

Initiative for
Research &
Innovation in
Science



IRIS

Win the World with Science



IRIS National Fair 2009

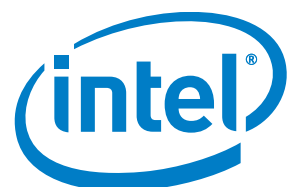
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Abstracts



Confederation of Indian Industry



Foreword



The **Initiative for Research & Innovation in Science (IRIS)**, India's largest research based science fair initiative for students, continues to inspire budding scientists in India. This government and private partnership between the **Department of Science & Technology (DST), Government of India, Intel, and the Confederation of Indian Industry (CII)** reaches out to numerous students across India.

IRIS aims to stimulate in young students a passion for the sciences and provides an educational experience through interaction with the judges and students, as well as provides a platform for the young innovators to represent India at International fairs like the Intel International Science & Engineering Fair (Intel ISEF) and International Exhibition for Young Inventors (IEYI) and Stockholm International Youth Science Seminar (SIYSS). This year, Apurv Mishra, a winner at the Intel ISEF 2006 has been selected as the Indian representative for SIYSS 2009.

In today's global environment, we feel it is essential to encourage originality of thought among students to enrich the quality of future human resource and build a pipeline of world class talent in the country. Intel remains committed to accelerate 21st century education for our students in India through programs like IRIS.

In its fourth year now, the IRIS fair has received a pool of over 800 project entries from school students across the country. The students have participated by sending synopsis entries across 10 categories: Behavioural Sciences, Bio-Chemistry, Botany, Chemistry, Computer Science, Engineering, Environmental Science, Mathematics, Physics, and Zoology. The Scientific Review Committee, comprised of eminent Indian scientists, has short listed nearly 85 best ideas which will now compete for the National Awards at the IRIS National Fair 2009 this year.

In this booklet, we have made an attempt to bring you a snapshot of the innovative ideas from the students so that we can appreciate the emerging scientists of India who are the future of the nation. I congratulate all the participants.

As we celebrate 10 years of Intel Education in India, I take this opportunity to thank all the participants, resource persons and scientists whose consistent efforts across the years have made Intel's science initiative in India a tremendous success.

Best wishes

A handwritten signature in blue ink, appearing to read 'Praveen Vishakantaiah'. The signature is fluid and cursive, with a long horizontal stroke at the end.

Praveen Vishakantaiah

President, Intel Technology India Pvt Ltd



Science, technology and innovation are the most powerful instruments of growth and development in the wake of the new demands that are being placed on the society.

It is imperative for us to involve the nation's youth in initiatives that will help us to meet the technology needs of the country in the years to come. To achieve this, we need to inculcate in them a scientific temper and a zest for innovative thinking.

Rashtriya Vigyan Evam Prodyogiki Sanchar Parishad in the **Department of Science & Technology (DST)** plays a pivotal role in the promotion of science and technology in India. In response to the challenges before the nation, it has partnered with **Intel** and the **Confederation of Indian Industry (CII)** in a public-private partnership - the Initiative for Innovation and Research in Science

(IRIS) - with the aim of fostering an ecosystem that encourages innovation and creativity in science. For the last four years, IRIS has succeeded in identifying and promoting budding young "scientists, inventors and innovators" from different schools through this process. The National Fair is a unique opportunity to explore and share innovative ideas, and gain insights through the process of mentoring and networking support. The recognition they get by winning awards is recognition of the merit of their ideas but each participant is enriched in the process.

We wish the young scientists the best, as their journey to make India proud begins here.

Er Anuj Sinha

Rashtriya Vigyan Evam Prodyogiki Sanchar Parishad
Department of Science and Technology
Government of India

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Bh Sc-01 (Jr)

Affect of Color in Increasing Maths and English Scores

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Textbooks often use bold, black or italics to set apart an important word or phrase but could it be possible that the words or phrases to be set apart would be better remembered? Many students have learning difficulties and I wanted to find out if color can help them perform better in English and Mathematics.

The participants consisted of 61 students. I used 3 lists of various words which are generally not used in everyday conversation. The first list of 12 words was printed in black ink. The second list was the same 12 words, 11 of which were printed in black and 1 word printed in red ink. The third list contained the same 12 words, six of which were printed in black and six in red ink.

The participants were given instructions and had 3 minutes to write down the words. In the Mathematics quiz, they had 10 minutes to solve the questions.

The data was collected and results were computed. The data was statistically analyzed. Significant difference was found.

This concludes that red color would help the students to increase memorization of words and also help them to score more marks in Mathematics.

Bh Sc-02 (Jr)

Study of Effect of Colour on Memory and its Impact on Students with Learning Disability

Vineet Simhan

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This project aims at analyzing the impact of colours on memory. The aim of this study is to determine how colours can help a student's ability in remembering words and concepts. It also establishes that the time taken to memorise words will be significantly reduced with colour-coding. This concept of colour-coding words will be extended to help students' with reading disabilities to see if it can help them learn faster.

Procedure Used: Students with learning disabilities were chosen as subjects. Worksheets were then prepared with age-appropriate words – one with black printed words on a white background and then similar words with the same difficulty level (but not the exact same words) printed in yellow on a black background. These worksheets were then given to the students for them to memorise these words and a spelling test was conducted to test their memory of the words they had just learnt. This data was then analyzed to give a quantitative memory comparison.

Practical Applications: In India, very limited resources and books are available for students with learning disabilities. So this project aims at encouraging publishers and book writers to use the concept of colour-coding for the benefit of such students. This concept can also be adopted by teachers in schools in colour-coding their presentations and notes.

Bh Sc-03

An Investigation and Solution of the Atto-Fox Paradox in the Lotka-Volterra Equations through Recursive Programming

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The aim of this project was to create a population/logistic growth model that would fix the problems with the current models. Most generic models are largely inaccurate because of a problem called the atto-fox paradox, a defect which originates from the Lotka-Volterra equations, the basis for many population growth models. In the paradox, the number of prey reaches approximately 10^{-18} , and then rebounds back to whole integers. So the first step was to deconstruct this paradox and identify the solution. Using the Lotka-Volterra equations, I calculated the theoretical populations of wolf and moose and compared them with data provided by the Isle Royale National Park. The comparison showed that the cause for the paradox was the unaccountability of a dynamic environment as the actual population data showed many sudden fluctuations, which were unrepresented in the theoretical data. From this basis, I converted assumed constants in the previous models, such as predator death rate, predation rate, prey growth rate, and reproductive efficiency, to variables. I then formed mathematical relationships between the variables, which proved my hypothesis that each environment has common traits of dynamicity which can be mathematically simulated. The fluctuations in the actual population data were mimicked by the theoretical data from my logistic growth model. The result of this endeavor was a model that solved the atto-fox paradox and is more efficient than generic growth models. A good application of this project would be the prediction of the growth of the human population independently in different regions.

Bio-Chem-01 (Jr)

Can Garlic Prevent Crown Gall?

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The objective of this project is to determine whether or not a garlic powder solution can prevent crown gall in tomato plants. Crown gall is a plant disease caused by *Agrobacterium tumefaciens*. Crown gall affects a large variety of broad-leaved plants, like tomato, apple & pear. It is characterized by the development of galls large, tumor-like swellings on the plant. The galls appear on the crown of the plant, just about the soil level. *A. tumefaciens* infects plants through wound sites, e.g., from pruning or transplantation. This disease is not much of a problem for mature plants, but seedlings and young plants that are infected can be severely stunted. The *A. tumefaciens* bacteria can remain viable in the soil for long periods of time (up to two years). Antibiotics can not be used for agricultural purposes, because resistant bacterial strains will develop with widespread use, resulting eventually in loss of effectiveness of the antibiotic against human disease. Here I am testing a natural product as an anti-bacterial agent to protect plants. Garlic powder has been shown to have anti-bacterial properties under some conditions. Can it protect tomato plants from *A. tumefaciens*? In this project I will grind up garlic tablets in order to make solutions with a known amount of garlic powder. To infect the seedlings, I will use a stab inoculation technique using a pin, and then I'll conduct experiments on the infected saplings.

Further experiments conducted:

1. Pouring the solution on the gall directly.
2. Pouring the solution into the soil.
3. Injecting the solution into the gall directly.

I am also conducting the same experiments with fresh garlic solution and am going to find out which is more effective- fresh garlic solution or garlic tablet solution.

Bio-Chem-02

Bio Plastics from Banana Flower Skin/Stem

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Synthetic plastics pose one of the biggest threats to the environment today. The most promising solution to this problem is the prospect of biopolymers. In this work, I have explored the possibility of using banana stem / flower skin blending them with starch and gelatin. I observe that banana flower skin / stem has a waxy structure and is hydrophobic. Different ratios of banana stem, flower skin - gelatin - starch was used to make polymer film. All the materials used for the polymers are bio-derived and completely biodegradable. Solution blending followed by curing was the method adopted for the preparation of the film. Water absorption test showed that the water absorption was negligible. The tensile strength was equal to that of the present day plastics. Novelty of the work lies in using the waste flower skin and stem for making the polymer. This method utilises a waste product and the polymers prepared are potential biomaterials

Botany-01 (Team)(Jr)

Board from Bio Matter

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Tanisha Shetty

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The main cause for the various environment related problems is the afforestation. Usually particle boards are made from husk, coconut shell or wood for which many trees are cut.

Keeping all these in mind we have made eco friendly particle board using the fallen dried leaves or the garden waste and leaf base powder of Areca.

The boards were made in the size of 12x8 in varying thickness of ¼inch, ½inch, and ¾inch. Dried fallen leaves powder, Areca leaf base powder were tried separately for board preparation. As rigidity and strength was not good, they were used in three varying combinations (29g +67g of leaf base powder and dried leaf powder respectively for thin, 59g+ 135g for medium and 117g +270g for thick boards) in the further experiments. Two different types of gums i.e., fevicol (120ml, 300ml,420ml) and industrial gum(120ml, 300ml, 420ml) were used for preparing boards of all the three thickness. We have also tried placing cloth for further strength.

After testing for pressure and weight bearing capacity of these boards, green boards using green leaves and coloured board using coloured leaves along with leaf base powder of Areca was prepared. We have also prepared a board using design cloth for a designer look.

Botany-02 (Team) (Jr)

Eco Friendly Pen

Kripa Puthila

Savitha Bhat

Sudana Residential School

Puttur, Karnataka

A small effort to save our environment from the deadly harmful plastic is trying to find out an alternate to the all purpose pens, available in market usually made either from plastic or metal. We have made pens using the powdered leaf base of Areca catechu the most prominent plantation crop of our area. 17g of this powder was taken, mixed with fevicol SH (20g, 25g, 30g), Fevicol DDL (25g, 28g, 30g), Industrial gum (16g, 18g, 20g, 25g), Fabric gum (20ml, 25ml, 30ml), bee wax (5g) and cashew gum (7g) and verified for its hardness and rigidity. For coloured pens we have taken the industrial glue along with cashew gum and bee wax as they are naturally available gums and hence more eco friendly.

We have used 5g leaf base powder with varying amounts (9g, 11.5g 4.5g etc) of many different natural powders for making coloured pens like green, maroon, orange, brown etc as will be given under the discussion.

Thus we have made pens of various colours using different powder of natural materials like petals, leaves, fruit, and seed etc using natural gum.

Botany- 03 (Team) (Jr)

Writing Pad Using Leaf Base of Areca Catechu

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Depletion of forests and pollution by the non degradable plastics are the two major problems of the modern urbanized world. We have made, as an alternate to the plastic or wood, a writing pad made out of a naturally available, handy, waste, biodegradable matter, i.e., leaf base of Areca catechu. The use of this material will give an alternate source of income to the rural people of our area. The innovative use of this big plant part is the preparation of the writing pads, retaining its natural look and texture but making it strong and durable for its everyday usage was a challenge.

We have made pads using 2, 3, 4 leaf bases after flattening them under the roll press. They were then given a thin coat of the glue (synthetic rubber based adhesive) and allowed to dry for 7 min. Then they were rolled in the press for joining them. The pad, made using 3 and 4 leaf bases seemed ideal for use as writing pads. Pads using 2 leaf bases are good for making file pads or as hard cover for books.

