be chemicals that are not good for the plant. Plants need water and minerals to grow. After germination, plants make leaves, stems, and roots. Plants make food from the sun and the leaves absorb minerals from soil and water. Plants will either not grow properly or die if they don't get minerals or food. In our science project, we are trying to find out the growth of our kidney bean plants with different liquids; water, milk, orange juice, lemon juice, oil, vinegar, and Gatorade.

Methods/Materials: Pots, Soil, Kidney Beans Seeds, Different liquids to experiment

Results: Plants always grow best with water.

Team: Young Saviors (317)
Title: Water Sheros
Participants: Avani Gupta and Saanvi Aluri

Objectives/Goals: The study aimed to water and help save the planet.

Methods/Materials: We collect the shower water and tap water into the main storage tank of the house. We will kill the bacteria in the used shower water and tap water by putting chlorine tablets. Once that water enters the toilets storage tank, a net will be used just below the toilet's storage tank's lid. This will allow the recycled water to pass-through without any items like hair. That leaves us with freshwater rising up when we flush. It will require some plumbing changes in the house.

Results: We can now save up to 1.5 gallons of water per flush. That's almost 3,000 gallons of water saved per year! And only for one person! Per year, we can save up to $300 on our water bills.

Conclusions/Discussions: This project might not be the coolest, but it is definitely one of the most effective. Water is a very valuable resource that we take for granted. In other countries, they have a very limited amount of water left. If we don't act now, our water resources *will* come to an end. Which also means the end of the human race and all living things that *actually help our planet* for that matter. Another big thing that this project can do is help prevent global warming.

Summary: The big idea is to save water and in return, save the planet.

Team: Kinetic Duo 318)
Title: How to Produce Free Electricity Through a Windmill With Magnets
Participants: Rishab Patel and Joel Jerald

Objectives/Goals: This project shows how to produce electricity through a windmill operated by magnets instead of wind. Windmills are helpful to the environment in real life since they're powered by wind, a clean energy source. The windmill with magnets will also be helpful because it relies on the pull of the magnets.
Problem Statement: How to operate the windmill without wind?

Materials:
- 1 Bottle cap
- 4 popsicle sticks
- Sharpie marker
- Hot glue gun
- 1 Big Magnet
- 8 Magnets
- 1 DC Motor

- DC Holder
- 3 Red wires
- 1 Black wire
- 1 Small lightbulb
- Cardboard
- Parchment Paper
- Wooden stick
- Squared wood

Methods: 1. Take 4 popsicle sticks and cut each popsicle stick in half.
2. Hot glue the 8 popsicle stick pieces evenly on the border of the bottle cap.
3. Attach the DC holder to the bottle cap.
4. Glue the 8 small magnets on the ends of the popsicle sticks.
5. Glue the wooden stick on the squared wood.
6. Glue the DC Motor on the top of the wooden stand.
7. Connect the DC Motor and the DC Motor Holder, using glue.
8. Attach the wires of the small lightbulb and the DC Motor.
9. When you place the big magnet underneath the fan, and give it a little spin, it will spin continuously and violà!

Results: The opposite direction of magnets attract each other and that makes the fan to spin quickly. The DC Motor converts this kinetic energy into electricity, which lights up the lightbulb.

Conclusions/Discussions: There are many ways to produce electricity, but our invention is producing electricity through windmill, using magnets to spin the windmill quickly instead of wind..

Team: Googols (319)
Title: Radiation in our Lives
Participants: Rachit Koltur, Amogh Yadav and Hassan Ahmad

Objectives/Goals: This study is aimed at understanding the harmful effects of EMF radiation on the human body via some observations and coming up with ideas to minimize or prevent human exposure to EMF radiations.

Methods/Materials: Steel wool, Cellphone, Sprouts, Microwave

1. EMF radiation at its peak is proved when cellphone surrounded by Steel wool, wool burns once exposed to the radiation, proving that our brain is constantly subjected to these radiations.
2. Sprouts exposed to the EMF radiation from the microwave. When planted, these don't grow whereas the healthy bean, grows.

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:
1.The experiments made us realize the strength of these EMF radiations. There are NOT enough studies to directly link EMF radiations to diseases but ENOUGH to start us get concerned. Irritability, leukemia in children, glioma in adults (usually found on the same side used by the person to speak into the phone).

2.Analyzing the market for a gap in products, looking at the EMF quiet zones being created around the world (e.g. in Austria & Sweden) that formally recognize EMF as harmful gave us ideas.

a. Idea #1: EMF zone at Home. Paint the house with EMF proof paints, set up EMF Zone Ex: easy access to attic with a mechanism to drop devices into a dropdown case that automatically wires them. Devices can be used via a wired huge screen that mirrors the device screens.
b. Idea #2: Sew EMF shield fabric into our daily wear so the body is protected from the EMF radiations.

Summary: This project aims at bringing EMF awareness into our lives and come up with ideas to minimize human exposure to these radiations.

Team: Couple of Polymers (320)
Title: Casein Plastic
Participants: Kanishkha Duna, and Adithi Suresh

Objectives/Goals: Milk is not just for drinking and making cheese anymore. There are lots of other ways where milk can be used to minimize and replace the use of plastic and other similar polymers. In this project we explain the ways of making and using the milk casein as plastic and glue.

Methods/Materials: The casein lumps can be separated out of milk by following the below step-by-step procedure.
Step 1: Pour a cup of milk in a pan and heat it close to the temperature bearable to touch. Do not boil the milk.
Step 2: Transfer the milk in a container and mix with it about 4 teaspoons of vinegar.
Step 3: The casein would separate as curds while stirring. When the lumps are formed and the milk turns in to yellowish liquid, strain it.
Step 4: Press and remove the excess liquid and pat it dry with paper towels. The result will be a blob of milk plastic.
Step 5: Mold it in to desired shape and let it dry.

