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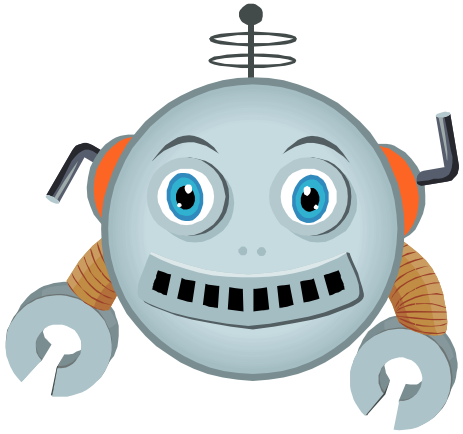
Science Expo

2008-09



Bellows Falls Union High School

January 08, 2009

6:30-8:00 pm

Project Participants

Honors Earth Science

1. Bike Power

Subject: Honors Earth Science
By: Kamelia Crawford, Sara Engerman, Cooper Long, Matt Marchica, Cooper Reis, Emma Shaw, and Jacob Stoddard.
Mentor: Mr. Norkun

How much power does it take to for an alternative energy apparatus to power a TV and an X-box? We hypothesized that the energy it takes to pedal a bicycle could be harnessed to power a Television and an X-box. An old bike will be pedaled to turn some sort of generator to produce electricity that will power the electronic equipment. The generator will spin magnets inside a coil wire to produce electricity, the faster the magnets spin the more electricity we will produce. The apparatus will capture that energy and power the equipment. Speed that the bike is pedal is directly proportional to the amount of energy we can capture to power the equipment.

Biology

2. The Effects of Energy Drinks on Hand-Eye Coordination

Subject: Biology
By: Amber Strickland, Matt Martineau
Mentor: Mrs. Steiner

Many advertisers and commercials say that energy drinks can improve a person's focus, stimulate their performance, and enhance their concentration. However, do energy drinks really have this effect? This experiment tested the subject's hand and eye coordination before and after they consumed an energy drink. The subjects were tested repeatedly on catching a ruler when dropped, both before and after consuming the drink. A specific drink called the "5-Hour Energy Shot,", which was created to provide energy in the form of caffeine and other chemicals, was used. The results supported the hypothesis because everyone's reactions changed significantly; the reactions were much faster than before consuming the drink.

3. Animal Behavior: How Animals React to New Environments

Subject: Biology
By: Isaiah Shabazz
Mentor: Mrs. Steiner

The way an animal reacts in its environment is called animal behavior. This project looks at how pill bugs react in different terrains. To do this I put six pill bugs in a chamber that had two sides. One side had a layer of pebbles and the other side had plain filter paper. The pill bugs were observed to see how long they stayed in each chamber. The hypothesis was that if the pill bugs have a choice of environments, they will choose the terrain with pebbles over the terrain without. This experiment supports this hypothesis, where most of the pill bugs preferred the pebble terrain.

4. The Effect of pH on Enzymes Reaction Rate

Subject: Biology
By: Ryan Allcock
Mentor: Mrs. Steiner

Enzymes are important to everyday life. They are known to scientists as specialized proteins that catalyze metabolic processes. Different levels of pH can affect the ability of enzymes to catalyze reactions. The objective of this study is to find an optimum pH level for yeast enzymes. To measure the optimal rate, paper filter disk were coated with yeast enzymes and then transferred into a hydrogen peroxide substrate with pH levels of 2, 4, 6, 8, and 10. As the disk hit the bottom of the beaker it was timed on how long it took the disk to reach the top. The results of the experiment showed that no enzyme activity occurred at pH levels of 2, 4, and 10. Levels of pH between 6 and 8 were ideal.

5. Measuring Air Pollution Using Lichen

Subject: Biology
By: Carissa Healey
Mentor: Mrs. Steiner

Measuring air pollution using lichen is not that difficult to do. I did this for my project because I thought that it was very interesting. Also it is very important to know what metals are polluting the air the most. The one that did the most damage to the lichen was that of the lead chloride. This is the product that is most polluting our air. The pollutant that was the less damaging was the Sodium Chloride. The reason that I did this project was because we need to figure out what the most polluted thing is in the air. I approached this problem by doing an experiment. By putting lichen in blue dye then putting some of them in each of the different chemicals.

6. The Zone of Inhibition of Herbs on Bacteria

Subject: Biology
By: Emily Gehly
Mentor: Mrs. Steiner

Many herbs have been used for most of all recorded time. They have been used to season foods and more importantly as an alternative to medicines. The purpose of this experiment was to measure the antibacterial potency of certain herbs. In this day-and-age, it is important to find alternatives to chemicals that fight bacteria and can harm the environment. Herbs have varying levels of antibacterial potency. Onion and garlic have more potential to kill bacteria than do cloves and mint. To extract the antibacterial properties, tinctures were made. The bacteria were exposed to each herbal tincture. The zone of inhibition was measured for the ability of the herb to kill bacteria. The results of this experiment supported this hypothesis, showing that onion and garlic had the largest zone, and cloves and mint had a smaller one.

7. Comparing Bacterial Growth on the Girls and Boys Bathroom Door Knobs

Subject: Biology
By: Megan LaBeau
Mentor: Mrs. Steiner

Bacteria are everywhere even though you cannot see it, it is still there. Bacteria sometimes form endospores which allow them to survive under conditions they would normally die in. Bacteria are all over your skin, most of which are pretty harmless, but some may be able to cause serious diseases. Hands tend to pick up more bacteria because they touch so many things in a day such as the bathroom door knob.