Botany-04

Ayurvedic Medicine for Jaundice

Radiya Mahale

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My project mainly deals with the ayurvedic powder which is used to cure most common disease called jaundice. In my project roots of *kutki* plant are used. In botanical name *kutki* is also known as picrorrhiza kurroa.

I got the encouragement of making this project from my grandma who is involved in this business. For making this powder we most commonly require the roots of the *kutki* plant, mincer, mixer and container. For making this powder I have brought the *kutki* roots from the ayurvedic pharmacy. Then I cleaned the roots and removed the unwanted and dirty things. Then I kept the roots for drying in the sunlight for 2-3 days. Afterwards I crushed the roots in mincer till I got the partial powdery form. Then I grinded it in the mixer and I obtained the actual powder, which I kept in the container. The photos of preparation of this powder are clicked. I have tried this powder on some jaundice patient and I have noted down the results. According to these results I have made various graphs.

Next I have carried out some experiments in the school laboratory through which I came to know that this powder is neutral in nature and not harmful for human consumption. Then I collected various information about jaundice and this ayurvedic medicine from my family members and from internet. I also took the help of the doctor and asked him various questions and collected the certificate from him which proved that this powder is effective against jaundice.

Botany-05

Effect of LED on Growth of Plants (year-2)

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Today there is scarcity of land for farming due to the industrialization and population explosion and there are many places where the sunlight doesn't reach due to the climatic conditions. So for getting more production and healthy food I have done the research project on Effect of LED on growth of plants. For that I have checked the rate of photosynthesis in per hour in the light of LED, for this experiment I have used 21.5 cm long Hydrilla (*Hydrilla verticillata*) plant. I have performed experiments and recorded observations by varying the duration of LED lights to 2 hours, 12 hours and 24 hours. For this experiment I have grown mustered (*Brassica juncea*). After that I have grown the mustered plant (*Brassica juncea*) in test tube to observe the growth of root in the light of LED.

To see that all the tissues are developed in the plants grown in LED light I have done three experiments, two on mustered (*Brassica juncea*) and one on Mung (*Vigna radiate*). I have prepared the permanent slides of the sections Mung plant (*Vigna radiate*). And capture the photographs the sections of plants in slides in microscope.

Till now I have done all the experiments on Red and Orange LED, but now there are two types of Red and Orange LED available in the market so I have done the experiment to compare them. For this experiment I have used the plant of Mung (*Vigna radiate*). I got the results that the physical characteristics of plant are same in both the LEDs, but I observed that the leaves are greener in the new LEDs. So now I have grown *Mung* (*Vigna radiate*) and *setaria italic* in the Light of both the LEDs. I will check the carbohydrate, Protein and fat and all other nutritional values of these plants. I have also grown Coriander (*Coriandrum sativum*) In the light of both the LEDs to check the food quality.

Botany-06

Investigation of Antimicrobial Property of *Ervatamia Coronaria* Flowers

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Since time immemorial plant extracts have been used for healing purposes which emphasizes upon the preventive and curative measures of medicine. This project investigates the antimicrobial properties of flowers of *Ervatamia coronaria*. Methanol and aqueous extract of the flowers of *Ervatamia coronaria* were made and tested for antimicrobial activity against *Staphylococcus aureus* and *Escherichia coli*. Agar well diffusion was employed as the test method.

Experiments:

1. Aqueous extract and methanol extract of *Ervatamia coronaria* flowers were made
2. Study of the susceptibility of *Staphylococcus aureus* to Aqueous & Methanol extract of *Ervatamia coronaria* flowers.
3. Study of the susceptibility of *Escherichia coli* to Aqueous & Methanol extract of *Ervatamia coronaria* flowers.
4. Comparison study with the effect of Chloramphenicol, on *Staphylococcus aureus* and *Escherichia coli*.

Observation: The well in which the methanol extract was added showed an inhibitory zone of diameter (15 mm) against *Staphylococcus aureus* and *Escherichia coli*, while aqueous extract showed no zone against each of the bacteria. Sample A also did not show any hollow zone. Chloramphenicol, an antibiotic to *Staphylococcus aureus* and *Escherichia coli* were kept as a positive control also did not show hollow zone.

Results:

1. Methanol extract of *Ervatamia coronaria* inhibited *Staphylococcus aureus* as well as *Escherichia coli*.
2. Aqueous extract and Sample A did not inhibit *Staphylococcus aureus* and *Escherichia coli*.

Conclusion: Methanol extract of *Ervatamia coronaria* has a significant antimicrobial activity against pathogenic strains of *Staphylococcus aureus* and *Escherichia coli*.

Botany-07

Investigations on Growth Stimulating Activity of Datura Stramonium and Embelia Ribes in Crop Plants

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The project puts forth an innovative way to increase the growth and yield of crops. Numerous synthetic and organic chemicals and fertilizers are being used for this purpose, however their indiscriminate use pose threat to our environment. Hence, in search for a safe and eco-friendly alternative, it was decided to test the efficacy of plant extracts in terms of their growth promoting activity.

The preliminary experiments hinted about the growth stimulating action of the extracts prepared from Datura seeds (*Datura stramonium*), a weed, and Wawding seeds (*Embelia ribes*) - a medicinal plants. These plant materials are easily available and economically feasible. Initial study was performed to test the efficacy of these extracts on 14 different crops belonging to various groups viz., oilseeds, cereals, pulses and vegetables. The extract was prepared by soaking the plant seeds in 10 volumes of water (w/v) at room temperature for 48 hours. The filtrate was used for the study. Seeds of crop plants were sown in propagators. Extract was added on day 1 only, with different concentrations. Subsequently the seedlings were watered.

The effect of extracts was studied in terms of seed germination, root length, shoot length, root-shoot ratio, and vigor index. It was found that extracts had a positive effect on germination and growth of crops, particularly at lower concentrations. In addition to this it was observed that the use of extract decreased the need of subsequent irrigation with water.

Botany-08

Leaf Extract of Clerodendrum Inerme (Forest Jasmine): A Potential Pesticide

Sharanappa Kallappa Kadabinakatti

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In my project I have tried to explore the use of the extract obtained from *Clerodendrum inerme* (common hedge plant) leaves as a potential pesticide.

The *Clerodendrum inerme* is extensively used in our campus (INV Koppal) for fencing and beautification purpose. While going through the path lined with *C.inerme* fence, I observed that the plant leaves always appear fresh and free from any sign of pest infections whereas other plant leaves are infested with the various types of pests.

It gave me the idea that hedge plant leaves may contain some chemical which protects them from being eaten by the pests. Being encouraged by our teacher, I conducted the experiments to find the potentiality of the extract obtained from the hedge plant leaves as a pesticide.

In my project I did experiments first to check whether *C.inerme* leaves are pest resistant and second can the leaf extract of *C.inerme* be used as pesticide in field conditions.

Experiments conducted by me and the data obtained have been tabulated and analyzed

The experiments show that *Clerodendrum* leaves are potential pesticides.

Botany-09

Natural Color from Algae

Pooja Dholakiya

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Rajkot, Gujarat

Ours is a very colorful world. Natural and Artificial are types of colors. Mostly we are using artificial colors. But our natural sources have amazing diversity of colors. Algae are one of these natural sources. There are lots of algae species easily available in sea; freshwater of rivers, dams, lakes, etc. but limitation is that they are available in winter season.

These species have different colors. My project is regarding to algae's colors. I have done experiment on marine and freshwater algae like Polysiphonia (red), Halwa (green), Clado (green), Hypnea, and Gelidium calcicola (red). I have put algae in oven at 70° C for 6 hours. Then crushed it and made powder. Water was added in powder but it was not soluble. So I have added different chemicals like Methanol, Ethanol, and Acetic acid in powder. But I have preferred Ethanol because it is a natural product. I have taken 5g powder and added 50ml ethanol. Then it was filtrated. This liquid was boiled to make it viscous. After boiling I have got 30ml liquid. This liquid can be used as ink. The benefits of this color are that it is not hazardous, eco-friendly and biodegradable.

Botany-10

To Study the Effect of LED Light on Growth of Plants

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Due to global warming the production of crops and other food grains is decreasing. We need to look out for the ways to increase the production. We were delighted to have the opportunity of experimenting with LED lights. Various experiments were conducted with LED light to compare with natural. One chamber was surrounded by black paper to prevent sunlight. LED lights were positioned to ensure that each treatment received an equal level of photosynthetically active radiation. We chose dicots (wheat and jowar) and monocot (mustard and moong) to conduct our experiments. Seeds were soaked and watered regularly. Observations were recorded and data was statistically analyzed.

Plant height for natural light treatment was the highest 9cm, LED was 7.6cm and the mean after 15 days was 8.3 cm which formed to be significant. The target is to develop innovative technology that will lower the cost of harvest and be eco-friendly as well. This technology can also be adopted to grow plants under sea.

Botany-11

Herbal Preservation of Tomatoes

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Tomatoes usually decay in a week when left unpreserved. During rainy season, they decay even earlier and the cost of tomatoes goes up. Even when kept in refrigerator, they could not be preserved for more than 15 days and after a week the nutritive content gets altered and is harmful for consumption. So an attempt has been made to develop a herbal method to preserve tomatoes for a long time.

Method of preservation: 5 sets of bowls, each set containing 4 bowls with one tomato in each bowl were taken for experimental study. All the bowls were left open during the entire course of the experiment.

In each set, we followed the below procedures:

- The tomato in the first bowl remained as control
- In 2nd bowl dried tulsi leaf powder was put on the scar end of the fruit.
- In 3rd bowl, dried tulsi leaf powder was put on the scar end as well as dusted around the fruit
- In 4th bowls, the tomato was fully buried in the dried tulsi leaf powder.

Observations were recorded in each set in the following manner: 1. The first set after 15 days, 2. The 2nd set after 30 days, 3. The 3rd set after 45 days, 4. The 4th set after 60 days, 5. The 5th set after 75 days

Periodically, we observed the 1. Morphology and 2. Taste of the tomatoes. From the data observed we find that the fruits which were sprayed with dried tulsi powder at the scar end and dusted around remained without decay till 45 days, but only slightly shrunk and sour taste not reduced. These observations indicate that this is a better and safe method of spraying & dusting tulsi powder on the scar and around the tomatoes to preserve them for a period of at least 40 days.

Abstract not available

Botany-12

A Search For Plants Having Acetylcholine Esterase Inhibition

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Botany-13

A Quantitative Assessment of Phytoremediation of Copper Effluent Using *C. Esculenta*

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Project Synopsis

Metal pollutants in industrial processed water and ground water are most commonly removed by precipitation or flocculation, followed by sedimentation and disposal of the resulting sludge. A promising alternative to conventional cleanup methods of contaminated ground water is rhizofiltration, a phytoremediative technique in which aquatic flora hyperaccumulate heavy metals and remove pollution from aquatic ecosystems. This project was designed to quantitatively assess the viability of phytoremediation of copper effluent using the aquatic flora *C. ESCULENTA*. Multiple trials were conducted exposing randomly assigned samples of *C ESCULENTA* to copper effluent at varying concentrations. Rhizofiltration was demonstrated by a decrease in the absorbance of light as measured by a colorimeter. *C ESCULENTA* shows a promising potential for the rhizofiltration of copper effluents from ground water and the improvement of overall water quality.

Botany-14 (Team)

The Effect Of Artificial Light on the Growth of Plants

Drashti Dantara

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Our project deals with the effect of artificial light on the growth of plants. We have performed the experiments in different phases. They are as follows:-

We started our project with the use of incandescent lamps and fluorescent lamps. We observed that the plant growth was better under fluorescent light.

Phase II Date: 21-8-09 to 5-9-09

In the second phase of our experiment we took up second species of plants that is *Cicer arietinum* and continued. We provided incandescent lamps of 40w, 60w, 100w and fluorescent lamp of 11w. on 21-8-09 new set of seeds of chick pea *Cicer arietinum* were sown. Along with moong *Vigna radiata* remarkable growth was seen under fluorescent light in comparison with the growth under incandescent bulb. Plants were observed and it was seen that leaves were getting damaged under incandescent bulbs. We regularly measured the lengths of the plants, the number of leaves and the length of the internodes of the plants.