To make glue, repeat until step 3.

Results Learning how to make biodegradable plastic from milk. We can also experiment with the amount of casein available from diff types of milk, like whole milk and skimmed milk.

Conclusions/Discussions: Some plastics are suspected of leaching harmful compounds in to food. But this protein-based film is good to prevent the food from spoilage and also offer additive nutritional value. With the addition of formaldehyde, casein becomes an insoluble compound finding its use in many industries. It is an effective way to reduce the amount of future plastic landfills and it is also sustainable.

Team: The Science Gems (321)
Title: What Type of Gases are in Mines, and What Can They Do to Miners and the Environment? How Can WE Help?

Participants: Lasya Sandilya Bejugama and Ashna Mathur Kalawadia

Objectives/Goals: Think of all the gases that could be so deep inside the ground, imagine what it's like for miners and the environment. We want to help.

Materials/Tools: The way we went about this project was by asking questions and finding an answer by researching about the question. For example, "What gases can be released into the air in mines?" and we read articles about it. As we read, we came up with more questions and that led to the question of, "How can we help with this problem?" What we decided to do, was find the gases that are being released, and find how they hurt the human body and the environment. For this, we read articles on National Institutes of Health, Wikipedia, and Jewelry Wise.

Results: We found that the gases being released are, Carbon monoxide, Hydrogen Sulfide, Carbon Dioxide, Nitrogen, Oxygen, Oxides of Nitrogen, Sulfur Dioxide, Hydrogen Sulfide, Hydrogen and Methane. If inhaled, it goes down the nose and into the bloodstream which carries it to the rest of the body, including the cardiovascular system. Some of these gases are not very kind to the heart mainly Methane and Carbon Monoxide, if you're around these gases for too long in poorly ventilated areas, you can die. These gases also deplete the ozone layer, causing global warming.

Conclusions/Discussions: Mines can be dangerous for miners and the earth. We can help the earth and the miners by not having mines and just using laboratories for your precious gems! Laboratory gems are real because they physically and chemically are the same as mined gems.

> "If you do not express your own original ideas, if you do not listen to your own being, you will have betrayed yourself."
>
> - Rollo May

Middle School Projects

Team: Fabulous Five (601)
Title: Hydraulic Arm
Participants: Yashvi Patel, Sunidhi Mitikiri, Eva Patel, Alugameenaa Ram and Schyata Sharma

Objectives/Goals: This study attempts to determine how scientists can use a hydraulic-bridge pattern to make an arm that can lift things.

Methods/Materials:
(Specific Directions for arm not included)
You will need:

- Glue
- Syringe and Tubing Kits
- Cardboard
- 4" cable ties
- Toothpicks
- Old battery
- Drill or knife

First, we built the arm. Start building the structure with the cardboard, craft sticks, toothpicks and a hot glue gun. Make sure to make a base, the cardboard sections of the arm and the syringe connections. Next, we have to make our hydraulic arm syringes. Fill four syringes with colored water and attach the tubing to the nozzles set between the cardboard. Place another syringe on the opposite end of the tubing. Now, once you pull and release all the syringes, the water will flow through the tubing to the other syringes, leveraging or moving the part of the arm it connects to in the process. Complete the grabbing mechanism of the arm in any design you like.

Results: With the 4 syringes of colored water, we were able to control each part of the hydraulic arm.

Conclusions/Discussions: When you push the plunger one of the syringes, the water is pushed underneath the pressure and it's forced to move through the tubing and fill the other syringe. This is defined as hydraulics. When you push one of the syringes, that part of the arm moves. Using multiple syringes, we can control the movement of all parts of the arm. Hydraulic bridges and arms are very useful in the real-world because they can lift and move extremely heavy objects.

Team: Team Solar (602)
Title: Solar Powered Car
Participants: Kevin Benedict, Samarth Sharma and Karthik Parambath

Objectives/Goals: This study is aimed to build a solar powered car that will completely replace unclean forms of energy like oil and gasoline with solar energy, thereby finding a solution to reduce air pollution which is one of the causes for global warming..

Methods/Materials: The materials needed to build a solar powered car are

- Solar panel
- D.C motor
- Rubber bands
- Lego Rim
- Electric switch
- For the body- Cardboard
- For the Wheels- plastic bottle caps
- For the axles-metal rods
- Plastic straws to mount the axles.

Our project is to build a solar powered car using cardboard for the car body because it is lightweight meaning less power is needed to move the car and because it has enough weight, not to be blown away by the wind. Next we will use popsicle sticks for the base and connect them using hot glue and straws. Then we will use wooden skewers and insert them into the straws. After that, we will insert a lego car wheel ram into one of the skewers and put a thin hair tie around it. Then, insert four bottle caps, 1 on each side for each skewer. Then hot glue a mini D.C motor onto the base and tie the hair tie around one side of the motor. Next, get another bottle cap and hot glue it onto the popsicle sticks. Then, attach a ball and socket lego piece facing upwards onto the bottle caps. Connect a solar panel to the ball and socket lego pieces and place and glue an electrical switch to one side of the popsicle sticks. Then connect the wires from the solar panel to the switch which will activate the car to move. Finally glue the cardboard around the car forming the car walls, but allow the solar panel to be above the cardboard so the solar panels can gain sunlight to

make the car move. And also we are going to make an attempt to store the solar energy to dead batteries to see if the batteries are getting charged in the presence of sunlight, and then this potential energy can be used as a backup and keeps the car moving, at night and during a cloudy or rainy day. Results: The solar powered car was able to run on solar power because the solar energy helped to drive the motor and the car moved.