For this investigation the girls and boys bathrooms were swabbed and any bacteria present was transferred to nutrient agar. After a couple of days the bacterial colonies that formed were counted. The numbers of colonies for each door were then compared. The hypothesis was that if the boys do not wash their hands as much as the girls after they go to the bathroom, then there should be more bacteria present on the door knob of the boy's bathroom. The results of this experiment showed that the boy's bathroom had more bacteria than the girl's. This implies that they may not wash their hands as much as girls.

8. Comparing the Vitamin C Levels in Various Juices

Subject: Biology
By: Hillary Willard
Mentor: Mrs. Steiner

Vitamin C, also known as Ascorbic Acid, is a white crystalline vitamin found in citrus fruits, tomatoes, potatoes, and leafy green vegetables. Vitamins are a required organic nutrient that functions as a co-enzyme, assisting enzymes in catalyzing metabolic reactions. To prevent nutrient deficiencies, nutritionists established the recommended daily allowances (RDA's) which are the minimal standards for required nutrients. Because Vitamin C is soluble it is expelled regularly and not retained in the body. Consequently, the body needs to take in more Vitamin C everyday.

A deficiency of Vitamin C can cause Scurvy, a degenerated disease that effects skin, teeth, blood vessels, and the immune system. This investigation measured the level of Vitamin C in various juices, each sample was subjected to titration using Iodine. As soon as the Iodine completely reacted chemically, the remaining iodine reacted with the starch solution that was present, turning the solutions blue. The results from this showed that of the juices tested, most had around the same Vitamin C levels in them. Apple juice was an exception with over 100% of Vitamin C.

9. The Effects of Calcium Chloride on *Lemna minor* (duckweed) Population Growth

Subject: Biology
By: Forest Jade
Mentor: Mrs.Steiner

Calcium chloride is a salt, most commonly used for treating insect bites such as those from black widow spiders. Calcium chloride is also now being used as a road salt alternative. *Lemna minor*, also known as Duckweed, is a kind of herb that grows usually in still water and takes in toxins and other substances present in water. This species of plant works well in studies that measure toxicity levels because it has minimal upkeep needs and multiplies very quickly.

For this investigation a serial dilution for calcium chloride was conducted. Five different concentrations were produced in test tubes in which to grow the Duckweed. The tubes were checked every other day to observe plant growth. As a result, the more calcium chloride present in the tubes, the less growth was observed. In the strongest dilution the Duckweed died.

10. The Effect of Sodium Chloride on *Lemna minor* (Duckweed) Population Growth

Subject: Biology
By: Ashley Moran
Mentor: Mrs. Steiner

Toxic chemicals are always getting into bodies of water, especially when the winter season comes around and salt is put on the roads. The plant *Lemna minor*, or Duckweed, takes in toxins, therefore removing them from the water. The toxins affect fish and other organisms that rely on the water. This experiment is important in determining the harmfulness of sodium chloride in Duckweed, and its potential to kill off other roadside vegetation.

The Duckweed was put into different concentrations of a Sodium Chloride solution. Their growth was measured every other day by counting the number of Duckweed fronds in the test tube. My hypothesis is that the Duckweed will grow best in lower concentrations of the Sodium Chloride. The experimental results supported this hypothesis; the Duckweed in the lower concentrated solution grew faster and was healthier.

11. The Effects of Nicotine on *Spirostomum*

Subject: Biology
By: Nicole Gay and Nicole Goncalves
Mentor: Mrs. Steiner

Nicotine is a drug that makes people addicted to products that contain it, such as that found in cigarettes. Nicotine related deaths are easy to prevent, yet they are the number one cause of preventable deaths in the United States. This experiment looked at the lethal dose of nicotine in the indicator species, *spirostomum*. Advertisements for smoking have been banned, yet 24% of the population in the United States still smoke.

It is hypothesized that eighty percent nicotine would be considered the lethal dose for this species. A range of nicotine concentrations were produced by creating a serial dilution which incremented at ten percent intervals starting with fifty percent and ending at one hundred. The lethal dose was obtained by subjecting *spirostomum* to the various levels. Results of this experiment showed that fifty percent nicotine was lethal.

12. Measuring Toxicity Levels of Caffeine

Subject: Biology
By: Buffy Rivard
Mentor: Mrs. Steiner

Caffeine is an addictive drug that many people in the world consume. It can come in many different forms (its pure state it's a crystalline white powder), anywhere from coffee, soda, gum, and energy drinks. There are many side effects to using caffeine on a daily basis. Its the highest addicting substance in the world. Most people don't even realize how dependent they are of it. Caffeine causes changes in the chemicals of the brain, in two ways. The first one being that it can have the ability to mimic adenosine binding to all the adenosine receptors in your brain, preventing the real adenosine from doing its job (which slows down the nerve impulses that causes drowsiness, making your brain more alert). The second is that it also increases dopamine in your brain, which increases a feeling of well being. It also improves your mood (it's the dopamine effect that is the root of the addictive properties).

13. The Effects of Caffeine on *Blepharisma*

Subject: Biology
By: Chandler Mitchell-Love
Mentor: Mrs. Steiner

Eighty five percent of the world's population drinks coffee on a regular basis. Not only are there many more coffee shops around these days but, there are a lot of choices of different coffee flavors to choose from such as; latte, Americano, mocha, cappuccino, and hazel nut to name a few. Caffeine is a very addicting drug and there have been problems with people trying to quit the drug. Caffeine is absorbed by the body and carried out through the body. Caffeine stimulates the nervous and cardiovascular systems and it effects the brain by increasing a persons heart rate, blood flow, respiratory rate, and metabolism for several hours. This project looks at the toxicity levels of caffeine on the indicator species *Spirostomum*. The hypothesis was that caffeine makes the *blepharisma* energetic. The results from this investigation showed that 10% of caffeine killed the *blepharisma*.