Phase III Date: 29-9-09 to 22-10-09

On 29-9-09 white vatana *Lathyrus sativus* was planted. Since growth of plant under fluorescent bulbs was better, we used different wattage of fluorescent bulbs like 5w, 8w, 11w, 12w, 15w, 18w along with 40w red and blue bulb (incandescent bulb).

We also kept a control and dark room condition for further results. In dark room we have provided 12w bulb for 5 hrs everyday. In dark room it was observed that plants were growing tall but were pale. Good growth was observed under blue incandescent bulb and also under fluorescent light. Our results were tabulated in graphs and tables.

Phase IV Date: 6-10-09 to 22-10-09

On 6-10-09 chana *Cicer arietinum* was planted in different pots and kept under previous conditions. We observed the length and the number of leaves regularly. We found that the plant growth was very good under fluorescent light and also under 40w blue bulb. Our results are tabulated in graphs and tables.

Botany-15 (Team)

Micronutrient a Boom to Agriculture

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In India farmers use many ways to increase their crop production but a large amount of fertilizers remain unutilised, as they do not know the proper amount and best compound to be used, which in turn affects crop production. To overcome this problem we have a solution to maximize crop production i.e. zinc which is a micronutrient that can be used in fertilizers. Our aim through this project is to guide the farmers that how to use fertilizers of which particular compound and in what amount. Through our project we will find the best source of zinc for crops.

We conducted experiment with 4 different sources of zinc i.e. $ZnSO_4 \cdot 7H_2O$, Zn-EDTA, Zone and $ZnCO_3$. The crops taken in consideration are gram and pea. Zinc was supplemented through analytical reagent to give zinc concentrations of 0.0, 2.5, 5.0 and 10.0 mg/kg through $ZnSO_4 \cdot 7H_2O$ 0.0, 5.0, and 10.0 mg/kg through Zone. 0.0 5.0 and 10.0 mg/kg through $ZnCO_3$ and 0.0 2.5 5.0 7.5 and 10.0 through Zn-EDTA. For each observation 4 replicas were taken. Crops were harvested to maturity and yield of both straw and grain were recorded.

The order of increase in grain yield of gram with respect to zinc source was $ZnSO_4 \cdot 7H_2O > Zn-EDTA > Zone > ZnCO_3$, the grain yield with 2.5 mugs/kg applied as $ZnSO_4 \cdot 7H_2O$ was higher than that observed with application of 10 mg Zn/kg through $ZnCO_3$ and Zone. Same with Zn-EDTA grain yield with 5 mg Zn/kg Zn-EDTA was higher than 10 mg Zn/kg through Zone and $ZnCO_3$. Similarly the shoot yield of gram was 10.9 and 10.7 g/kg with $ZnSO_4 \cdot 7H_2O$, and Zn-EDTA AT 10 mg Zn/kg which is higher than that by Zone and $ZnCO_3$. Similar trends were observed in pea crop.

These results indicate that zinc soleplate was either at par or superior than Zn-EDTA applied at various stages but Zone and $ZnCO_3$ were clearly inferior to $ZnSO_4 \cdot 7H_2O$ and Zn-EDTA in terms of agronomic effectiveness.

So we suggest to farmers not to use Zone and $ZnCO_3$ as it will lead to wastage of money and time as they do not increase yield significantly. The best source for crop

Botany-16 (Team)

Effects of Biochemicals on Cauliflower (Brassica Sp)

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Due to population explosion there is a need for faster harvesting of crops. The farmers use many types of fertilizers and pesticides enormously which affect the whole environment adversely. Now the question is why do people use these harmful chemicals? Is there any natural alternative? To find the answer we performed some experiments on cauliflower. We took three plots of 25 sq. feet each and cultivated Cauliflower in them. In the first field we used CHEMICAL FERTILIZER & PESTICIDES; In second we used BIO-COMPOST & BIO-CHEMICALS and in the third neither chemical nor compost has been used. Tobacco manure, vermi-compost, neem oil cake, compost were used in biological farming while DAP, Boomflower, Potash etc. were used in chemical farming. From this we concluded that in the results of chemical farming Height of plant; diameter of stem, span of leaves, size of flower, number of leaves were more than general and Biological farming. The products of chemical farming became mature one week earlier than biological farming. To save this one week only the farmers use many harmful chemicals. These chemicals attract insects pests and damage the crop. It also requires more irrigation. They are less lustrous and less tasty than biological farming product. Now the question is How can we save earth from these harmful chemicals? In our project we tried to convince the farmer of Patwan locality of Munger district. In our survey we found that 85% farmers are dependent on these harmful chemicals for farming of which 70% do not know even the harmful effect. Is it possible to save earth without educating the farmers? We found that 55% farmers were satisfied from our results and agreed to use biological farming instead of chemical farming.

We also came to know about a HARMONAL SPRAY & INJECTION "WIN-CHE-WIN" using which plant start blooming within 3-4 days and gave crop earlier. When we showed its harmful effects, 62% farmers agreed not to use it.

Hence, by this project the farmers of this locality became aware of the harmful effect of chemicals and agreed to minimize the use of chemicals. If such things occur on mass level our earth can be saved from harmful effects of chemicals.

Botany-17 (Team)

Analysis of The Effect of Electric Impulse on Plant Growth & Development.

Uday Wagh

Shazad Chinoy

Bhavan's Hazarimal Somani College
Mumbai, Maharashtra

Purpose:

Electric stimulation helps to relieve muscle tension and pain in human body but what effect does it have on plants and its growth & development? Here we have analyzed the same by conducting a controlled experiment using a gadget devised exclusively for this purpose.

The Gadget:

The devised gadget was capable of providing minute electric impulses to plants. It consists of an electric circuit that provides an output ranging from 0.1-4.0 volts AC. The input supply was from a general purpose 9v battery. The gadget is small and easy to carry and it can be operated by any individual. It is also low in cost.

Procedure:

A controlled experiment was performed on four different plants namely Eggplant, Holy Indian Basil, Bottle Gourd & Lady's Finger. Electric pulsation was given for a period of 30 days for 15 seconds on a daily basis, at specific points on the plant body like the axes, nodes, apex bud and base of the stem.

Results:

There was significant increase in the overall growth rate of plants. The size of fruits and leaves increased staggeringly. The stems became more thick and sturdy. Significant development in the quality and quantity of the fruits was observed. Susceptibility of insects to plants decreased. This proves that electric pulsation has an overall positive effect on the growth of plants. Our project can help to explore a whole new area of research in the field of agriculture.

Chem-01 (Jr)

Retrieving Printing Ink From Discarded HDPE Bags

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HDPE bags are used for the regular packing of powder chemicals because of their hydrophobic nature. Statistics show that close to 30 million tons of HDPE goes into the production of bags etc, thus depleting the already depleting petroleum resources, which are a predominantly used raw material in the manufacture of HDPE. Secondly the printing inks used in the marking of such bags also use petroleum based solvents. Thus I have made an attempt make some use of the discarded HDPE bags and also try to retrieve the printing inks from such bags and study if the ink could be reused.

The procedure was carried out at the school lab level with NaOH, methyl alcohol, ethyl alcohol on the collected old HDPE bags but was unsuccessful and then tried with Iso propyl alcohol 20 ml IPA was collected in two beakers. In one of the beakers cotton balls were soaked and were used to scrub on the printed portion of the HDPE bags. These were then put into the other beaker and kept for 15-20 minutes. The cotton swabs were squeezed and removed. The coloured solution of IPA was then distilled and the excess removed leaving the printing ink in the flask. This was cooled to the room temperature and collected in bottles.

The collected ink has been sent for testing the properties of fastness and adhesion and the results are expected.

Thus printing ink retrieved from the old, HDPE bags can be used for screen printing on similar substrates and as ink in sketch pens.

Chem-02

Approach for Carbonaceous Nano Material Synthesis from Soil Sources and its Application.

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The project aims at extraction of carbonaceous nano material through simple technique from terrestrial sources, their physiochemical characterization and exploring their potential as an enzyme immobilization matrix. Current research reveals, microbial quality up gradation of soil is dependent on carbon nano material formation and clustering. Soil humus and also Shilajit, a natural substance, exuding naturally from mountain rock pores, were considered for clustered resource for carbon nano-materials. These biogenic nano-carbons can perhaps be utilized as safer and useful nano systems.

Simple solution and extraction procedures were adopted for low temperature carbon nanomaterial extraction from shilajit and humus. The natural nanostructures were therefore retained which can provide less toxic interactions in ecosystems. The product was evaluated for its shape and size through Photon Correlation Spectroscopy AFM, SEM and TEM imaging and chemical characterizations were done in Energy Dispersive x-ray Spectroscopy and powder XRD analysis.

Shilajit derived nano carbon was further used as an immobilization matrix for different enzymes, Urease and Bromelain. The enzymes were successfully immobilized with almost no depreciation of activity even after prolonged exposure to ambient temperature conditions, indicating possible applications of new soil derived carbon nanomaterial in biochemical researches, biosensors and different other fields. Additionally there lies a significant possibility that such nanomaterials will be less toxic and ecofriendly and cost-effective.

This project proves that carbonaceous nano-material can be extracted at low cost from our eco system only and these nano materials are possibly devoid of any eco-toxicity, thus, can be put to diverse application.

Chem-03

To Study the Efficiency of Various Vegetable Dyes for Synthesizing Solar Cells.

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Mumbai, Maharashtra

Plants use the free electrons to make carbohydrates, the original carbo-loading. Solar cells use the electrons to make streams of electrons. That's called an electric circuit.

We already have solar cells called photovoltaic cells but they prove to be very expensive. Hence, my project aims to build a natural dye synthesized solar cell, with much lower cost than common commercial silicon solar cells.

For building the solar cell, glass plates which were coated with Titanium dioxide (TiO₂) was used. The glass plates were then sintered and stained with various dyes extracted from fruits, flowers and vegetables. A number of experiments were conducted with crude and solvent dye extracts. The catalyst coated counter electrode faces the TiO₂ film. The iodide electrolyte solution (0.5M potassium iodide mixed with 0.05M iodine in water free ethylene glycol) was placed at the edges of the plates. The liquid was drawn into space between electrodes by capillary action. Two binder clips were used to hold the electrodes together. The absorption spectra of dye solutions were taken using a spectra photometer. Then the voltage of the solar cells was measured. The best results were shown by spinach leaves, followed by beetroot, which was followed by black grapes and then by Shankhpushpi flowers. Thus, I was able to demonstrate that vegetable dye is effective in synthesizing solar cells and can be harnessed to create electrical energy.

Chem-04 (Team)

Colour Candles Burning Effect

Yuga Bargavi

S Jyothi

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Most of the people in developing countries are facing crises of power. People living in developing countries prefer candles over emergency lights. Candles are available in variety of colors and shapes. People are fascinated by the colours of the candle and purchase them. Some candles melt faster than others. Does it depend on its composition, colour, shape or any other factors? We are trying to find out this through our project Colour Candles - Burning Effect.

Our project aims to analyze

- Consumption for different colour candles.
- Intensity of light emitted for different colour candles.
- Effect of surface area on candles consumption and intensity.
- Frozen candles consumption and intensity.
- Effect of dye concentration.

A thermally insulated experimental set up box was constructed. We measured the intensity of different colour candles for every 10 minutes, and consumption was measured for every one-centimeter length. Our research results showed that, white candles yield better illumination and sustain long.

Similarly, we studied the frozen candles and we experimented on shape as function of candles, consumption and intensity and concentration of the dye.

Chem-05 (Team)

Bio Fuel from Watermelon Seeds

Vaishnavi Shankar

Nanditha Ramachandra

MES Kishore Kendra

Bangalore, Karnataka

We decided to use agricultural waste from which we can obtain fuel. This has made us to choose watermelon seeds, which people put to no use.