Conclusions/Discussions: In summation, this Solar Powered car is an efficient, and easy way to reduce air pollution. By using simple materials, such as,a solar panel, a D.C. motor, a rubber band, a lego rim, an electric switch, cardboard, rubber lego treads,metal rods, and plastic straws, you can make a solar-powered car is an environmentally friendly option for transportation.

Team: Soil Scientists (603)
Title: Soil: The Earth's Fragile Skin. How can we protect it from eroding?
Participants: Anirudh Ramakrishnan and Vinuta Ramakrishnan

Objectives/Goals: Soil Erosion is a huge problem for the health of our Earth. Just like how we take care of our body and health, we wanted to do this experiment to help take care of our Earth. The goal of this project is to find the best way to prevent soil erosion from using sheet moss, burlap logs, and mulch.

Methods/Materials: For this project, we used 4 Empty Milk Jugs, Garden/Yard Soil, Mulch, Burlap Logs, Sheet Moss, and Cups of Water.

1. We cut off the handle part of the bottle.
2. We added soil and any other variables that needed to be added to the soil.
3. We added water and collected the runoff.

Results: In order to find the true solution of how to prevent soil erosion, we drained out the water from the different jugs and put it into a cup. After 30-45 min, all of the particles of soil settled down at the bottom, giving us a clear understanding and visual of the different variables/results. After conducting the experiment and observing the different test results, we found that using burlap logs was the best way to prevent soil erosion.
Conclusions/Discussions: We were able to come to a conclusion based on the amount of particles that remained at the top of the water in the cup. We also used the color of the water to determine the amount of erosion. We inferred that the mulch would be the best method of prevention, but our hypothesis was incorrect. This experiment showed us that a simple solution involving burlap was actually the best way to prevent soil erosion.

Summary: This experiment determined what the best method was to prevent soil erosion, which was using burlap logs.

Team: The Survivors (604)
Title: Car Nanny
Participants: Nimmat Sukhija, Tisha Subhedar, Mohit Pradhan, Krish Tiwari and Atharv Rege.

Background: The combustion engine of a car is one of the biggest contributors of air pollution, due to the steadily increasing worldwide car population. The combustion of fuel and air in the car engine releases hydrocarbons, carbon dioxide, carbon monoxide and nitrogen oxide into the atmosphere. In human beings, carbon monoxide affects the ability of blood cells to carry oxygen. This is because carbon monoxide is attracted to the hemoglobin in our blood and prevents it from supplying oxygen to the cells. When the carbon monoxide levels in the bloodstream becomes too high, symptoms of nausea, dizziness, flu and headaches start to appear. Higher levels of carbon monoxide can cause brain damage and death. High Levels of Carbon Monoxide left unattended in a parked car has led to an increasing number of fatalities particularly amongst infants and pets. The level of awareness on this issue amongst the general populace, even in developed nations, remains abysmally low.

Children dying from heatstroke in cars, either because they were left or became trapped, have reached a record number. In 2018, 53 children lost their lives — the most in more than 20 years. This year, there have been 52 deaths, according to Jan Null, who tracks the incidents through NoHeatstroke.org.

More than half of vehicular heatstroke cases from 1998 to 2018 were because an adult forgot about a child, Null found. Among the trends he discovered in these incidents:
- About 44% of the time, the caregiver meant to drop the child off at daycare or preschool.
- The end of the workweek — Thursdays and Fridays — saw the highest number of deaths.
You may be asking yourself: How does this happen? Families who lost a loved one thought the same thing at one point, but then the tragedy happened to them. Let this be your reminder to keep alert, avoid distractions, and put safeguards in place so your child is never left in the backseat.

Methods/Materials: The team intends scoping out a detector that can be placed in any automobile and senses 3 things: Heat, Motion and Levels of Carbon Monoxide. A non-running engine parked in temperatures exceeding 80 degrees Fahrenheit can spike the interior temperature of any car, while simultaneously increasing the carbon monoxide levels. The natural reaction of any infant or pet in the automobile would be of generating motion if such a circumstance occurs. The detector would capture any motion inside a vehicle while also monitoring heat/CO levels. Any abnormal reading would be sent as a message to a preset number stored by the owner. The materials used are as follows:

1 Arduino Uno
1 Multi-meter (DMM)
1 breadboard with various jumper wires
1 Motion sensor
1 Temperature sensor

Results: The detector will be a lifesaver to a majority of unintended events that happen w.r.t. stationary automobile accidents. The team is also in the process of conducting surveys in their local neighborhood trying to gauge the receptiveness of its proposal and the "extent" of the issue at hand.

Conclusions/Discussions: These sensors can easily save lives, since a majority of the cars are not equipped with sensors

Team: Climate Scientists (605)
Title: Changing Climate
Participants: Shloak Menon and Devin Sanghvi

Objectives/Goals: We are analyzing different Climate Change patterns, demonstrating the effect of climate change, and different methods of reversing the effect of Climate Change.

Methods/Materials: We will be using a simulation as that is the best way to demonstrate our effect on the environment and theories on which climates might be easier to reverse the damage on than others. We will be using a Unity C#-coded simulation to show it in the most realistic way possible. We also researched the climate patterns of each continent separately to make sure we had individual results

Results:
Asia - The mean temperature has risen 11°C (51.8°F) since the Industrial Revolution
Africa - The mean temperature has risen 0.5°C (32.9°F) for the last 50-100 years
Europe - The mean temperature has risen 1°C (33.8°F) for the last 100 years
North America - The mean temperature has risen 18.4°F (-7.56°C) for the last 100 years
South America - The mean temperature has risen 1°C (33.8°F) for the last 50-100 years
Australia - The mean temperature has risen 1°C (33.8°F) for the last 120 years
Antarctica - The mean temperature has risen 3°C (37.4°F) for the last 20-30 years

Conclusions/Discussions: Based on extended research, we can conclude that no 2 countries have the same exact effects from climate change, but all of them have been hit in one way or another. There are no ways to fully reverse climate change, but there are ways to prevent future climate change. Change to energy efficient light bulbs in areas with electricity. Make your commutes green by walking or taking a bike. If in areas where people wash clothes by hand wash clothes with warm water or cold water not steaming hot water. Use energy wisely. Use renewables.