14. The Effects of Nicotine on *Spirostomum*

Subject: Biology
By: Ryan Hayward
Mentor: Mrs. Steiner

Advertisements for cigarettes and tobacco all have nicotine in them, but do they actually tell you how bad it can be for you? When you smoke cigarettes you get addicted to them because of the nicotine that is in them. Advertisements for the 21st century are lower then they used to be. In the United States there are around 24% of Americans who actually smoke cigarettes. My objective for this was to look at the toxicity of nicotine by measuring the lethal dose (LD50) in *Spirostomum*.

For the steps in this project there had to be a serial dilution that took place. After the serial dilution was made for this project *Spirostumum* had to be prepped so that it is ready to add the nicotine. Five levels of nicotine were examined.

15. The Cation Exchange Capacity of the Soil

Subject: Biology
By: Jesse McCoy
Mentor: Mrs. Steiner

Soil ecology, the study of living organisms and non living matter in the soil, is important in agricultural production. Different soil samples were investigated to find the cation and exchange capacity of the nutrient levels in the soil samples. Two soil types, sand and dark soil were tested using eosin Y and methane blue dye solution, each having cation or anion properties. Oppositely charged ions that were present in the dye went through the soil and were retained. Depending on the type of dye expelled or the level of dye absorbed determined the nutritional property of the respective soil types. The soil sample with the red dye retained the most fluid. This indicated that this sample has more nutrients. This project shows the ionization within the soil which is the physical process of converting an atom or molecule into an ion by adding or subtracts charged particles such as electrons.

Potassium, calcium, and magnesium are trace elements that are required by plant life. These positively charged cations, K+Ca2+,mg2+, are taken up by negatively charged colloidal particles that exist in the clay. The soil works as a natural filter by absorbing these chemical that are deposited onto the surface.

16. Chomotaxis of *Physarum polycephalum*

Subject: Biology
By: Miranda McGahan
Mentor: Mrs. Steiner

Chemotaxis is the responsive movement of chemicals toward an attracting stimulus. Slime Mold as known as *Physarum polycephalum* is classified as a confusing, complicated subject, but yet simple in scientist's eyes. This subject is so complex because it is classified into different categories like the fungi and animal. This project interested me because slime mold wasn't that familiar to me and I was mostly amazed at the fact that something like this could move. This project is important because it shows how slime mold reacts in different situations.

It seems as though slime mold loves food as much as we do. You could even say that it has a mind of its own. This conclusion was made when oatmeal, one of foods that it is most attracted to was taken away from it. Its food was replaced with Coco Puffs and Rice Krispies to see its reaction. In one case it seems as though the slime starved so it chose both cereals. In the other trials it choses Coco Puffs and went nowhere near Rice Krispies.

17. The Effect of pH on Isopod Behavior

Subject: Biology
By: Emma Neathawk
Mentor: Mrs. Steiner

You may ask yourself how do I get rid of a certain animal or attract them? Well, it all depends on the level of pH. This starts with decomposers and how they are really important to the food cycle. They are needed to break down leaf litter and keep the cycle continuous. This top soil habitat ranges in pH and is hospitable to isopods (decomposers). For this project a range of pH level concentrations were created . This range included: 5, 6, 7, 8, 9; acidic to basic conditions respectfully. Isopods were exposed to these different levels. The hypothesis for this investigation was that the bugs would not survive the 9 pH level and that they would not be affected in the 7 pH and under. I thought that they would struggle in the 8 pH. The experimental results supported my hypothesis and the Isopods lasted for a certain amount of time until they died in the higher levels of pH.

18. Flesh Eating Beetles Consumption Rate

Subject: Biology
By: Ethan Reeve
Mentor: Mrs. Steiner

Scientists can use demisted beetles, also referred to as flesh eating beetles to clean flesh to the bone. Forensic scientists can examine a section of bone to determine how one may have died in a suspicious death. These beetles may also assist in determining how long the person has been dead for. Do to this, scientists can determine what points of the life cycle the beetles are in. The particular point, long or short, coincides with how long the body has been dead for.

This project focuses on how much flesh a culture of demisted beetles can consume in three days. To do this, beetles were fed a piece of squirrel meat and over the course of three days the meat was weighed out daily to determine how much was consumed. The hypothesis for this investigation was that bone would be exposed within a three day timeframe. The results of this experiment showed that bone was exposed after the three day timeframe. It was also determined, that as the time went on the meat got more pungent and the beetles seemed to consume the flesh at a faster rate. With further investigation we could figure out what condition they like the meat the best.

Honors Biology

19. The Growth of Biofilm Forming Bacteria on House Hold Substances

Subject: Honors Biology
By: Luke Brophy
Mentor: Mrs. Steiner

Biofilms are everywhere. Biofilms are slimy substances that are formed by bacteria to protect the bacterial colony from foreign materials and harsh conditions. They create this slimy layer through a process called quorum sensing. This is a unique feature in the biofilm development. This is communication within the bacterial colony itself. This is one of the reasons that these biofilms are so difficult to prevent. As an example, the slimy layer on your teeth can be scrubbed off when you brush your teeth, but it will be back within an hour. You cannot see them, but they still pose many questions. Where do they grow? How fast do they grow? Are they dangerous? This project looks at the growth of bacteria and the biofilms they form on different house hold substances.

Microscope slides were used to grow the bacteria on. Three of the four slides were coated with a different substance. The first was the control with no substances, left untouched, the second was coated with cooking oil, the third was coated with hand lotion, and the fourth was coated with petroleum jelly. This was done to see the different growth capabilities of the bacteria and biofilms.