Method of extraction:

There are mainly three steps in this extraction

1. Estimation of the amount of oil in water melon seeds: Appropriately 5 grams of watermelon seeds are powdered and are kept in two separate timbers. These timbers are placed in two separate jars containing boiling stones. Petroleum ether as the solvent is added to the jars which are kept in the soxtherm apparatus. It takes approx. 4hrs for the estimation of percentage of oil.
2. Extraction of oil from the water melon seeds: The watermelon seeds are introduced into the opening of the expeller. Turn the handle in at the side of the expeller. The oil comes out from one side of the expeller while the cake of husk comes out of the other. The oil is collected in a container.
3. The conversion of oil into bio fuel
 - a. The extracted oil is heated to a temperature of 55 degrees. This preheated oil is introduced into the screw expeller which has a capacity of 6 kilograms.
 - b. Sodium Methoxide is formed by mixing sodium hydroxide and methanol.
 - c. The obtained Sodium Methoxide is mixed with the preheated oil in the screw expeller.
 - d. This solution should be mixed continuously for two hours and then should be kept for settling. This results in the formation of bio diesel and glycerin.
 - e. This mixture is introduced into the separating funnel to separate the bio diesel from glycerin.
 - f. The bio diesel so obtained is washed in a current of hot water and is then kept for settling. The filtered bio diesel floats on the residue of milky water. This is separated. This process should be repeated for three times.
 - g. The bio diesel is heated for about 20 -30 minutes at a temperature of 120 degrees to remove the moisture content. The heated bio diesel is then cooled. This whole process of converting oil to bio diesel is known as Transesterification. The bio diesel so obtained is pure.

Comp Sc-01 (Jr)

Simulation of Dancing Dolls

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Computer graphics is used in different areas today, such as simulation and animation for scientific visualization in art, commerce, business, cartography, in education and entertainment.

We have developed this application by referring various graphics books and have implemented our idea of dancing doll using OPEN GL programming language. The application chosen here is a SIMULATION OF DANCING DOLLS.

In the above mentioned application there are 4 dolls created using OPEN GL each with different outlook. The user can move the dolls together using the keys J and L, for left and right movements respectively. Zoom in zoom out can be done using the keys I and K respectively. The dolls can be locked to the initial position using Z key. Individual dolls from left to right can be moved to the required position using the keys C, V, B, N respectively. User can specify the distance and direction of movements of the dolls using the keys J and L. J is used for leftward and L for rightward movement.

We have put in our creativity to create a graphics based application which can be further used in the development of B grade games, 3-D animation and cartoons.

Comp Sc-02

Portable C Computer

Hitesh S

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This light weight computer weighs around 100 grams and costs around Rs.500. This computer will have only a C compiler and uses no operating system. Designed specifically for school students desiring to learn C language. Currently only the essential features of C language are implemented.

PS2 keyboard interface is provided. Simple LCD with scrollable screen is the display. A single program of around 40x20 characters can be saved. Printer interface also will be given to print both the program as well as the output. Phillips P89V51RD2 microcontroller is used as the processor. 11.0592 Mhz crystal drives the computer. 5 volt power supply should be provided through adapter. Sockets are provided to plug in PS2 keyboard and printer.

Also working on providing more storage place by using 24C64 I2C chip with 8K bytes EEROM that can store up to 10 programs of size 50x20 characters each.

The software required is written in Embedded C. No RTOS is used. It can be compiled by using Keil compiler or SDCC (free open source) compiler.

Comp Sc-03 (Team)

Offline Character Recognition

Karan Bhagat

Dushyant Uppal

Police DAV Public School

Jalandhar, Punjab

The fact that recognizing characters are widely used and the inconvenience in educational institutions, schools, colleges, banks, and offices emphasizes the need of having optical character recognition systems.

This project about offline optical character recognition software is used to convert handwritten as well as printed documents to computer based text documents. In this we present two methods for the recognition of characters. First is the recognition by overlapped characters. Second method is Feature based character recognition.

Firstly the text document is scanned and processed under noise remover to remove any spurious noise. Then it undergoes X-axis segmentation to separate the horizontal lines and then Y-axis segmentation to separate the words and letters.

Recognition by overlapped characters in this method a wide variety of font styles of alphabets are combined to form a complex image of each alphabet.

Thus 26 different images of alphabets are formed. Then the segmented letters one by one is overlapped with these 26 images and the alphabet that overlaps the most is recognized.

Feature based character recognition in this method comprises of giving each alphabet specific features used to recognize them. Other features and mathematical algorithms are also applied such as aspect ratio, normalized area, center of gravity, slope etc. Every alphabet will have distinct features and will be recognized if these features are matched.

The software is also trained by using it continuously for the handwriting of a specific person and every time we use, it betters its accuracy. Our main aim is to put it as OPEN SOURCE so that further development can be done by others so that it can be used by educational institutions, schools, colleges, banks, and offices

Comp Sc-04 (Team)

An Integrated Approach to Human-Computer Interface

Anuj Bhardwaj

Ankush Gupta

Delhi Public School, R K Puram

New Delhi, Delhi

Abstract not available

Engg-01 (Jr)

A Height Adjustable Wash Basin

Somak Maitra

Kensri School

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One of the reasons for getting a back pain arises from the use of a sink/wash basin located at an ergonomically incorrect height. That is why I have decided to make a height-adjustable sink/wash basin that can be adjusted to the ergonomically correct height for adults with different heights, and for children. This can be done in a variety of ways. I have designed (on paper) a number of different mechanisms for adjustable-height sinks, and have looked at the practicality and the expected cost so as to start the construction of a model. I have come up with designs that use pulleys, threaded rods, and jacks. So far the most practical of them all seems to be a design with threaded rods. It consists of one/two rods, that are threaded and run the height of the wall. These pass through nuts that are fixed on the sink and when the rod is rotated, the sink moves up or down. This is a simple and user friendly design, apart from being cost effective. It can be installed easily, I believe. The only requirements are regular oiling of the nuts and bolts, and a strong electric motor to turn the rods.

I am currently working on a model of this particular design, as well as another one with pulleys. The details will be discussed at the time of presentation.

Engg-02 (Team) (Jr)

Electricity from Sea Waves Energy

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Heena Nakum

Shree G K Dholakiya Private School

Rajkot, Gujarat

We have prepared a design of a model which can help us to transfer the sea waves energy into electricity. For that first of all we have prepared a model, having 60 cms length, 25 cms breadth and 19 cms height. In the middle part of model we placed a turbine, which has 19 cm diameter. It contains 12 wings and each wing is 9.5 cms in length and 9 cms in breadth. This is also connected to a generator with the help a pulley, which is 19 cms in diameter.

When the force of sea waves (Kinetic Energy) dashes with a turbine there is an increase in the mechanical energy of turbine. The mechanical energy is converted into electrical energy when the force of sea water reverses back to the sea, it again causes the movement in turbine and further electricity can be obtained.

This above designed model can be arranged and placed in the coastal areas. As coastal area of Gujarat is longest we have selected 1000 m length 500 m breadth coastal area of Dwarka village situated in Jamnagar district. During the tide time the sea water level increases about 1 metre than the ebb time at the particular place. During the tide time, the sea waves covers the distance about 200 m than the ebb time at that particular place. Therefore 1km length from track has been designed to place easy movable turbine on it. After some mathematical calculation we have designed this type of model. If we are able to arrange this type of model, we can get a large amount of electrical energy.

Engg-03 (Team) (Jr)

Innovative Door Lock Alarm

Sivaraj Thanga Barath

Mohan Kumar Vasuki

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Kuppam, Andhra Pradesh

In this modern world safety is a big concern. Modern science has developed many safety devices, but most of them are very expensive and not easy to afford by every one. With this in view we started our project Innovative Door Lock Alarm. Our project aims at constructing easy to afford safety device and making the place safe even when we are not there.

This is a very simple device, which works on the basic principle of open and closed circuit. One end of the wire is soldered to outer part of the lock which is directly connected to buzzer. Other end of the wire, from the buzzer is connected with one of the terminal of power sources and other terminal of the power source is connected to the inner lock of the door. This device is also fitted with a special arrangement of electromagnetic relay.

We have modified it and now it can be controlled by remote.

When some one tries to break in with metal products the circuit will close and the buzzer will produce sound along with that light, automatically switch on.

We showed this to many scholars and important persons in our society they all appreciated this innovative door lock alarm.

Engg-04 (Team) (Jr)

Flood Proof Your Car

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Abhimanyu Vasishth

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The project aims at providing a simple and cost effective solution to prevent passenger cars from drowning in floodwaters each year. Most cars today use airbags for safety against crashes. Our hypothesis is that such airbags can be attached to the base of a car to enable it to float on water. Using the Archimedes principle, we derived the dimensions of this airbag considering the height and weight measures of 4 popular car models.

Calculations revealed that an airbag that covers 61 to 63% of the base area of a car (leaving aside space for wheels, exhaust etc.) and submerges up to 1.25 feet deep in water, will act like a raft allowing the car will float on it. This was tested by taking model cars of different sizes.

The airbag is fixed under the chassis and is inflated / deflated using a 12 V car air pump. We have demonstrated a prototype of a simple cost effective manual inflation system. We studied the present system of automatic inflation of safety airbags and found that, in addition to the air pump manual inflation, automatic inflation may be possible using water level sensors.

Various experiments were conducted to test for stability and a suitable anchor. Ropes were attached to the airbag to tie the car to stationary objects like electric poles, trees, post boxes etc. These ropes are also used to navigate the car in shallow water. Additionally, a sandbag anchor of about 25 kgs can be stored in the boot and dropped while being attached to the car with a hook. For further navigation, small foldable oars can be provided in the car for use when the water level rises. As an extension, this airbag can also work like a jack.

Engg-05

3-D Screens

Ashwin Gandhi

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This project is an attempt to make a 3 Dimensional Screen, to show images in three dimension, i.e. either a miniature, actual or an enlarged model-like image of objects. Not only will the images just appear to be in 3-D but they will be 3-D!

In this project, I am analyzing the possibility of using colloidal solution, as the screen. Using the concept, that colloids of different size, display/disperse different colors (light rays of different wavelength), I have tried to make images in the screen. At first, the solution will be transparent i.e. a blank screen. When one wants to create an image, say, an image of a cup, then he/she has to expand or contract few of the colloid particles in such a manner that they disperse the right color at the right spots of the screen to finally make it look like a cup when seen together. The colloids size can be changed by providing them with some heat energy (for this, the particles have to be highly heat sensitive cum elastic in nature) with the help of infrared waves, which maybe modulated for precision if necessary.

My research's primary objective is to study about the variation in colors with change in size of colloid particles and developing an effective way of expanding & contracting the particles with the help of EM waves. Further, it can be extended to study the effects of varying the colloid particles size on its motion (i.e. randomness or also known as "The Brownian motion) in the solution. In the near future, I might take few other important physical cum chemical factors like elasticity of substances and optical activity of solute into account.

Engg-06

A Novel Writing Aid – Lipi

Neha Sharma

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The project provides A Novel Writing Aid - LIPI (Letting Infirm to Pen their Ideas), a device for the infirm who find writing difficult, including senior citizens afflicted with any disease or injury limiting their ability to write, or those having physical impairment specifically that of the digits of the hand involved in writing process, or those who have either lost any of the digits of hand including thumb or have them missing, or the professionals and students whose writing for a long period of time results in fatigue of the digits and hand, and the likes.

Mathematical interpretation and analysis of the act of writing (under normal conditions) was worked out confirming the factors responsible for ultimate writing fatigue. To overcome the limitations, a suitable device was designed and developed. The prototype of this device was tried and tested by a number of persons with physical impairment, missing digits including thumb, and senior citizens.

The device eliminates the pinching (squeezing) between the two fingers while grasping the writing tool by avoiding contact between the tip of the finger and the writing tool. Thus, nullifying the force exerted which otherwise gets amplified while being passed on to the adjacent joints up to the palm. Further it helps in distributing the mechanical force all along the finger on which the device is worn, rather than exerting stress on to the joints, while writing. And above all, it limits the use of thumb during the process of writing.