Summary: This project deals with the effects and possible solutions of the everyday issue of climate change

Team: The Keen Scientists (606)
Title: The Physics of Car Crashes 101
Participants: Prahas Ramidi, Aanya Muniyappa and Anusha Vakkalagadda

Hypothesis: Cars that are heavy, big, and have long fronts and backs are safer cars.

Objectives/Goals: Our objective for our experiments are to test a model car in a car crash. By learning about the physics of car crashes, we will determine which cars in the market are the safest models and brands to buy. We will also determine which certain requirements in a car add to its safety.

Methods/Materials: We will be using a model car, a dummy which shows if it survived the car crash or not, a hard object which the car will be crashing into and a wide piece of wood for the incline. We will add different safety features as variables to our car and test it in a car crash to see if the dummy survives or not. Lastly, we will record this safety feature for cars in the market.

Conclusions/Discussions: The conclusions for our project will be presented at the science symposium. We will review the results from our experiment, we will discuss the safest brands and cars currently in the market and present the requirements of a safe car.

Team: AJ Squared (607)
Title: The Mysteries of a Water Powered Car
Participants: Amruta Jayaganesh and Adwita Jagannathan

Objectives/Goals: The goals of this study are to find out how a salt water powered car works and the global impacts and benefits of using a salt water powered car.

Methods/Materials: We found out that a salt water fuel cell uses an anode and a cathode. The anode we use is copper. The cathode is zinc. Salt water gives the energy. To convert chemical energy into mechanical energy, we used a motor. This motor was attached to wires attached to magnesium and zinc which are in the salt water. A gear is attached to wheels making the car work. It works because the salt water slowly dissolves the copper creating hydrogen ions. This is what creates the electricity.

Results: Through our research, we found out what the long term results and benefits were of using a salt water powered car. Our gasoline comes from fossil fuels. It is not renewable. The burning of fossil fuels is a reason for climate change. Water is renewable. Our car is also environmentally friendly

Conclusions/Discussions: Based on research, we found out that you can use copper in place of the magnesium. They conduct electricity, they are metals, and they are cations. Their similarities make the salt water remove electrons from them, which make hydrogen ions. We think these elements can be interchangeable while using salt water to create electricity. Our experiments can include aluminum and magnesium.

Summary: The goal of this project was to determine how a salt water car works, the mechanisms used in it, and the benefits of using one. We found out that salt water powered cars use a fuel cell to work, and that the benefits are that it is renewable and environmentally-friendly.

"The most beautiful experience we can have is the mysterious. It is the fundamental emotion that stands at the cradle of true art and true science."

"There are two ways to live: you can live as if nothing is a miracle; you can live as if everything is a miracle."

"Why does this magnificent applied science, which saves work and makes life easier, bring us so little happiness? The simple answer runs: Because we have not yet learned to make sensible use of it."

- Albert Einstein

High School Projects

Team: **Touch the Stars (901)**
Title: Colonization of Inhabitable Planets
Participants: Ruijie Wang and Daljit Sing

Objective/Goals: In our ecosystem, global warming has caused various types of natural disasters. In 2019, the global temperature was 1.76 °F, which could cause the earth being destitute of essential resources for human survival. Therefore, this project is to prove the feasibility of interstellar colonization on Mars, with physics calculations, and chemical methods.

Methods/Materials: To begin the experiment, we put on our safety gear. Then we measure 250 mL of water and place it in the glass. Next, take two #2 pencils and cut both ends of them. These pencils will serve as cathode and anode in the water, which are attached to a battery with alligator clips. Also, we added baking soda to facilitate with current flow through the water between the batteries' ends. The reaction was observed for 2 min and repeated three-times to gain reliable results.

Results: There was a production of Hydrogen and Oxygen gas, confirmed by the glowing splint test.

Conclusions/Discussion: In order for the colonization of Mars, we require oxygen. In this experiment, we did electrolysis of water; however, on other plants, water is scarce. Therefore, we will need a substitute. One option could be carbon dioxide since it composes 95.32% of the Mars atmosphere. We pressurize CO_2 into liquid form in a closed system. Moreover, the station's solar panels can generate electricity and supply to the oxygen generators through the station's power grid. Water gets reclaimed by condensers that remove water vapor from the exhale water vapor. Finally, water can be recycled from the astronauts' urine by the ECLSS unit. The hydrogen gas made in the electrolysis process gets vented into space, and the oxygen gas is circulated into the cabin air

Team: The Noisemakers (902)
Title: The Impact of Sound Waves on Glass
Participants: Vedika Shah, Aruhi Vakkalagadda, Gabriella Seiden and Alyssa Mikita

Hypothesis: If you place a dense substance in a wine glass and attempt to break it using sound waves, then the frequency of the sound waves should be higher than the resonant frequency of the wine glass containing the substance.

Objectives/Goals: Usually, when people think about sound, they think about music and dancing. They do not think about the fact that sound could be a force of great destruction. This fact intrigued us, so we decided that we are going to test it on a smaller scale. We will attempt to break glass (empty, and filled with certain substances) using sound waves, to find out if it really is possible, and we will tie that into how protection from noise plays a big role in the health of our eardrums.