The results of this experiment suggest that the bacteria's growth was less affected by the substances while the biofilm growth was. All the slides had visible bacteria. The hand lotion and the cooking oil both showed more biofilm growth than the control or the petroleum jelly. This experiment also demonstrated that bacteria and biofilms will grow in any moist environment, but it is what that environment contains that will affect the amount and or intensity of that growth.

20. The Effects of Genetically Modified Foods on our Population

Subject: Honors Biology
By: Brendan Hackett
Mentor: Mrs. Steiner

You've heard about food shortages all across the world, but what if there was a solution to that. If there ever was a possible solution it may be found in genetic modification. Genetically Modified Foods, food items that have had their genomes altered by scientists. These alterations can have many favorable results in producing a desirable product.

This project was to find if many of our normal every day foods are genetically modified. Fritos, Doritos, and Soy Flour were tested for genetic modification. This was found first by extracting the DNA. Then denaturing and amplifying the DNA, and finally electrophoresing it.

The results of this investigation showed that Fritos, and Doritos were both found to be genetically modified. They both contained traces of genetic modification, while traces of genetic modification were not found in Soy Flour.

21. Transformation of DNA in the Green Gene Colony

Subject: Honors Biology
By: Ruth Rowell
Mentor: Mrs. Steiner

Bacteria can undergo transformation; this is when a cell takes up external DNA and incorporates it into existing DNA. This modified DNA is considered transformed. Transformation can occur naturally or by way of artificial conditions. Natural transformation, in single celled organisms like *Pneumoniae*, is a transformation that takes place naturally. Artificial transformation occurs when bacteria are subjected to conditions, such as a change in temperature, which allows the bacteria to take up new DNA. The transformation used in this experiment used the Green Gene colony which was an artificial form of transformation, the plasmid DNA from the bioluminescent jellyfish, *Aequorea victoria* was subjected to various temperature change. This allowed for the DNA of the jellyfish to be taken up by the agar and the glow gene from the jellyfish to be exhibited.

22. DNA Analysis of Suspect Bacteria Using Gel Electrophoresis

Subject: Honors Biology
By: Ryan Hitchcock
Mentor: Mrs. Steiner

When people think of DNA, they usually think of the hit crime shows that they see on television. This is because the characters on crime shows often spend much time discussing how they might use DNA evidence to prove that the suspect is guilty. The process that these crimes shows use to catch the criminals is called DNA Fingerprinting. DNA Fingerprinting is the process of comparing a sample of DNA with another sample of DNA to see if they match or not. It is used in real-life forensics labs, as well as on the aforementioned crime shows.

In this lab, DNA from bacteria was extracted and exposed to restriction enzymes. The restriction enzymes separated the DNA by length. Agarose gel is a substance with small tunnels in it small enough that allows movement of strands of DNA. When the DNA was placed into the gel an electrical current was added to separate the larger strands of DNA from the smaller strands. These strands of DNA were pulled across the gel towards the positively charged end of the gel. The gel was then stained using Carolina BLU staining solution, to make the bands of DNA visible. These showed patterns of bands along the gel. Each vertical line of bands represents a section of DNA. These sections did not show any conclusive results, for they all were located in the same region on the gel.

23. Transformation of the Green Gene Colony.

Subject: Honors Biology
By: Savana Rentas
Mentor: Mrs. Steiner

Gene transformations have led to new research and improvement in today's world like cures for viruses. DNA Transformation is when DNA is transferred into another organism. The jellyfish, *Aequorea victoria*, expresses the green glow gene used in this transformation experiment. The gene of the jellyfish has been extracted and transferred into other organism. There are two types of transformations, natural and artificial. A natural transformation is when the gene uptakes free DNA without alterations. Some bacteria can undergo natural transformations like *Streptococcus Pneumoniae,* but it is fairly rare. Artificial transformations is when bacteria is released into artificial conditions so they can uptake new DNA. Usually, for the bacteria to uptake the DNA, their ionic strength must be changed by adding calcium chloride after the cells are denatured. In this project, artificial transformation was used; the cells went through a heat shock to make them ready to uptake the gene. The green gene colony was transferred into nutrient agar to make the *E.coli* bacteria express the gene that makes them glow.

24. Sickle Cell Anemia: Migrating Differences between Regular Hemoglobin, Carrier Sickle Cell, and Sickle Cell

Subject: Honors Biology
By: Amber Leigh DiBona
Mentor: Mrs. Steiner

Sickle cell anemia is a painful blood disease that deforms the blood cell. It is most commonly found in African American people, and less common in Europe. Sickle cell is a blood disease that is not infectious, but it is inherited. A patient with sickle cell has to go through tons of treatments. A bone marrow transplant can help cure it but it is known to be very risky for most people and that's why it's not advised. Other treatments such as pain killers can only help the pain not completely cure it.

In 1910, James B. Herrick had a patient that came in and when James looked at her blood under a microscope; He quickly realized that her blood was sickle shape. James B. Herrick was the first doctor to have recorded a sickle cell case.

For this project the protein of normal, carrier, and sickle cell hemoglobin were separated through Gel Electrophoresis. Gel Electrophoresis is a method used to separate protein by size of the molecules. The hypothesis was that the carrier would show two bands, one for sickle cell, and one for regular hemoglobin.

The results supported the hypothesis by showing that the carrier did have two bands, the regular hemoglobin and the sickle cell hemoglobin.

Field Ecology

25. Flathead Catfish Invader or Welcome?

Subject: Field Ecology
By: Jen Mayer
Mentor: Ms. Gottschalk

Many people have recently become concerned about invasive species from several different countries. Invasive species can result in the disappearances of native species and cause habitat loss. One such species is the Flathead Catfish which is a serious problem down South, taking over the Short Nosed Sturgeon's homes, making them nearly extinct.