It is light weight, simple, easy and convenient to use thereby makes the process of writing effortless.

Engg-07

An Innovative Oil Slick Controller Machine

Ranu Chouhan

Shard H S School

Anjad, Madhya Pradesh

The aim of this project is to control oil slick and recycle oil spread on the water surface after a large spill in sea or any water reservoir using minimum time, energy and cost. This can be done by a simple mechanism of arranging of equipments and applying the principles of Pascals law, Hydrostatic paradox and Hydraulic pressure.

I have made an effort to solve this problem with the help of a working model by applying scientific laws and geometrical analysis.

I have designed this model to collect oil from water surface for both current flow water of sea and static condition of water. To create a static condition in wavy water of sea, I have fixed an automatic hydraulic sensing system using 8 vertical plates to destroy all horizontal forces of waves and inclined meshes in inner volume of conical apparatus and between the outer shape and conical apparatus of machine.

To destroy effect of waves on whole apparatus I have designed it in a cylindrical shape by giving it triangular slots.

To get pure oil I have derived a formula for stream line flow of oil in helical cylinder and I have developed a formula along with a computer programming by which the time can be maintained to separate all oil of cover area of machine at once. This time can be maintained like 1 minute, 2 minutes.

I have derived an equation by which the size of machine can be easily modified. This concept is eco friendly and not more costly compared to other conventional methods. This concept can be used after a large oil spill where the conventional methods can be failed or affect to ecosystem.

Engg-08

Harnessing of Energy in a Simple Way

Arijit Deka

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The purpose of the project:

In the present day, the crisis of energy can be felt in everywhere in the world. So this is the time for us to focus on how energy needs can be fulfilled using eco-friendly ways. This has been the real motive of the project. This project aims at utilizing the heat of a building for harnessing of energy.

Procedure Used :

The entire project can be prepared in the roof of the building. A conical dome is set up above the rooftop. The main aim is to provide a system for natural draught of air to occur. One end of these pipes are fixed to the region of the house where ventilations are made and the other end fixed to the region above the base of the dome to facilitate the continuous flow of air throughout the building in order to produce a cooling effect. As the dome is heated up, the pull from the room increases. However if there is sufficient flow, then its kinetic energy can be utilized.

A turbine is fixed inside the dome which is rotated by air pulled from the dome. In case the volumetric flow is high then small turbines can be fixed at the mouth of individual pipes. The current generated is collected and brought to the pole from where it is supplied to the house.

The project mainly focuses on the natural draught, flow and velocity of air, heat transfer and cooling of the room. The cooling of the room depends upon flow of air from the room to dome, the heating of the dome, temperature and pressure difference at any time. Various engineering aspects needs to be considered.

Conclusion :

Presently this project has a huge future scope if it can be made a working as it provides a method to cut energy consumption by use of coolers and production of energy at the same time. Various new designs can be explored for different buildings.

Engg-09

High Efficiency Boiler

G R Suma

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Global warming is one of the toughest challenges of the 21st century. Our project is an attempt to save the lot of firewood and much of deforestation for water heating purpose. This is the way our project aimed to save the earth from global warming. This model is a water heating device, which efficiently makes use of only 500g of firewood to give 50l of hot water at 55°C. The innovative technology in this boiler is the design of combustion chamber and chimney, which means greater absorption of heat energy released, by the water pipes inside the chimney. The water pipes are arranged from combustion chamber to top of the chimney. Due to this most of the heat from the flames and the smoke is absorbed by water pipes and inner surface of the water jacket. Water jacket is insulated by glass wool.

FEATURES

It saves lot of fuel, money, it is eco friendly, in minutes we get hot water, temperature of hot water maintains about 36hrs, it is compact, portable and risk free. Scaling doesn't corrode the boiler. Completely it is made up of copper for long life.

MATERIALS: locally available copper tubes, copper sheets, MS sheets, brass tap etc..

"ITS EFFICIENCY IS 3 TIMES HIGHER THAN THE GUJARATH BOILER".

So it is suitable for both rural and urban areas.

Engg-10

Mechanical Water Level- Controller System

Jay Kagathara

Shree G K Dholakiya School
Rajkot, Gujarat

We have to on or off the switches of electric motor to fulfill the OHT (over head tank) with water in our home, in industries or multistory buildings in which by mistake many times there may be waste of water and energy both.

To stop this I have made a MECHANICAL WATER LEVEL- CONTROLLER SYSTEM (MWLCS). By this system the switch of the electric motor can turn on or off automatically according to the necessity.

For this I have taken cylindrical tank which has 36 cm length and 27cm diameter. On this tank I have fixed 27cmx16cm iron stand.

After this arrangements, I placed two vertical bushings named A and B at their places. Then after I joined the 37cmx1.5cmx0.2cm iron plate with a metal bar through welding which has 38cm length and 6mm diameter taking care that which the iron plate is joined straight with the metal bar. By this process the iron bar gets ready which has 240gms weight. On one side of the iron bar, I fixed a plastic ball of 13cm diameters weighing 60gm. I also kept an extra 500gm weight on the ball. So the total weight is 800gm.

I have fixed this iron bar in such a manner that it can easily trim between A & B bushings. After joining the electric switch of 5A with the stand, I also fixed the point D and E in the plate which is joined with iron bar. By this process at the maximum water level in OHT the switch will automatically turn off by point E and at the minimum water level in OHT the switch will automatically turn on by point D.

The level of water will go up when the OHT is filled full with the water with this process plastic ball and if it reaches on maximum water level the switch will automatically off. Similarly the level of water will go down when the water will be wasted from the OHT. With this process, the plastic ball and the iron bar trim down and if it reaches the minimum water level, the switch will automatically turn on. By this whole process we can automatically control the water level.

Engg-11

Sea Waves Energy

Rutvi Merja

Shree G K Dholakiya High School
Rajkot, Gujarat

My project deals with generation of electricity from sea waves.

These waves carry tremendous amount of energy the main Idea of the project is to convert the sea waves in to electrical energy. We get 24 hours energy from this project.

For this I had made stimulator model in which 1 regulator box of 4(L) X 3(B) X 1.5(H) Dimension is taken and then attached a coated steel frame on it. Pipes are arranged with Barings on both the side of fabricated steel frame. Then I had attached 5 to 6 Fry wheels on each pipe and also hang some weight at the other hand of the chain. When waves hit this system, the spheres move up and down. A rotor which is connected to the sphere through a pipe revolves in circular motion. Thereby enabling us to generate electricity.

Engg-12 (Team)

Automatic Switchover Unit for Conservation Of Water

Pratheeksha Tiebbae

Nimisha P J

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Earth is a unique and the only planet with water. But now water is becoming scarce everywhere. Harvesting and conservation of water has become the key words in today's industrialized world.

A cost effective method of conservation of water in domestic appliances is also very effective. This unit has been designed to prevent the wastage of the initial cold water coming out from the geysers and solar water heaters in the bathroom by redirecting it to the sump. It has been noticed that about 5 litres of water is wasted when water is heated to 65 degrees centigrade in a single storied building when the water heater is at a height of 10 feet. More the distance more will be the wastage.

A thermostat is placed in the device to regulate the temperature of water to one's requirements. This is an electromagnetic device which allows the flow of water below the set temperature into the sump. Only above the set temperature the water is allowed to flow into the bathroom. This is done using a 12 v DC single pole relay and solenoid valve. This device can be installed in bathrooms of apartments or multistoried buildings where there could be large scale wastage of water.

Engg-13 (Team)

Climbing Chair

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Structure:

A normal chair is taken and the seating is cut into 2 equal parts in the anterior end (referred to as S1 and S2) and joined at the posterior end. Behind the backrest, 2 cylindrical rods(R1 and R2) are placed held to the backrest by loops. The bottom part of these 2 rods have a rectangular base. Similarly 2 more cylindrical rods(R3 and R4) are placed below the 2 parts of the seating. They are fixed to the divided part of the seating with the help of loops and are free to move away from the undivided part. The ends of these 2 rods protruding at the posterior end have rectangular bases too. They are aligned in such a way that the bases of R1 and R2 rest on the bases of R3 and R4 respectively. The divided part of the seating is free to move up and down with the help of hinges which is fixed between the divided and the undivided part of the seating.

Functioning:

The chair is kept in the slanting position. When R1 is pushed down, R3 goes up. Since R3 is fixed only to the divided part of the seating that part of the seating goes up. When the chair is slightly pushed forward, the front leg of the lifted side of the chair rests on the upper step. This action is repeated for R2 also. As this action is repeated the next time, the back legs of the chair also spontaneously get lifted and rest on the upper step resulting in climbing action.

We have understood its mechanism through construction of a dummy model of the chair. We came across many practical problems which are now being rectified.

Engg-14 (Team)

Design of a Low Cost Single-Shot Hypodermic Syringe

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Kolkata, West Bengal

Our project is aimed at preventing re-use of disposable syringes (especially in poor countries). We propose a cheaper model of the hypodermic syringes which stops acting after the first use.

The front of the piston of the syringe is provided with a projection of appropriate length, covered by a cap-like socket in which the projection can slide. The inner wall of the socket has a ring shaped projection near its bottom which allows the passage of the piston head to pass only once in the backward direction. The inner diameter of the nozzle of the barrel is slightly more than that of the piston cap. The nozzle's inner wall contains projections at two places along its length.

When the piston is pulled back the medication is drawn in. Due to the presence of the projected obstructions in the shaft of the nozzle and also in the shaft of the piston socket, the (piston socket) system gets more elongated than before. Now, as the piston is pushed forward for the final injection, the top of the piston socket system gets stuck in a clasp-like projection present near the top of the nozzle shaft and is unable to be pulled back without breaking the syringe. Our model proposes that the needle is not detachable but fixed with the syringe.

Engg-15 (Team)

Shutter Siren

Abhishek M Maru

Kishan Alodariya

Mabuchi L G Dholakiya School

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We have prepared A SHUTTER SIREN which can be used as a Security System. For that we have prepared electro mechanic system in which we have joint wire A with an LED and wire B with circuit chip. We have divided the wire of charging connection in two parts. Now, we arranged the wire that shows signs of operating the circuit with wire of LED. Further, wire is divided from the push up switch in three parts. Then the names A, B & C are given to the wires. Now from these wires, A wire is joined with battery and the others (B and C) are joined with circuit. Now, we took two wires for speaker. Both the wires are joined with circuit. Now, we joined cut-out of two wires with connecting pin of telephone with circuit. At the end, we joined battery with the circuit wire. Then after we took an iron box. We made three holes in both the sides of the box. We put an LED on one side and also the other side of the box and fix a charging pin to charge the system. We joined connecting pin of telephone at the other side of the box. In this circuit we put rechargeable battery of 27 w (6 v & 4.5 A) inside of the box. On the other side we put a lock. We arranged a speaker, a cut-out on LED (out-side), a push up switch, an iron bar and a spring beside it. To all these things we arranged a wire. Then we closed the circuit box carefully and fixed appropriately with the screw. Then after we have prepared a mini model of shutter and we have fixed a circuit on the bottom of the shutter so that when the shutter is closed down it will push the iron bar. So, afterwards when the shutter will open at that time the circuit will be completed and it will start working. Now, it will start the siren of the initial stage and then dial the number which was last dialed.

Engg-16 (Team)

Stop Reuse-Save life: A New Model of Disposable Syringe

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Krishnendu Chowdhury

Dum Dum Kishore Bharati High School

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Nowadays, the injection syringes which are available in the market are being reused. The goal of our project is to prevent this malpractice. So, we have devised a disposable syringe in true sense. We got the idea from water lock gate system. We are using two steel made plates and two hinges in this system. The hinges and plates are situated in the upper portion of the syringe. The hinges can open up to 90° angle. In the folded position the plates remain in the extended portion of the syringe. When the piston passes through this portion, it removes the plates and makes its own way. When the washer is in the top position the plates open again like first position and blocks the way. After that, the piston is locked by the previously mentioned hinge and can not be pulled back. We hope that our innovation will protect the reuse of syringes and will decrease the chances of contamination of diseases.