Methods/Materials: For our experiment we will use a wine glass and substances with different densities such as : Oil, Water, Yogurt, and Sand. We will also use a high frequency sound delivering device for the sound, and a lightweight object such as a straw to test the vibrations of the glass while the sound waves are being applied.

Conclusions/Discussions: We look forward to sharing our results derived from our collected data at this event.

Team: Simple Solutions (903)
Title: e-Counselor
Participants: Isha Shrivastava, Poojitha Kalasapati, Reina Fukahori, and Roshni Raghuraman

Problem Statement: Generally, for high schoolers, and even rising college students, it is a difficult task to figure out what colleges and majors are suitable for them, or what they want out of their major. High schoolers may not even know what activities to pursue in order to achieve their goals in a targeted field.

Objectives/Goals: We are striving to create a simple program which will clarify and organize their doubts.

Methods/Materials: Steps:
1. Collect data from college websites or current students
2. Create an application
3. Enter our information in a "quiz" format into our virtual assistant
4. Make our work available to the public
To do all this, we need:
-College knowledge and data collection
-A Laptop
- Internet Connection to access the service
-A phone or any electronic device
-Online platforms to create and run the application

Results: A SIMPLE SOLUTION - Effective, Working, and Interactive platform to help students in their future journeys

Conclusion/Discussions: We as a team feel like this is our small contribution to improving the lives of students. With a heavy workload and short periods of time to make important life decisions, students' become very pressured when it comes to college applications. Our e-Counselor will assist in making this task ten times easier.

Team: CPS (904)
Title: The Physics of a Roller Coaster
Participants: Prakash Nayak, Justin Chou and Sho Kagawa

Objectives/Goals: The objective is to find out what object will roll down the roller coaster the fastest and giving reasoning behind the results.

Methods/Materials: There is cardstock, in which the "tracks" and the supports for the rollercoaster can be made, as cardstock is a hard piece of paper and is sturdy. After we made the tracks and supports, we then rolled a "car" the tracks, and saw how the "car" goes down compared to the other "cars". With this in mind, the physics of the roller coaster will be seen and equations of physics will be used, to determine why what occured did occur.

Results: TBD

Conclusion/Discussions: The acceleration of the roller coaster would be dependent on gravity, as there is no applied force to move the "car". In addition, there would be friction because of the rough surfaces of the cardstock used for the tracks. The "car", will have a high amount of potential energy when it is at the highest point of the track and would have the most kinetic energy at the lowest point of the track. Also, when the object is going down the roller coaster, a low amount of air resistance is present because the sphere is evenly shaped with no flaps to prevent it from accelerating. Finally, when the roller coaster goes around a loop or swings on a tight turn, it would have centripetal force since there is a change in magnitude while accelerating.
Summary: A model of a roller coaster will be made using cardstock as tracks. 4 objects, each acting as a "car". The object will be noted on how it acts in each part of the roller coaster, so that one could determine physics of it. Physics equations will then be used to determine specifics relating to the roller coaster.

Team: Super Scientists (905)
Title: Thyroid Diagnostic System (TDS)
Participants: Abinaya Dinesh and Alisha Patel

Objectives/Goals: The purpose of this system is to expedite the process of detecting and analyzing thyroid.

Methods/Materials: TDS uses a user uploaded voice recording and picture of the throat to predict a person's probability for Thyroid Cancer. This machine learning algorithm is created on Microsoft Azure Machine Learning Studio. First, reliable data is collected. Next, our dataset gets cleaned and formatted for the system to be as accurate as data permits. Then, the data is split and utilizes a two-class boosted decision tree to find and correct any errors along the way. After that, the model gets trained to make the algorithm create an accurate probability. The final goal is a simple probability that helps people understand their bodies more clearly and take care of their health at earlier stages.

Results: As of now, the Thyroid Disease model has an accuracy rate of 83%. However, this is being constantly improved to a limited margin of error.

Conclusion/Discussions: Thyroid Cancer takes many months to develop to the can be made. This project proposes a predictive model that effectively diagnoses said illness in a few minutes with the use of voice recordings and images uploaded by the user. It will propose maximum accuracy using a dataset that consists of extrapolated data from patients and unaffected subjects. The results of experimental testing showed that a Boosted Decision Tree, which is an ensemble model made from gradient boosted regression trees, was the best model to use on the data, with higher accuracy scores than any others.

Summary: This project attempts to improve the diagnosis of Thyroid Disease using a voice recording and images of the throat.

NBT Science Symposium Supports STEAM Tank Challenge Teams

This year NBT Science Symposium Committee is supporting the teams participating in the STEAM Tank Challenge from our school district (High School and Middle School) by providing a venue to showcase their ideas in front of Scientific Advisory Panel. The Panel will provide constructive feedback to the teams and help them prepare for the Regional challenge ahead, leading to the Atlantic City Convention in October.

The STEAM Tank Challenge, created and sponsored by NJSBA and the U.S. Army, encourages New Jersey's public school students in the areas of STEAM – Science, Technology, Engineering, the Arts, and Math. It's an open ended design, challenge to maximize creativity.

The competition asks the district teams to invent something new, modify an existing product, or identify a situation or real-world problem that needs resolution. Teams are provided criteria and a panel of experts judge their designs and/or solutions.