On the other hand, the Flathead Catfish is an excellent sport fish for anglers. A popular pastime in the South is "noodling" the catfish, which is sticking their arms in the homes, and as the catfish bite their arms, they drag them out. It is also said to be a good fish to eat, but since it eats nearly anything it can, it accumulates toxins. This project addresses the question of whether the pro's outweigh the con's of this particular invasive species.

26. Forest Disturbance Around Us.

Subject: Field Ecology
By: Ross Gleason and Mike Sanderson
Mentor: Ms. Gottschalk

Forest fires, logging, and wind storms, these things can be quite devastating to a forest. We can see this fact just by looking in the woods out back of the high school. Knowing this my partner and I went to investigate. We found strong evidence of there being forest disturbance in our area.

Evidence of disturbance in a forest includes stone walls, barbed wire, thorny shrubs (juniper) and wolf trees which are all signs of pasturing. Signs of logging are multiple trunk trees, cut stumps, and opposing basal scars. Signs are standing dead trees, discontinuity in age classes, and basal fire scars. Signs of blights are snags with fungus growing on them. Signs of evidence of blow downs are blown down trees all lying in the same direction, and pillow and cradle topography. Finally signs of beaver activity would be standing dead snags in water, beaver cut stumps, and beaver damns.

Our display will outline and explain various types of evidence of disturbance, and challenge the science expo attendee's knowledge of forest disturbance.

27. The Invasiveness of Fire Ants and Japanese Beetles

Subject: Field Ecology
By: Mickey Rentas Jr., Michael Blanchard
Mentor: Ms. Gottschalk

Invasive species are a devastating aspect of our world, and therefore the further understanding of such destructive species is necessary, not only for the survival of other species in our world, but to us as well. Coming from foreign lands, these species wreak havoc not only on our ecosystems but also, humanly, on our economies. Two species under scrutiny are the Japanese Beetle and Fire Ant, which we decided to study, inwardly finding the negative impacts they have on our ecosystem. Through thorough research on both species, we have compiled an extensive collection of information potentially key for the education of individuals ignorant to the grave ways of non-natives. Through our fun presentation, we can inform the public of these invasive species, the damage they cause, the threat they pose and hopefully wake up in a more aware tomorrow.

28. Identification of Local Tree Species
Subject: Field Ecology
By: Zack Anderson, Bradley Lawrence
Mentor: Ms. Gottschalk

The average high school student can't identify a single tree species at their own high school. This project will educate participants about how to identify varies local tree species. In order to do that, we created an identification guide for the trees of the BFUHS property. It includes a description of branching patterns, leaf types, leaf structures and other identifying traits. Also, it includes photos and descriptions of over twenty local species. Expo attendees are invited to look at our identification guide and use it to identify several local species.

29. Tree Bingo

Subject; Field Ecology
By: Janice Nowers and Alisa Dupuis
Mentor: Ms. Gottschalk

Very few people in Vermont, ranging from teenagers to people who have lived here all their lives, can identify even the most common of native trees. This inability to connect with our local ecosystems has prevented us from being able to preserve our environment as well as possible. For our project we are going to educate our participants of the correct ways to identify various local trees. To do this we created an original Bingo game based on the descriptions of Vermont's native trees so that participants can learn and have fun while doing it!

30. The Killer Kudzu

Subject: Field Ecology
By: Gillian Mitchell-Love
Mentor: Mrs. Gottschalk

There are many invasive species in the world but one of the coolest ones has to be kudzu. This invasive species has an amazing history. Not all invasive species are harmful to the ecosystem or the economy. In fact some species become naturalized. Kudzu is not one of those plants. My project describes the impact that kudzu has had on the economy and the ecosystems. This knowledge could be extremely useful to people so that they don't unknowingly spread an invasive species.

Kudzu grows at an alarmingly fast rate. It can grow up to one foot per day. It is also extremely hard to control, costing power companies an estimated $1.5 billion per year. The plant takes over any species around, out-competing them or even smothering them. Kudzu is extremely destructive; it is capable of pulling down power poles and collapsing buildings. My project shows the basic background of Kudzu and describes all of its effects on the ecosystem, both good and bad.

31. The Effect of Heated Water on Duckweed

Field Ecology
By: Rachael Kirkpatrick and Izaac Pellerin
Mentor: Ms. Gottschalk

Duckweed is a plant with a very specific niche. It likes still water and lots of nutrients because it reproduces so fast. Because it reproduces rapidly, it actually takes over areas and can kill plants and animals in the water by blocking sunlight to aquatic plants, thus preventing oxygen production in the water. The purpose of this project is to find out if duckweed can survive in warmer waters. Duckweed produces more protein per square inch than soybeans, so it could be very useful to people. Since duckweed is such a specialist, we want to know if a slight change in the surroundings will help it or hurt it. Our hypothesis is that warm water will help the duckweed, because usually colder temperatures kill plants. So to find out if warmer water will affect the duckweed negatively or positively, we have two beakers of water and duckweed in them, one being the control group and the other the experimental group. They will have the same conditions except one beaker will have a higher temperature. So far the results of this project show that warmer waters help the duckweed reproduce more quickly, because there was more duckweed in the beaker of warm water (experimental group) than in the beaker of room temperature water (control group).

32. The Effects of the Cane Toad, an Invasive Species

Subject: Field Ecology
By: Mindy Sault
Mentor: Ms. Gottschalk

An invasive species can greatly impact an ecosystem and the native species. Depending on the invasive species, some natural species can adapt to the arrival of invasives. I've gotten the chance to study about one invasive species from Queensland Australia, which has affected many farmers, bee keepers, and even residents. Also some native species of Australia have been affected by Cane Toads. Cane Toads carry a highly toxic poison, and have caused problems for some snakes in the area because snakes try to eat these toads. This project addresses the affects that Cane Toads have on the native species of Australia. My recommendations to control the invasive species in this situation would be to keep organizing hunting groups. There's not much else that you can do to control Cane Toads because their high/fast reproductive rate, but hunting groups seem to help a great deal.