Env Sc-1 (Jr)

Green Plastics

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Plastics have become a part of our lives. Life would certainly be very difficult without them.

The magnitude of the plastics industry, however, is itself a cause for concern. The pressures of increasing waste and diminishing resources have lead many to try to re-discover natural polymers and put them to use as materials for industry. As a result, there is increasing interest in the promise of a new generation of green plastics. My project aims at preparing vegetable origin plastic. I used different vegetable resins like tapioca, potato and beaten rice powder to prepare a plastic film.

This plastic can be used for dry packaging. It is biodegradable thermoplastic. I used extract from the vegetable mixed it with an acid , a base and a plasticiser was added. I could get a plastic film from the vegetable resin.

Plastic film obtained from the tapioca was found to be the best. In this project I am using Plant products which are eco friendly. Since they are biodegradable it will become a solution form global warming. This project if it is carried at a large scale, definitely it will improve rural economy.

Env Sc-02 (Jr)

Build Bricks with a Difference

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Experiments were performed to determine whether there is a low cost, low tech way to build homes out of recycled paper. Blocks were made with a mixture of recycled paper, concrete, sand and water in varying ratios. My hypothesis was that recycled paper can be made into homes in a low cost, low tech way. Test was performed to find the maximum rate of stress that the material could withstand without failure and compare those results to the minimum standard for the rate of failure of the most comparable building material, brick.

My conclusion is that paper bricks would most likely be a strong building material. It could also be used as a substitute for wood that would also provide good insulation.

Env Sc-03 (Jr)

Composite Boards from Audio Cassette Tapes

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The audio cassette tapes are thrown off and are not recycled. The audio cassette tapes are made of plastic and it is a polyester polymer. This causes drainage and creates problem to eco-system.

The audio cassette tapes were soaked in sodium hydroxide 20% for 24 hours. The cassette tapes were removed from NaOH and were washed and kept for drying. After drying it was then melted. Pellets made were melted and to it varying ratio of coconut fibre powder was added to make boards. Colour pigment was added to make boards colourful. Thus this product can be used for various applications according to the requirement. We can make agricultural materials, construction materials, stationery etc.

Env Sc-04 (Jr)

Controlling Pests in an Eco Friendly Way Using Marigold as a Natural Pesticide

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Due to increasing eco-consciousness, people are trying the traditional methods of using plants products as pesticides. They want to eliminate their use of toxic pesticides as they are aware of their harmful effects. During my study on plant pesticides, I came to know that some gardeners plant marigolds around the vegetable fields to repel pests. This means these plants have the capacity to control pests. Marigolds release chemicals that discourage pests from infesting nearby. They have several compounds including volatile chemicals called thiophenes that kill the larvae and adults of insects. Certain species of marigold release compounds like β -tertiophene from their roots that are toxic to some species of nematodes.

As marigold plant shows pesticidal property, it can be used as a pesticide. Here, I propose a simple way of making marigold pesticide.

Mash 1 cup (225 ml) of marigold leaves and flowers. Mix with 500 ml of water. Allow the contents to stay in water for 2 days. Stir the contents 2-3 times a day. Strain through cheesecloth. Dilute it with 1.5 litre of water and 5 ml of castile soap (an organic soap prepared with vegetable oil). This spray was tested on plants challenged with the pest *Spodoptera litura*.

Details of observations, result and conclusion will be discussed.

Advantages of using marigold as a pesticide:

- Non poisonous to humans and livestock.
- Doesn't harm the environment.
- Pests find it difficult to develop resistance to this natural pesticide.
- Cheap and easy to prepare.

Env Sc-05 (Jr)

Identifying the Fabric by Burning Test

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Generally the cloth items are sold in India by mixing the inferior (cheaper) fibre with the pure (costlier) fibre. It is difficult for the consumers to identify this adulteration during the purchase and therefore they get cheated easily on regular basis.

This simple method of identifying the fabrics in the cloth sample (usually threads of fibre), utilizes the burning property of different fibres. During the test I observed the characteristic burning of different cloth samples including the smoke and the ash obtained after burning. These observations were compared with the available standard burn-test log sheet for different kind of cloths and then the conclusion was made. I was able to identify whether the cloth material is pure silk, cotton, wool or a mixed fibre in the various samples obtained from shopkeepers, tailors etc

As we can see this method does not require any specific equipment, laboratory or technical information to check the cloth material and therefore can be easily done by the purchaser to ascertain the authenticity of the cloth.

Env Sc-06 (Jr)

Hing is King

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Use of artificial fertilizer has not only degraded the soil fertility but also made it pest prone. Hence a bio pesticide is the need of the hour.

A solution made with a mix of asafoetida, Lantana camara, neem, custard apple seeds, Clerodendrum inermi and turmeric powder can be used as a bio pesticide since they contain strong pungent smell. This can repel away the pests/bad soil microbes and control diseases. The effect of this solution was experimented in different proportions on fenugreek and coriander. (Fenugreek was used as white patches can be seen on the undersurface of its leaves and coriander seedlings are ants prone.) This was sprayed once in 5 days. The height of the plants was measured. A row of plants on which the solution was not sprayed was taken as control.

In the process, a mix in the right proportion had shown good results in terms of plant height and pest attack was minimal-to-zero.

This solution can be used more effectively on fruit-boring plants like brinjal.

CONCLUSION:

Detailed findings of this study assessed the ability of using the above ingredients in right proportion as an eco friendly bio pesticide.

Env Sc-07 (Team) (Jr)

Making Prototype Photo Bioreactor and Simple Method for Testing Carbon Capture

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Excess of CO₂ >600 ppm in air causes adverse health effects in persons working in closed buildings. Photosynthesis is natural process of converting CO₂ to Oxygen by green plants in presence of sun light. Our hypothesis was to make prototype Photo bioreactor (PBR) using algae and light to convert CO₂ into O₂ and develop simple method to test its feasibility for carbon capture. PROCEDURE: We built a prototype of photo bioreactor <PBR> by taking Blue-green algae in water (500ml) and ammonium phosphate(0.5g) in wide mouthed glass bottle(1L) and used 14W CFL as light source and mirrors as reflectors. Aerator was used to pump CO₂ present in air into the PBR. For testing CO₂ conversion to O₂ by algae in PBR, we proposed simple method based on time taken (t) for neutralization of residual CO₂ in air coming out of PBR with known amount dilute alkaline solution (0.005g/ml, 10ml) containing phenolphthalein indicator which changed from pink to colorless on completion of neutralization. Control experiment without algae was also done to get the data on time taken for neutralization of CO₂ in air coming out of PBR.

DATA: Time taken for neutralization of NaOH solution by residual CO₂ in air from PBR

S.No	Control	Experiment	Algae in	PBR
1	25 min	50 s	26 min	10s
2	26 min	50s	27 min	20s
3	24 min	55s	25 min	34s
4	25 min	34s	26 min	10s
5	26 min	20s	27 min	05s

25.90 min (Average) 26.46 min(Average)

CONCLUSION: The above data shows that simple method based on neutralization of dilute NaOH solution by residual CO₂ in air has been developed to test carbon capture in prototype photo bioreactor. There is marginal difference in time taken for neutralization of residual CO₂ in air coming out of PBR in comparison with control experiment. Thus, additional experiments with more algae to be used in PBR are required to prove efficacy of CO₂ capture by PBR.

Env Sc-08

Best Way to Recycle Left-Over Paint

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Excess paint is generally a waste and is abandoned causing a lot of environmental hazards. Thus, this prompted me to make use of paint and cement to create better concrete blocks.

The objective of this experiment is to make use of paint and cement to create concrete blocks and test their compression strength, water resistance and heat resistance.

To show this experiment, three mixtures were made. To make these mixtures, 1500g of cement and 500ml water was mixed to make a paste. In the first mixture, 350ml of water was further added to the paste. In the second mixture, 75ml of paint was substituted in place of the 350ml of water, to the paste. In the third mixture, 125ml of paint was substituted in place of the 350ml of water and 75ml of paint, to the paste.

These mixtures were then poured into 3 round moulds with diameter of 3 inches and thickness of 1 inch, and 3 cubic moulds of 4 inches by 4 inches, to create concrete blocks. Water was sprinkled for first 3 days on the blocks for curing purpose. These blocks were then kept for 7 days to dry. The compression strength of the blocks was tested with the help of Universal Testing Machine, ranging at 30ton*0.1 ton. The blocks were submerged in water for 24 hours to test their water resistance. The blocks were heated with help of a burner for 40 minutes to test their heat resistance.

It was observed that the compression strength, water resistance and heat resistance of the third block increased, when paint was substituted for some of the water.

Env Sc-09

One Step Gold Nanoparticle-Based Sensing and Removal of "Silent Killer" Heavy Metal Ions

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Heavy metals are ubiquitous in nature, thus constituting a serious environmental problem. Divalent lead, mercury, nickel, lead, cobalt and cadmium ions pose significant public health hazards when present in drinking water at parts per million concentrations or higher.

The chemical inertness and resistance to surface oxidation make gold an important material for use in nano-scale technologies and devices. This property is crucial when particle size approaches the nano-scale and the dominance of surface atoms results in an enhanced chemical reactivity

We present a one step strategy for using gold nanoparticles tailored with 4-aminothiophenol (ATP) for the sensing and removal of heavy metal ions, by monitoring changes in optical absorbance upon the addition of heavy metal ions. We used ions such as Hg_2^+ , Cd_2^+ , Co_2^+ , Pb_2^+ and Ni_2^+ in aqueous solution and were able to detect their concentrations up to femtomolar level.

Addition of 4-ATP to aqueous solution of gold nanoparticles results in the formation of chain like structure. The addition of heavy metal ions to these chains shows a red-shift in optical absorption of gold nanoparticles. The shift was observed as a result of ribbon formations due to adsorption of metal ion on the surface of gold nanoparticles. Adsorption was found to be highly dependent on the pH of the medium. Various techniques such as HRTEM, SEM, FTIR, and AAS were used for characterization. This is a simple approach for the detection of heavy metal ions in the water sample up to concentrations as low as 10⁻¹⁵ M spectroscopically and electrically i.e., by measuring the electrical conductivity. The optical absorbance behaviour of the resulting nanoscale aggregates has been enlightened. This experiment reveals that the presence of heavy metal ions can be detected by physisorption of the heavy metal ions on one of the free amine groups present on the gold nanoparticle.

The amine functionalized gold nanoparticles were also used for the removal of heavy metal ions from the potable water. The experiment was monitored by making use of AAS technique.

Env Sc-10

Latex of Calotropis Gigantea as Natural Fungicide

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I have prepared natural fungicide from latex of *Calotropis gigantea*. First of all I have checked effect of latex of *Calotropis gigantea* on Tulsi leaves (*ocimum*). After that I have done an experiment on fungus *Aspergillus Niger*. I made the mixture of latex, neem oil and water. And stirred it using a stirrer for 5 minutes. Then in four Petri dishes I have taken PDA (Potato Dextrose Media) as medium. Then using a rod attached to a loop of metal wire I strucked spores of *Aspergillus Niger* on Petri dish, and spread the spores using a glass spreader. I am using two methods.

1. Paper disc method
2. Ditch method

In first method I had taken two petri dishes and dipped the 1st blotting paper in neem oil and second in mixture of latex and neem oil and kept the blotting paper in center of petri dish. I have seen 0.5 cm zone of inhibition. In second method I had taken two petri dishes I have made a hole of 1 cm in the medium and I had put 0.2ml mixture of latex and neem oil and 0.2ml of neem oil in hole. I had seen 0.4 cm of zone of inhibition

I wanted to check anti-fungal activity of latex of *calotropis gigantea* so in this experiment I have removed neem oil and cow urine. I checked its effect on different fungi growing on bread, then I have taken 4gm chloramphenicol yeast glucose agar in 100 ml of water. Then I digested media and kept it for autoclaving. Then in two Petri dish I poured equal amount of media and kept it for solidifying for 10 minutes, this is base media. Then I made culture solution and made same media second time and mixed the Culture solution with media. Then I poured these media on base media and dipped four-four blotting paper of 0.5cm in latex and kept it in both the petri dishes. For incubation I kept the petri dishes in an incubator for three days, after three days I saw that there was 1 cm of zone of inhibition. You can see it in photographs. And now onwards I will experiment only on latex.