STEAM Tank Scientific Advisory Panel

1. Jeannine Lanphear
2. Paul Mikita
3. Leo Whalen
4. Michael Lin
5. Todd Lanphear
6. Andrea LaMagra
7. Sanjay Sengar
8. Madhu Reddy
9. Paritha Patel

High School STEAM Tank Team Ideas

Team Members: Zach Hill, Sheev Shah and Frankie Garbolino
Team Name: AGE-O
Idea: AGE-O
Abstract: In this project we are attempting to create a safer way to reverse aging that would help keep cells within the body from turning into "zombie" cells. In other words, we are attempting to reverse aging or make it so that the human body can last for a longer amount of time. Whenever a chromosome copies itself, the edges tend to shorten down. To stop them from shortening, our bodies created telomeres that would be at the edge of these cells to allow the ends to not shorten as fast. Although, these telomeres are only effective for about fifty years of our lives. As we grow older, we tend to shorten down and these cells don't exactly die, but turn into senescent cell which basically disrupt all of the other cells. A good to stop the amount of telomeres from shortening is using a thing in our bodies known as telomerase which helps lengthen telomeres. Although telomerase isn't that abundant in our bodies, so a good way that we can get more is by inserting stem cells which help produce some telomerase which can help slow down the aging process more. Our project is a pill that has stem cells that can help produce more telomerase and slow down the process of senescent cells being created.

Team Members: Gabriella Seiden, Naachammi Ramu, Rhea Palliath and Tanaya Bhatt
Team Name: The STEM Cells
Idea: Trash Compactor
Abstract: Everyday, millions of people around the globe throw away tons of pounds of trash. This mindless action of throwing any object or food into its respective container can have a serious toll on our Earth. Just in the U.S. alone, there are over 3,000 active garbage landfills that continue to grow. As one could imagine, these landfills are starting to take up lots of space on our Earth causing it to become more polluted and a hazard for many of earth's creatures. This is what sparked the main idea for The Stem Cells' project. If there was only some way to compact the amount of trash humans throw away, than the landfills will be more compact, thus taking up less space. Our project features a small prototype, that can quickly compact everyday items that are thrown in the trash. The compactor would be placed inside garbage trucks. While the truck is driving, it would compact the trash into a cube to take up less space. This way, when it gets to a landfill, it will be smaller in size and easier to move. We look forward to sharing more about our project on the day of the presentations.

Team Members: Aliza Lopez, Hetvi Khatri, Sreenidhi Ravishankar and Gael Gonzalez-DeLaLuz
Team Name: The Photovoltaics
Idea: The Photovoltaics
Abstract: Numerous problems are presented with the function of solar panels in today's market. Commercially, the available solar panels expend only 10 to 20 percent of the sun's energy. Existing solar powered technology can usually take long periods of time to store enough usable energy, which may not be desirable for high rates of efficiency. The average cost of a silicon cell solar panels is about $2.92 per watt, causing the installation of the panels to be quite expensive if they are to be used in everyday life. We want to improve the efficiency and affordability of the solar panels, so that renewable energy is used more often than non-renewable energy. While there are alternative methods of producing solar panels, the materials used are overly expensive, making solar panels a poor investment. Older methods used are more bulky and take up unnecessary space because they do not work as efficiently as one would expect. Instead of using silicon as the material for the power cells, we propose an alternative material that is cheaper and more efficient.

Team Members: Prabhav Sharma and Justin Chou
Team Name: J&J Corporation
Idea: Backer-upper
Abstract: The "Backer-Upper" is a foam padded pad that has your back when lifting heavy weights on your back such as a backpack or a modern leaf blower. This pad is versatile for all ages and heights and is designed to push your back forward so that you can't slouch and ruin your posture. This product isn't meant to heal damage any damage done to one person back but to prevent any further damage that can be done by carrying heavy books for multiple periods of time.

Team Members: Miranda Byszynski and Divya Salgarkar
Team Name: Newview
Idea: Newview
Abstract: NewView Medical Transportation is the focus of our group- providing a fresh perspective on the idea of efficient transportation for medical services. Our goal is to create a car that can navigate intensely crowded areas and use unique means to reach people in need in record time. As of current, our means of doing this are extendable wheels and or supports to allow the car to move amongst other vehicles in an atypical manner. Feature would include a sturdy safety system and wheel, an LED display, aerodynamic body, and the ability to carry back a patient in a comfortable manner. A suspension system is another idea, to minimize the shock of braking for a vehicle moving at high speed. By being able to move faster and via unusual means the car can reach patients who may not survive outside of the allotted time frame without necessary medical care.

Middle School STEAM TANK Team Ideas

Team Members: Nisha Patel and Radhe Patel
Grade: 7
Idea: Backpack Jacket Combo
Short Description: The Backpack Jacket Combo is a convenient tool for students of all ages. It doesn't matter if it's for lite spring weather or a heavy winter. The jacket is designed for all weather needs. Are you no longer a student? But you travel? The backpack jacket combo is perfect for traveling.

Team Members: Samantha Guadagnino and Rose Rykus
Grade: 7
Idea: Zipper Zipper
Short Description: Zuper Zipper is a device that prevents broken zippers and the ruin of an item that is otherwise usable.

Team Members: Patrick Branz, Jonathan Branz, Brian Lin and Vaibhav Chari
Grade: 6
Idea: More Than Clean Toothbrush
Short Description: A toothbrush that does more, it is an App to encourage kids to brush their teeth and monitor progress.

Team Members: Haasini Tatti and Amruta Jayaganesh
Grade: 7
Idea: Anti-Pick Pocket
Short Description: A device that detects an attempted theft on a person.

Team Members: Stephanie Tom, Catie Donahue and Inna Chernyavsky
Grade: 7
Idea: Silky Smooth Brush
Short Description: A perfect brush for all hair types!