33. Hemlock Wooly Adelgid

Subject: Field Ecology
By: Chaz Soboleski & Cody Monty
Mentor: Ms. Gottschalk

Ecologists are always worried about the impact of invasive species on our local ecosystems. Invasive species are second only to habitat loss as most destructive impacts on native species. The Hemlock Wooly Adelgid is one of many invasive species currently threatening Vermont forests. If people were educated about how to identify this species, more prevention of damage to local Hemlock trees could occur. Our goal is to make people aware of the damage that the Hemlock Wooly Adelgid does to the Hemlock trees. We will tell you how to identify them and how to get rid of them.

Honors Physics

34. Rollercoasters: Is There a Certain Speed Needed to Make the Loop-De-Loop?

Subject: Honors Physics
By: Jennessa Lever and Nadine Rowell
Mentor: Mr. Nystrum

This project was designed to test what speed is needed to make the loop-de-loop, and was chosen because of an interest in rollercoasters. A model rollercoaster was built and a computer program was set up to measure the velocity of a marble while it went through the "rollercoaster." It was assumed that if the marble was not started high enough on the drop then it would not have enough velocity to carry through the loop. The marble was dropped from three various heights, a high height, a mid height, and a low height. The velocity was measured by a computer program that had been set up at various points to measure the actual velocity of the marble as it passed through the measuring point. Then the acceleration of the marble was determined by equation. The results showed that the minimum speed necessary was consistent with physics. A discussion about the results will be held at the table.

35. How Does a Pathologist Work?

Subject: Honors Physics
By: Stefanie Bernier
Mentor: Mr. Nystrom

What do Pathologists do? My study will explain the questions they ask themselves, the instruments they use and the process of finding out the cause of death. Everyday people like us don't generally know much about pathologists, just that they deal with the dead. My study will dig deeper into the pathologist's job.

I chose this project because I didn't know much about pathologists to begin with and I wanted to educate myself, while educating everyone else. I will also make a mock case and act like a pathologist to solve this case. My results will be presented at the expo.

36. How the Flight of Different Objects are Effected by Compressed Air

Subject: Honors Physics
By: Dyllon Nardino and Luke Conway
Mentor: Mr. Nystrom

Flying objects and loud noices are always interesting to learn about. This project shows how the flight of different objects are altered by different pressures of compressed air. To figure this out we built a small object launcher out of pvc pipe. We built a chamber that holds a certain amount of pressure and then when the valve is turned, the pressure shoots an object out of the barrel. We found out the more dence the object it, the better it flies. While doing this project, we had fun!

37. Accuracy of Ballistic Fingerprinting

Subject: Honors Physics
Shea Soboleski
Mr.Nystrom

Ballistic fingerprinting is a forensic method that is intended to help find guns that were used in a crime. Forensic firearm examiners will examine the bullet or cartridge case to come up with a better understanding of the size, shape, and kind of gun that was used. The identifying marks on the bullets or cartridges are as unique as human fingerprints, no two markings are identical. Federal BATF agents reported that even after 5,000 rounds were fired, the ballistic fingerprinting images were still durable. Ballistic fingerprinting has proven effective in catching criminals and solving crime scenes. Three different guns will be compared. Several rounds will be fired, comparing the bullets at each shot.

38. The Effects of Temperature on the Bounce of Tennis Balls

Subject: Honors Physics
By: Craig Guild and Codi-Ann Hindes
Mentor: Mr. Nystrom

Ask any tennis player what their ideal playing conditions are and they will likely tell you that they prefer a clear day with a comfortable temperature. Temperature easily affects the play of the athlete, too hot and they will easily tire, too cold and their mobility goes down. But how exactly does temperature affect the performance of the ball? We believe that if the temperature of the gases inside of a tennis ball are increased or decreased, then the rebound of the ball will increase or decrease with respect to temperature. We believe this because temperature is a measure of the kinetic energy of molecules, the higher the temperature the greater the kinetic energy; gas molecules with a greater kinetic energy should hit the inside of the tennis ball with a greater force this would create greater tension on the elastic properties of the tennis ball.

In order to test our hypothesis, we created three test groups; one group of tennis balls that was kept at room temperature, one group whose temperature was increased, and one group whose temperature was decreased. We then dropped each member of the test groups twice and measured the rebound. Our results backed up our original hypothesis that the tennis balls with the higher temperature bounced higher, and the tennis balls with the lower temperature bounced lower.

Honors Chemistry

39. Determining Iodide Content in Salt

Subject: Honors Chemistry
By: Aly Hewitt
Mentor: Dr. Marin

The experiment described in this report examined the iodine content of various types of commercial salt, including; iodized and non-iodized salt, as well as other types. The reason this topic had been chosen was because it would be interesting to see if the amount of iodine in iodized salt could be found in other types of salt. The question for this experiment asked which salt has the most iodide content and if the "iodized salt" actually contains more than any other types of salt. The hypothesis states that of the types of salt tested for the "iodized" salt will contain the most iodine. The results of this experiment will be shown and discussed in the presentation.

40. The Effects of Two Common Road Salts on Ice

Subject: Honors Chemistry
By: Julie Cermola
Mentor: Dr. Marin

The experiment described in this report examines the effects of two common road salts, NaCl and CaCl2, on the rate ice melts and how much is melted. More than one type of road salt is available for melting ice. One question is, which would be the most effective to use that would save time? The hypothesis tested in this experiment is "If an ice chunk is sprinkled with NaCl or CaCl2, then CaCl2 will have a greater effect on the ice." The results of these tests will be further discussed in the presentation.