Env Sc-11 (Team)

Building Grey Water Greens

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Households in large cities generate huge amount of grey water (the water that has been used once for washing and cleaning). At the same time many households use more water to keep their lawns and gardens green than they use for cooking and drinking altogether.

We did an experiment to study the impact of grey water on plant life or ornamental plants that we grow in urban landscapes. Five water samples were created having different concentration of grey water collected from second wash of the washing machine. These samples were Control, 100% Normal tap water, 100% Washing machine water, 75% Washing machine water + 25% Tap water, 50% washing machine water + 50 % Tap water and 25% Washing machine water + 75% Tap Water.

Five sets of pots labeled as Control, A, B, C and D were filled with pulverized soil rich in fertilizer and sunflower seeds was sown. Sunflower plant seeds were chosen to do the experiment since it has large leaves and one can observe the impact of the grey water easily. Pots were watered with 100ml of respective water samples. Developments were recorded like no. of leaves, size of each leaf, height of plant, withering of leaf, and drooping of shoot.

Simultaneous experiment was conducted on fully grown up sunflower plants and any changes like drying of leaves, spotting on the leaves, leaf turning yellow was watched and recorded regularly. To widen the horizon spinach seeds and kidney bean seeds were also used to observe their growth patterns.

It was observed that the 100%, 75% and 50% samples were not conducive for the growth of the seeds. Only the control and 25% concentration water facilitated the seeds to germinate and grow and support the grown up plant.

Env Sc-12 (Team)

Conservation of Energy Through Dry Leaf Pads

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Science and technology has revolutionized almost all domains of our lives. The development of Science and Technology has led to an all-round development of society. But there is always a darker side to all inventions. Now the world is facing the ill effects of the use of electric and electronic gadgets and it is adding to the already advancing global warming. With this in view, we have undertaken our project, trying to find out if we can in any way, reduce global warming.

Our project aims at:

1. Studying the cooling effect of fallen dry leaves.
2. Manufacturing leaf pads with longer durability.

For experimentation, we made two cardboard house models with fiber roofs, fitted with thermometers one was kept as control and to another we kept a leaf pad made out of peepal dry leaves beneath the roof. This setup was kept in the sunlight for 4 - 5 hours, we measured the temperature for every 30 minutes. Our project has got a scope to utilize the fallen dry leaves for making of pads, which can be used beneath the roofs, windows and doors.

Origin of Idea: Last year our seniors won the special award for the project, Cooling Effect of Green Leaves Pads. They inspired us and motivated to take up the project to next level. This initiated us to start our project and keeping our environment in view, we selected fallen dry leaves.

Env Sc-13 (Team)

Eco Friendly Particle Board Made From Agricultural Waste Using Natural Binder Derived from Spoiled Garlic

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This project aims at deriving the natural binder from spoiled garlic and using that natural binder to make particle board from agricultural waste. The maximum life span of garlic is about 6 to 8 months. So every year lot of spoiled garlic is found in marketing yards and from farmers. And every year the agricultural waste which is remained on the farm after harvesting the crops, is burnt by the farmers. So it spreads air pollution. The main advantage of our process is that synthetic binder was not used during the whole process like urea formaldehyde and phenol formaldehyde. Secondly we have tried to utilize the agricultural waste by making particle board from it. And the binder which we have used in making the particle board from agricultural waste is also made from spoiled garlic.

Process-1 (making natural binder from spoiled garlic): We collected 250 g spoiled garlic bulb and put it into the pressure cooker. After that one litre water was added to it. It was heated on a stove till the volume of water does not become half. Then this boiled mixture was crushed in a kitchen mixture. After that again 500 ml water was added to it and was heated in the pressure cooker till the volume of water doesn't become half. Then that mixture was constricted with the help of cotton cloth to collect the extract in the liquid form. We got nearly 500 ml extract in liquid form. After that we boiled it in an open vessel till it becomes thick paste. Then we got nearly 80 g binder.

Process-2 (making sheet from agricultural waste using natural binder): We collected agricultural waste like cotton straws, wheat husk, groundnut husk, castor straws, etc. and dried it in open sunlight. Then we crushed and pulverized it to convert it into powder form. After that we took 80 g agricultural waste powder and mixed uniformly the 20 g of binder made from spoiled garlic with it. Then we fed this mixture into the mould and gave appropriate pressure and heat on both the side simultaneously with the help of vulcanizing press. Then we took the sheet out of the mould and kept it for self cooling.

Uses: We can utilize agricultural waste for making particle boards. We can also utilize the natural binder in place of Urea formaldehyde, Phenol formaldehyde etc. to make any type of particleboard. Such particle boards can be used in furniture applications.

Env Sc-15 (Team)

Natural, Eco-friendly & Cost- Effective Plant Pest Repellent and Tonic

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An abundance of scaly insect-pests such as mealy bugs, aphids, mites, whiteflies, thrips feed on the plant sap of vegetables(e.g. Okhra, Brinjal, Gourds, Tomato) & fruits(Lychee, Mango, Guava, Citrus), weakening/killing it, severely affecting horticultural productivity and farm livelihoods. To combat this, we studied the characteristics of various pests & properties of some naturally occurring commonly available items & applied these successfully to the relevant field cash crops.

The base ingredients used:

soap-nut - insecticidal soapy cleaning garlic - strong repulsive smell & therapeutic value tobacco leaf, neem oil, asafetida & turmeric powder - repellents & healants They were processed using common farm tools to get the respective decoctions that were sprayed sequentially on the infested areas of multiple crop & pest types in particular cycles: the effects were very positive each time, convincing us of our success in creating an inexpensive, simple to make, safe, eco-friendly, reusable & effective botanical insect repellent cum tonic.

Partnering with farmer-interest-groups & agro-service operators, we interacted with hundreds of farmers to explore, experiment & test the applicability of our innovation (& alternates), learnt about potential business models, cost/revenue streams & the challenges/opportunities/benefits of large scale distribution. We studied issues related to effective production & distribution techniques & use of ICT to enable efficient, seamless, integrated scalable operations.

Given the initial success, grass-root partnerships & market acceptance, we hope to reach the benefits of improved yield and quality of produce, to a larger number of horticulturists & consumers in a sustainable manner.

Env Sc-16 (Team)

Role of Aquatic Plants in Maintaining Oxygen Levels

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Plants prepare their food through a process called Photosynthesis. In this process oxygen is released as one of the by-product, which plays a vital role in life process. Similarly in water bodies Phytoplanktons release oxygen required for aquatic organisms. The oxygen level changes from pond to pond. Physical, chemical and biological factors can bring a change in the oxygen content. It depends upon the type of Phytoplanktons and aquatic organisms in the pond. Our project aims to analyze the role of plants in oxygen liberation and suggest the best natural source of oxygen in aquaculture and aquarium.

We selected 3 types of phytoplanktons 1. Floating plants, 2. Submerged plants, 3. Algae

We collected different types of plants from above phytoplanktons. 20grms of each plant were kept in separate bottles filled with tap water. These bottles were kept in the sunlight for 3 hours. Then the oxygen levels of each plant was measured

-by Winkler's method. Further, we studied the Chlorophyll amount for these aquatic plants using colorimeter. Our research will be helpful in improving the aquatic life and their ecosystem by planting the appropriate plants in the water body.

Maths-01 (Team) (Jr)

Fraction Percentage Pan Balance

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This activity aims at providing pupils with a range of experiences that challenge them to articulate their thinking and reasoning about fractions and percentages. It helps to understand percentage as the number of parts in every 100 and to express simple fractions such as one half, one quarter, three quarters, one third, two thirds, and tenths and hundredths, as percentages (e.g. know that $1/4 = 25\%$).

Procedure Used

Two bottles with equal volume of water are fixed on to the stands. One of the bottles is graduated in fractions (The height is divided into 5, 10, 20 equal parts on separate strips of paper and glued to the bottle) and the other in percentages respectively from the top to the bottom. Two empty bowls of the same mass will be placed on a pan balance. Water from one of the graduated bottles will be poured into one of the empty bowl with the help of a pipe and a stop cork. To balance the pans, some amount of water should be poured into the other bowl. Once the pans are balanced, the graduated bottles will show the equal value of a fraction and its corresponding percentage.

Practical Applications

This is a learning tool that can be used in the Math Lab to learn the relationship between fractions and percentages. This can be modified with different graduations to compare fractions. The tool can be used to learn equivalent fractions also. This is definitely an aid which will help the students' community in visual learning and help the teachers also, as teaching and learning go together.

Maths-02

An Improved Tool for 'N'-Secting an Angle

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A simpler and much improved mechanism to divide an angle into any number of equal parts has been developed by me, rectifying the flaws of my previous year's "Compass to n-sect an Angle". This instrument consists of a disc and an adjustable rod is attached perpendicularly to the centre of the disc. The other end of the rod is fixed to a needle (supported by stands) with the help of a ball-and-socket joint and the mechanism is made such that the rod can move in all directions pivoted at a point. The disc is inclined to the vertical at a certain angle. When it is rotated on its axis, the centre of the disc also traverses a circular path, with the point of attachment of the rod as the centre.

The needle and a certain point on the disc touch the plane of the paper. Let the distance between these two points be 'd'. Assuming that the disc purely rolls, the angle rotated by the disc and that by the rod are respectively in the ratio of the radius of the disc and the distance 'd'. Thus an angle can be divided in any ratio.

Maths-03

Spidrons

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A spidron is a plane figure consisting of an alternating sequence of 2 kinds of isosceles triangles. In my project, I have looked at the mathematics behind spidrons and have established mathematical results relating to the sides and area of a spidron. The following mathematical results have been proven-

- For a spidron formed from a regular polygon the ratio between the sides is $1/2\cos(x/2)$ where x is the angle of the polygon.
- For a spidron made from an isosceles triangle which is a part of a regular polygon, the ratio is $\cos(x)/\sin(x/2)$ where x is the base angle of the isosceles triangle.
- The area of a spidron formed from a triangle and a square are equal to their parent figures.

I have also studied spidrons as fractals and calculated the dimension for a spidron fractal which turns out to be 2.1619. Further, I have used different spidrons from regular polygons to tessellate a plane. I have also looked at what happens to a beam of light when it enters a glass slab shaped in the form of a spidron. In case of some angles of incidence, total internal reflection takes place. This phenomenon can be used in photonics especially as optical memory.

Maths-04 (Team)

Multipurpose Equations Adjoining Music and Mathematics

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Our work is mainly, on the properties of musical instruments based on tempered chromatic scale (T.C.S) [a musical scale, where the frequency of tones are in G.P.].

- We got that, frequency of tones in a musical scale must be in G.P. to result the most soothing music.
- We found the general equation for determination of unknown frequency true to any musical instrument based on T.C.S, where T_{ya} is frequency of a tone in a^{th} octave with position y in it and p is the no. of tones in an octave.

$$\log_2 T_{ya} = \log_2 x + a + \frac{y}{p}$$

- We have deduced a relation between common ratio(r) of T.C.S and no. of tones (p) in an octave:

$$r = \sqrt[p]{2}$$

- We have coined the concept of pretone (x), a tone situated just before the lowest tone of the lowest octave and it is a constant for every particular musical instrument.

$$x = \frac{f}{\sqrt[p]{2}} \quad [f \text{ is the lowest frequency}]$$

- We found relation between relative position (R) of two tones and no. of tones(p) in an octave.

$$R = g.p + t$$

Where,

- 1) $(1-p) \leq t \leq (p-1)$
- 2) $g=0$ or $g=$ +ve integer
- 3) $t= 0$ or any integer

Giving results :

- 1] g is the difference between two octaves, t is difference between position of two tones.
 - 2] There will be only two values of g corresponding to two values of t , which satisfy the equation (1).
- For a particular musical instrument, if parallel straight lines are plotted, given by the equation(1) for different values of R , then we will only get two points on each of them, satisfying the equation(1) and distance between the said points on each straight line will be same and in the form $A \propto R^2$
 - The area(A) intercepted by the straight line given by equation(1) between the positive direction of x axis and y axis, is proportional to the square of relative position(R) between two tones. $\sqrt{p^2 + 1}$

We got that :

- 1] Product of deflections is either greater or less than zero.
- 2] Summation of n deviations is always greater than or equal to absolute value of difference of $(n+1)^{th}$ deflection and deflection.