Team Members: Anusha Vakkalagadda, Laila Turchi and Vinuta Ramakrishnan
Grade: 6
Idea: Suction Hanger
Short Description: Stop unwanted wrinkles in your clothes and prevent clothes from falling off their hangers

Team Members: Ashanti Burrel, Ummi Hashim, Beyonca Hutcher and Khadija Moro
Grade: 6
Idea: Animal Tracker
Short Description: A device and app that allows you to know where your pets are at all times

Team Members: Pavan Patel, Dean Kamel, Scott Cohen, Joshua Goldenfarb and Colin McNulty
Grade: 7
Idea: Magnolaces
Short Description: Never fall from untied laces again but do not let style suffer!

Judges At A Glance

Jenna Ballard

Jenna 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 seven 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.

Dr. Randy C Dockens

Randy C Dockens, PhD, became the Clinical Operations Lead regarding Phase 1 studies within Innovative Medicines Department, Bristol-Myers Squibb (BMS). Prior to that, he was Group Director for Clinical Pharmacology Scientific Operations (CPSO) within Early Clinical & Translational Research, BMS. He led three groups within CPSO: Clinical Pharmacology Analysis and Reporting (CPAR) which handles the non-compartmental pharmacokinetic (PK) analyses for early and late phase studies conducted by BMS, Clinical Pharmacology Operations (CPO) which is a group of Study Directors that guide the development and reporting of clinical pharmacology studies that are outsourced to vendors, and Data Sciences (DS) composed of several data scientists and programmers who prepare datasets for PK and pharmacometric analyses and data visualizations for translational research and development (TR&D) teams. He received his B.S. in Pharmacy and Ph.D. in Pharmaceutics from Auburn University, AL. Before joining BMS, he worked as a PK Reviewer with the Food and Drug Administration (FDA) for 4 years and joined BMS in 1991.

In addition, Randy has a creative side. He earned a doctorate in Biblical studies from Louisiana Baptist University in 2014 and has recently combined this interest with his scientific background into a futuristic fictional literary series called The Coded Message Trilogy with books entitled T-H-B, F-S-H-S, and T-U-L-E. An astrophysicist, working on a Mars mission, stumbles upon a world secret that plunges him and his friends into a covert adventure of mystery and intrigue. Randy uses science in his writing to add a feel of authenticity to the storyline but still makes the story fun to read. One can learn and be entertained at the same time. He is currently in the process of writing another futuristic series: Stele Prophecy Pentalogy.

Dr. Giridhar Tirucherai

Dr. Giridhar Tirucherai 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, he joined Quintiles Kansas City, a global contract research organization, 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. Dr. Tirucherai 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. Dr. Tirucherai is widely published and is a recognized expert in the area of cardiovascular safety evaluation in clinical research. Dr. Tirucherai enjoys spending time with family and friends, and is an avid crossword and Sudoku enthusiast.

Dr. Venkata Nanduri

Dr. Venkata Nanduri has been with pharmaceutical industry for 29 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.

Leanne Barnhard

Leanne Barnhard is a 5th-grade teacher at John Adams Elementary School, and current 5th-grade level leader. This is her 4th year teaching at JA, and 3rd year teaching 5th grade. She was born and raised in North Brunswick, and went through the North Brunswick School District. She is few months away from Graduating Seton Hall University with her Masters in Education Administration, and she is excited to see what the future holds! In her free time, she enjoys spending time with family and friends. She also love to travel and volunteer all over the world.

Dr. Akhileswar Patel

Dr. Akhilweswar Patel, completed his Masters and Ph.D in Physics 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.

Martin Kozicki

Martin Kozicki received his Bachelor of Science and Master of Science in Pharmacology & Toxicology and Pharmaceutical Sciences, respectively, from SUNY at Buffalo. Currently working for Bristol-Myers Squibb as a Senior Pharmacokinetic Scientist within the Clinical Pharmacology & Pharmacometrics department. Martin has extensive experience in providing scientific perspectives into the design of phase I Bioequivalence and other Phase 1 clinical pharmacology studies, drafting clinical study protocols, analyzing and interpreting Pharmacokinetic and Pharmacodynamic data. In his free time, he enjoys skiing and spending time with the family.

Dr. Lucille O'Reilly

Dr. Luci O'Reilly is currently a tenured faculty member of the North Brunswick Township High School Science Department, where she teaches chemistry at both the College-preparatory and the Advanced Placement levels. Dr. O'Reilly is also the team teacher for the North Brunswick Township High School's Waksman Student Scholars, a molecular biology and bioinformatics research group associated with Rutgers University, a volunteer for the North Jersey American Chemical Society's sponsored events to promote STEM to K-12 students and a participant on alumni panels to promote a K-12 education career track for graduate school science majors post-graduation. Dr. O'Reilly received her doctorate in Molecular Biology and Biochemistry from The University of Medicine & Dentistry of NJ's School of Biomedical Sciences (Piscataway, NJ), where her research focus was the interaction of retroviral particles with the host cell. Dr. O'Reilly is also an alumnus of Rutgers College (New Brunswick, NJ) and Montclair University (Montclair, NJ). Prior to receiving her doctorate, Dr. O'Reilly worked in both academic and biotechnology/pharmaceutical laboratories and has taught at the college level.

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. She has received many industrial accolades including international accolades and invitations.