41. Son of a Bleach: Determining the Effective Bleaching Power of Chlorine Bleach Vs. Oxygen Bleach

Subject: Honors Chemistry
By: Taylor Acquaviva
Mentor: Dr. Marin

The purpose of this investigation was to determine whether chlorine or oxygen based bleach was more effective at removing a grape juice stain from a white cotton shirt. The hypothesis tested was that chlorine bleach was more effective at removing a grape juice stain from a cotton shirt than an oxygen bleach. Small cotton squares were stained with grape juice. A group of "stain standards" was established by diluting the grape juice with water and staining cotton squares for comparison. Fully stained cotton squares were submerged in one of the two bleaches for different periods of time. Once removed the squares were compared to the standards. The results of this experiment will be discussed during the presentation.

42. The Effectiveness of Getting a Grape Juice Stain Out

Subject: Honors Chemistry
By: Marissa Smith
Mentor: Dr. Marin

The experiment described in this report tests whether there is a significant difference in the amount of stain removed by two brands of laundry detergent, Tide and All. The hypothesis tested was that there would be no difference in the effectiveness of the two laundry detergents. Cotton squares were soaked in grape juice and washed in laundry detergent, according to manufacturers' instructions. The washed and dried cotton squares were then compared to a standard set of stains. The results will be discussed in my presentation.

43. Moldy McDonalds:Comparing Mold Growth on Different Bun Brands

Subject: Honors Chemistry
By: Aaron Morton
Mentor: Dr. Marin

Urban legends have always cast McDonald's food as indestructible, or impervious to decay. However, there is no real scientific evidence to back this up. Is McDonald's food really as mold-resistant as everyone says? This project compared the distance of mold growth on a McDonald's hamburger bun, an organic store bought bun, and a store bought bun with preservatives. The hypothesis tested was that the McDonalds variety would grow the least mold, followed closely by the preservative buns, with the organic buns having the most mold growth. To do this, an aqueous mold solution was mixed, using a blue penetrating mold found on bread. A small amount of this solution was applied to a single bun of each variety. These were placed in 3 separate, sealed containers. Untreated controls for each bun variety were also placed in 3 separate, sealed containers. The buns were observed twice each day, and their mold growth recorded. After a week, the final extent of mold growth was recorded. The data gathered, and the conclusions drawn from this experiment will be discussed at the Science Expo.

44. Porous Paper Towels: Do Generic or Bounty Paper Towels Absorb More Water?

Honors Chemistry
By: Jennessa Lever
Mentor: Dr. Marin

For this Science Expo project the absorbency of paper towels was tested. A generic brand of paper towels and the "Quicker Pickerupper" (Bounty) brand were tested. The test done was to see which one was a better absorber of water and which paper towel could do it more efficiently. This topic was picked because of an interest in the idea that generic brand performs the same as the "name brand." The question used was, "Does the generic paper towel absorb just as much water as the Bounty paper towel in the same amount of time?" The hypothesis used was, "the Bounty would be faster and absorb more." This was thought because of personal experience. Compared to the Bounty brand, generic paper towels always seemed thin, and "weaker." Two beakers were filled with 500 mL of water each. Then one sheet of each type of paper towel was placed in its respective beaker, and submerged. Once the paper towels were fully submerged, a stop watch was started. After 30 seconds each paper towel was pulled out of its respective beaker, and placed aside. After the paper towel was pulled out of the beaker, the amount of water in the beaker after was subtracted from the original amount of water. The results of this experiment will be discussed at this Science Expo station.

45. Measuring the Melting Effects of Sodium Chloride and Calcium Chloride Based Road Salts

Subject: Honors Chemistry
By: Ali Mann
Mentor: Dr. Marin

The experiment described in this report measures the relative efficiency of NaCl and CaCl2 in melting ice. This topic was chosen because bad winter weather in Vermont necessitates the use of salt to clear roads and walkways. The experiment tests whether one type of road salt, (sodium chloride or calcium chloride) works better than the other. The hypothesis to be tested is that if both road salts are used on the same amount of ice, sodium chloride will melt ice at a faster rate. Equal amounts of sodium chloride or calcium chloride were spread on identical of ice. The rate at which water accumulated was measured. The results will be discussed at the presentation.

46. The Effects of Water and Paint on the Inking Quality of Pens

Honors Chemistry
By: Hannah Hodsden
Mentor: Dr. Fred Marin

When painting, there are certain types of materials that can be used well. Some pens are able to be painted over without fear of smudging or running, but some will run and ruin the painting. Some pens are advertised as good for inking, and so may in fact be better to paint over than regular ballpoint pen. There are also some pens which are advertised as permanent, which also may stay on the paper better than a ballpoint pen. Some pens are also erasable, which may effect their attachment to the paper.

Chromatography runs were done using the different types of pens with water along with mixtures of different types of paint that would often be used to paint over pen linework. These paints included standard watercolors and gouache paints, which can be used in a way similar to watercolors. The data was measured by how far each pen ran when exposed to the different mixtures.

47. What Soda Stains The Most

Honors Chemistry
By: Ben Hewitt
Mentor: Dr. Marin

The experiment described in this report examines the ability of four different sodas to stain tile. Coke, Pepsi, Rootbeer, and Dr. Pepper were tested using white tile instead of real teeth. I choose this topic because I wanted to find out which type of soda is the worst for your teeth in terms of appearance. The question being asked is whether any one stains more then the others. The hypothesis tested is that Coca Cola will stain teeth more than the other brands. The results will be discussed during my presentation.