2019 NBT SCIENCE SYMPOSIUM WINNERS

Team#	Team Name	Category	Participants	Award
109	The Keen Scientists	Elementary School	Prahas Ramidi	1st Place
109	The Keen Scientists	Elementary School	Aanya Muniyappa	1st Place
109	The Keen Scientists	Elementary School	Peyton Mikita	1st Place
109	The Keen Scientists	Elementary School	Anusha Vakkalagada	1st Place
106	Little Einsteins	Elementary School	Jay Pindipol	2nd Place
106	Little Einsteins	Elementary School	Vishwa Swamy	2nd Place
106	Little Einsteins	Elementary School	Tarun Yamarthy	2nd Place
106	Little Einsteins	Elementary School	Manaswi Mantena	2nd Place
105	SAS(Serious About Science)	Elementary School	Saanvi Singh	3rd Place
105	SAS(Serious About Science)	Elementary School	Mahati Vemula	3rd Place
209	Team Emoji	Middle School	Aruhi Vakkalagadda	1st Place
209	Team Emoji	Middle School	Gabriella Seiden	1st Place
209	Team Emoji	Middle School	Stacy Rappolt	1st Place
209	Team Emoji	Middle School	Vedika Shah	1st Place
209	Team Emoji	Middle School	Alyssa Mikita	1st Place
206	Project Poseidon	Middle School	Steven George	2nd Place (Tie)
206	Project Poseidon	Middle School	Ameya Gobburu	2nd Place (Tie)
206	Project Poseidon	Middle School	Schyata Sharma	2nd Place (Tie)
208	Simple Solutions	Middle School	Isha Shrivastava	2nd Place (Tie)
208	Simple Solutions	Middle School	Poojitha Kalasapati	2nd Place (Tie)
208	Simple Solutions	Middle School	Reina Fukahori	2nd Place (Tie)
208	Simple Solutions	Middle School	Roshni Raghuraman	2nd Place (Tie)
303	The Pioneers	High School	Ujjayi Pamidigantam	1st Place
303	The Pioneers	High School	Abhaysai Vemula	1st Place
306	Floating 2 Victory	High School	Prakash Nayak	2nd Place
306	Floating 2 Victory	High School	Lukas Siernos	2nd Place
305	EurAsia	High School	Akshay Muniyappa	3rd Place
305	EurAsia	High School	Robert Cannuni	3rd Place
305	EurAsia	High School	Canaan Matias	3rd Place
101	Three Positive Ions	Elementary School	Nakshatra Vustapali	Outstanding Creativity
101	Three Positive Ions	Elementary School	Akshita Thakur	Outstanding Creativity
101	Three Positive Ions	Elementary School	Mona farook	Outstanding Creativity
102	Dry Ice and Water	Elementary School	Eva Patel	Outstanding Design
102	Dry Ice and Water	Elementary School	Yashvi Patel	Outstanding Design
102	Dry Ice and Water	Elementary School	Sunidhi Mitikiri	Outstanding Design
102	Dry Ice and Water	Elementary School	Stephanie Biju George	Outstanding Design

2019 NBT SCIENCE SYMPOSIUM WINNERS

113	Masterminds	Elementary School	Ayaan Narale	Outstanding Presentation
113	Masterminds	Elementary School	Om Nangia	Outstanding Presentation
113	Masterminds	Elementary School	Aaron Ling	Outstanding Presentation
111	Mighty Musketeers	Elementary School	Mukilan Chidambaram	Outstanding Research
111	Mighty Musketeers	Elementary School	Milan Virdi	Outstanding Research
204	The Mathemagicians	Middle School	Hael Raj	Outstanding Creativity
204	The Mathemagicians	Middle School	Sibi Thiagarajan	Outstanding Creativity
207	Kelvin 800	Middle School	Rajeev Achar	Outstanding Design
207	Kelvin 800	Middle School	Saifuddin Abbas	Outstanding Design
207	Kelvin 800	Middle School	Shiv Patel	Outstanding Design
207	Kelvin 800	Middle School	Srikar Patri	Outstanding Design
207	Kelvin 800	Middle School	Sheev Shah	Outstanding Design
210	Got Science? ..We matter!!	Middle School	Tisha Subhedar	Outstanding Research
210	Got Science? ..We matter!!	Middle School	Nimmat Sukhija	Outstanding Research
210	Got Science? ..We matter!!	Middle School	Atharv Rege	Outstanding Research
210	Got Science? ..We matter!!	Middle School	Krish Tiwari	Outstanding Research
210	Got Science? ..We matter!!	Middle School	Mohit Pradhan	Outstanding Research
116	Robostars	Elementary School	Ayush Sharma	Popular Choice Award- 1st place
116	Robostars	Elementary School	Nethra Gujja	Popular Choice Award- 1st place
106	Little Einsteins	Elementary School	Jay Pindipol	Popular Choice Award- 2nd place
106	Little Einsteins	Elementary School	Vishwa Swamy	Popular Choice Award- 2nd place
106	Little Einsteins	Elementary School	Tarun Yamarthy	Popular Choice Award- 2nd place
106	Little Einsteins	Elementary School	Manaswi Mantena	Popular Choice Award- 2nd place
208	Simple Solutions	Middle School	Isha Shrivastava	Popular Choice Award- 3rd place
208	Simple Solutions	Middle School	Poojitha Kalasapati	Popular Choice Award- 3rd place
208	Simple Solutions	Middle School	Reina Fukahori	Popular Choice Award- 3rd place
208	Simple Solutions	Middle School	Roshni Raghuraman	Popular Choice Award- 3rd place

Thank You !!

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

AGRAJ SEVA KENDRA presents

LETS DANCE FOR A CAUSE

SATURDAY MAR 21, 2020
4.00 PM - 7.00 PM

GROUP PERFORMANCES

BOLLYWOOD, BHARATANATYAM
KUCHIPUDI, KATHAK
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All Proceeds go to Cancer Institute Of NJ

$10 - Entry Tickets per Person
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(Group size between 5 & 10)

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Guru Rubina Sudharman 609-647-5076

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Commemorates a Historic World Event – 73rd Independence Day of India

"MAA (MOTHER) - Manifesting in Many Forms"

Join us for entertaining and educative event

August 15, 2020

10 am – 1 pm

North Brunswick Township High School Auditorium

Organized By

NBT India Day Committee (A service project of Agraj Seva Kendra)
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