48. Cheap Vs. Expensive Hairspray

Subject: Honors Chemistry
By: Audrey Forrest & Johanna Rodriguez
Mentor: Dr. Marin

This Science Exposition project dealt with which type of hairspray, cost effective or more expensive, worked better against time and wind. This topic was picked because people are trying to find several ways to save money and beauty products are an easy way to start saving money. If the cost effective hairspray was as effective as the more expensive hairspray, then people could both save money and look good! The question being asked was which hairspray on sewing string would hold curls better in a time of 60 minutes and against constant wind from a house fan in a time of 30 minutes. The results will be discussed at the Science Exposition.

49. Determining Different Dyes Used in the Production of Candy

Subject: Honors Chemistry
By: Trevor Fuller
Mentor: Dr. Marin

Candy companies across the world know that in order to sell their products, they must present them in a way that will grab the attention of children and adults alike. Many times they do this through the use of bright colors and flashy slogans. The experiment presented in this report analyzes the pigments used in coloring candies, using paper chromatography to determine whether candies with similar colors are chemically identical. Pigments from green Skittles and green M&Ms; were extracted and chromatographed in several different solvents. The hypothesis tested was, if the candy colors are similar between two different candies, the dyes used to create the color must be the same. The results of these experiments will be presented

50. The Effectiveness of Powder and Liquid Detergents on Removing Set in Stains on Cotton Fabric

Subject: Honors Chemistry
By: Molly Chisamore and Eliza Masure
Mentor: Dr. Marin

The experiment described in this report tested whether powder or liquid laundry detergent removed stains more effectively. The topic was picked because people are messy and want to know which detergent works better. The hypothesis tested was that detergents of the same brand should be equally efficient, whether powder or liquid form. Cotton fabric was soaked in grape juice, allowed to dry, and washed in the two different forms of detergent according to the manufacturer's instructions. The amount of stain removal was measured by comparing the washed samples to "stain standards." The experiment was repeated three times to make sure the results were accurate. The results will be discussed during the presentation

51. The Effect of Brewers Yeast and Instant Active Yeast on Bread Rising

Honors Chemistry
By: Hillary Harrington
Mentor: Dr. Fred Marin

The experiment described in this report asked whether there is a significant difference between brewers yeast and instant active yeast in causing bread to rise. The two yeasts tested in the experiment were instant active yeast (Fleischmann's) and brewers yeast (Swanson). The hypothesis tested was that there would be no difference between the effects of the two different yeasts. Bread was baked, using the two types of yeast. Once each loaf was finished baking, the heights were measured and compared to determine which yeast produced a greater height. The experiment was repeated to improve the credibility of the results. The results will be discussed in my presentation.

Project Power Point Presentations

6:30 – 7:00 PM

Biology – In the Chemistry Room

1. The Effects of Drugs on the Body

Subject: Biology
By: Bryeanna Sheldon
Mentor: Mrs. Steiner

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7:30 – 8:00 PM

Honors Biology – In the Chemistry Room

2. Jumpin' Around The Genome: Transposons in *Arabidopsis thaliana*

Subject: Honors Biology
By: Courtney Perry
Mentor: Mrs. Steiner

In 1940, Barbara McClintock made an incredible discovery: not all genes are stationary. Some of them are able to change their location within the genome. These "jumping genes" are called transposons. Transposons exist in all kinds of organisms; there are even some transposons in humans. Transposons can have both positive and negative effects of the genome. Transposons have been linked to genetic diseases like hemophilia; conversely, they can also cause beneficial mutations to occur. They affect genes that are adjacent to them by "turning" them "on" of "off". Transposons can be sorted into two different classes, each with its own method of mobility. Class I transposons move using a process that is similar to the "copy" function on a computer keyboard, by copying and inserting multiple copies of themselves throughout the genome. Class II transposons move with a process that is more like the "cut" and "paste" function on the keyboard, by first removing themselves from the genome and then reinserting themselves in a different location. Both classes of transposon depend on enzymes to move. These "jumping genes" are prevalent in modern science and will continue to play a role in genetics for years to come.

7:30 – 8:00 PM

Honors Physics – In The Physics Room

3. Development of a Linear and Two Dimensional Physics Engine in Macromedia Flash 8.0

Subject: Honors Physics
By: Tanner Degenkolb
Mentor: Mr. Nystrom

A physics engine is one of the most extensible manifestations of the basic laws of Newtonian physics that can be portrayed on a computer. The development of a physics engine based around Newtonian physics depends upon the use and understanding of the basic laws of Newtonian physics. As a result of this the majority of physics engines are defined arbitrarily in order to allow for the quick development of an application or game. It was expected however that a simple linear physics engine would be fairly easy to create, and with several significant modifications could be adapted to work in two dimensions. The basic laws of physics were fairly easy to work into a simulation, which accurately replicated the Newtonian model of physics, however it was significantly harder to develop this simulation into a full-fledged physics engine, which could be extended beyond the limits of a set simulation. To develop the simulation the basic Newtonian laws of physics were converted into ActionScript 2.0 scripts which were coded to manipulate the positions of sprites on the screen simulation collisions between and the movement of objects of varying masses and with varying forces acting upon them. Once these scripts had been developed they were extended so that they could be applied to varying situations with varying numbers of interacting objects. This resulted in a functional physics engine.

Welcome! This year's Science Exhibition is a spin off from our previous year's Science Fairs.

RAFFLES WILL BE GIVEN AWAY
EVERY HALF HOUR!

Go to our raffle table in the library to check out the raffle items and to find out how to get free raffle tickets to participate,

REFRESHMENTS BEING SERVED IN THE LIBRARY

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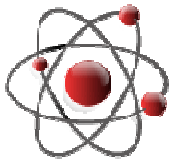

Project Poster Presentations

Project Power Point Presentations

Science Demo Day

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