[Interval : ratio of frequencies of two adjacent tones in any musical instrument other than T.C.S.

Deviation : difference between two consecutive intervals.

Deflection : difference between common ratio of T.C.S and intervals.]

The above results help us analyse music better.

Physics-01 (Jr)

Investigation of a Configuration of Magnets Used as a Spring

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The aim was to study a repulsive arrangement of ring magnets as spring. The experimental setup consisted of a stabilising rod to prevent magnetic poles aligning to their natural state thus ensuring that the magnets remained suspended repelling each other.

To investigate the variation of the force with distance between magnets, different loads were applied on these magnets, and the distances between magnets measured. The variation of the gap with load was found to be non-linear. Such experiments were performed for 2, 3, and 4 magnet configurations.

These simple measurements helped me correlate the effect with the Hooke law. Additional magnets may be used to alter the stiffness of the spring. This combination can be used as shock absorbers. Modifications to these can be studied to explore possibilities of making a low vibration table for sensitive experiments.

I plan to extend this study to multi-pole arrangement to explore low friction magnetic couplers and clutch mechanisms to transfer energy. Some preliminary results are shown in the details attached.

Physics-02 (Jr)

Wind Screens

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This project is all about getting rid of the fog formed on the glasses of vehicles during rains. In this project two glasses are placed instead of one glass. Two glasses have to be attached parallel to each other.

WORKING

Fog formation is when the external temperature decreases then the internal temperature. Due to vacuum present, heat doesn't travel and results in zero fog formation.

EXPERIMENT DONE:

I tried designing a wind screen like a cathode ray tube which is narrow in dimension and has a vent to be used for vacuumising. Once the air is removed it serves the purpose and I did spray cold water on the outer surface and there was no fog formation. Now I have an idea to use LCD screen and vacuumising it.

Physics-03 (Team) (Jr)

The Best Oil for Lamp

Dharani Palani

V Supriya

Z P H School Gudipalli
Kuppam, Andhra Pradesh

Oil lamps are not a new concept. From very early civilization, they have been a part of our Still many people in developing world, especially people in remote areas and people in hilly regions depend on oil lamp for lighting. This influenced us to undertake our project The Best Oil for Lamp.

Our project aims to analyze: 1. Consumption rate of oils and intensity of light emitted by burning oils lamps, 2. Role of capillary action, 3. Study different lamps, 4. Develop better oil lamps.

We constructed the experimental chamber. For every 10 minutes interval we measured the consumption rate of different oils and intensity of light emitted by them in a common lamp. Our results showed that sunflower oil is better as it burns with uniform intensity and consumption is less.

We repeated the experiment with different types lamps fueled with sunflower oil. Based on our experimentation we developed an Innovative Lamp.

Every time we light lamps in prayer, we wondered why the brightness of lamp differed. We began to think if oils and lamps had any effect on it. We took the initiative and began working on this.

Physics-04

The Study of Viscous Forces on a Liquid

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Different liquids have different densities, and so the resistance offered by each of these liquids is also different. This effect was studied by dropping ball bearings in these various liquids which were contained in tall containers. The time of fall and the distance of fall were recorded. A minimum of six readings were taken for each of the liquids. The experiment was then repeated with ball bearings of two different sizes, apart from the one that was used earlier. The result was that as the density of the liquid increased, the resistance offered by the liquid also increased. When the size of the ball bearing was increased, the drag forces on the ball bearing also increase due to increase in the surface area of the ball bearing.

The physics behind this is that, as the ball bearing falls through the liquid, its velocity keeps changing because the weight of the ball bearing is acting vertically downwards, and an opposing force is acting upwards. When the density increase, the number of particles opposing the downward motion also increases and therefore, the resistive force also increases and so, the ball bearing takes longer to fall through a liquid with a higher density. So viscous forces, therefore, depend on the density of the fluid and the area of cross section of the body travelling in the fluid

Physics-05

A Novel Cow Dung Based Microbial Fuel Cell Using Inexpensive Proton Exchange Membrane and Graphite Electrodes

Vishnu Jayaprakash

Chettinad Vidhyashram
Chennai, Tamil Nadu

In my previous project/venture, I made cost effective and efficient Microbial fuel cell (MFC). The innovation came by the way of using inexpensive graphite electrodes for my Cow-Dung based Fuel Cell (CDFC) which is 90% cheaper than average MFCs, costing only 5\$ while providing improved efficiency when compared to other MFCs around the world. The application envisaged for my CDFC is for lighting in rural villages using ultra-bright LEDs.

The current research focuses on replacing the Proton exchange membrane (PEM), Nafion® (costs approximately 1000\$/m²) which is the only expensive part of my CDFC, with other PEMs. In my trials I used different membranes like Sulphonated-Poly-Ether-Ether-Ketone (sPEEK), (CMI-7000*) and (AMI-7001*)[*Obtained from Membranes International Inc].

It was found that CDFCs using CMI-7000 & AMI-7001 gave 13% more voltage when compared to CDFCs using Nafion®. Their power densities are ~ 2 W/m² and 1.6 W/m² while their current densities are ~ 2.5 A/m² and ~ 2.1 A/m² respectively. This is to be compared with the CDFCs fabricated using Nafion®, for which the corresponding quantities are 756mW/m² and 1240mA/m². In addition, they are 80% cheaper than Nafion®. These new set of membranes used in my CDFC make it more efficient while reducing the overall cost by 40%. The longevity of my CDFCs remained unchanged at 4 days.

Simultaneously I am attempting to make an indigenous membrane using different polymers such as sPEEK as they promise to be cheaper than the imported membranes. I am trying to identify all the bacteria which contribute to power generation (exoelectrogens) and increase their presence in the anode to increase the efficiency of my CDFC. I believe, these changes will make my CDFC more economical and efficient for lighting in rural India.

Physics-06

A Study on the Reflection of Electromagnetic Waves from Two Reflection Type Diffraction Gratings

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Diffraction gratings are useful in infrared spectroscopy and can also be useful in the microwave bands, for astrophysical research. Gratings of special designs would be necessary for the purpose.

This project is a theoretical study of the properties of two special designs of reflection gratings, regarding their screen intensity distribution pattern (IDP). The anticipation is that the gratings would be useful as dispersing element in the far infrared and microwave bands.



Grating 1



Grating 2

For grating 1:

$$I = I_0 \left(\frac{\sin^2 \frac{k a \sin \theta}{2}}{\sin^2 \theta} \right) \left(\frac{\sin^2 k N a \sin \theta}{\sin^2 k a \sin \theta} \right) \left(\cos^2 \frac{k d [(1 + \cos \theta) d + a \sin \theta]}{2} \right)$$

I is the intensity, I_0 is a constant, k is the wave propagation constant, θ is the diffracted angle, N is the number of grating elements.

The derived intensity expressions tell us that IDP depends not on the absolute values of a , d and wavelength of the incident radiation λ but on their ratios. We use two ratios

$\lambda/a = \lambda'$ and $\lambda/d = \lambda''$

with $a=d$ and $N = 5,10,15,20$; I vs. θ , plots were obtained.

$a = d = 1$ was used.

$-10^\circ \leq \theta \leq 10^\circ$, considering the mathematical approximations made in the derivations

Intense side bands were obtained for $\lambda' = 0.01$ to 0.1 ($N = 10,15$) and $\lambda' = 0.10,01$ to 0.07 ($N = 5$).

For grating 2 :

$$I = I_0 \left(\frac{\sin^2 \frac{k a \sin \theta}{2}}{\sin^2 \theta} \right) \left(\frac{\sin^2 \frac{k d (1 + \cos \theta)}{2}}{(1 + \cos \theta)^2} \right) \left(\frac{\sin^2 \frac{k N a \sin \theta}{2}}{\sin^2 \frac{k N a \sin \theta}{2}} \right)$$

This design did not secure good results

A method has been designed that allows simultaneous variation of a, d, λ, N and corresponding variation of the nature of the IDP can be observed.

Ratios $d/a = m_1$ and $\lambda/a = m_2$ are introduced.

$a = 1$ is used.

A special transformation function converts each ordered pair $(m_1(1), m_1(2))$ into one single unique numerical entity (V) , (restrictions imposed).

$$V = m_2 + 4^{m_1 - 1}$$

An index E represents the nature of the IDP concerning the side bands for $-10^\circ \leq \theta \leq 10^\circ$ in a qualitative sense with a number.

A FORTRAN program creates a data file of the corresponding E, V, m_1, m_2 and N .

E vs. V vs. N plots and V vs m_1 vs m_2 plots will give us the $(d/a, \lambda/a, N)$ sets for grating 1 which give good results.

Resolvability, dispersion, free spectral range, missing orders are topics of further study. The program for grating 1 has to be executed. Practical experimentation also has to be done with for grating 1.

Physics-07

Increasing the Life of a Burning Candle

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A candle is household material to get light.

Candle burns to give light, heat and CO_2 with vapors of unburnt wax. Burning of candle under suitable conditions of temperature, wick height, material in surroundings and radius of the candle minimizes the loss of wax and thus increases the life of a burning candle. I conducted a number of experiments checking the effect of temperature, wick height, material in surroundings and radius on burning life of candle taking one variable at a time while others were kept constant.

The data was tabulated and analyzed. It can be concluded that life of candle depends on the height, radius of wick and also on the thickness of the candle. It is also affected by the presence of moisture in the surrounding air and the temperature. At the end of the project I have arrived at the most suitable conditions under which a candle can achieve 70% or more extra life giving light of similar intensity.

Physics-08

Squeezing Cotton Cloth: Drying Faster or Does it Harm the Cloth?

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Koppal, Karnataka

It's a normal practice to dry the clothes after squeezing them. It is presumed by us that the squeezing helps cloth dry faster as it removes substantial amount of water from the clothes. But on having a second thought, we find that a squeezed cloth dries by evaporation whereas a cloth which is not squeezed dries two ways:

- (i) by evaporation
- (ii) By dripping.

Both processes take place simultaneously thus helping the cloth dry. At the same time, squeezing results in the weakening of the fiber. In this project I did experiments and collected data to find how fast a squeezed cotton cloth dry and how does the squeezing affect the fiber strength. In the project, I did experiments taking two cotton cloth pieces and keeping other variables viz. temperature, wind speed fixed, I noted the drying time for the wet clothes. One of the pieces was squeezed whereas other was not. In the second part of the experiment, I found out the fiber strength of the cloth pieces and compared it with the fiber strength of the new cloth. Similar experiments were conducted for polyester cloth. The observation data was tabulated and compared. Data shows that though the squeezing marginally decreases the drying time that too on a humid day but it damages fiber by decreasing its fiber strength substantially.

Physics-09 (Team)

Anemometer-The Wind Measuring Device

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Biswanath Chariali, Assam

For combating climate change, weather study is an important factor, so our project Anemometer-The Wind Measuring Device has laid stress on including all the people in the process of weather studies. Accordingly, the causes as to why the people do not perform such sort of work were analyzed and the reason got was costly instruments and complex procedures.

Anemometer is a device used to measure wind speed. However, the meteorological anemometer is very costly and involves some complex formulas, which are beyond the reach of common people. Therefore, we made two anemometers using recycling materials. The first anemometer was made using plastic materials (syringe, balls) at a cost of about Rs.10. However, since it could be used only in those places where the wind-speed is mild, so another anemometer was made using iron materials (wasted pieces of cycle) at a cost of Rs.50. Then a new but very simple hypothesis was formulated in calculating wind speed, which simplified the process of wind study largely.

Then some results on wind speed were obtained using the homemade anemometer. Now by application of these results we tried to develop a scientifically natural air cooler. The drawbacks of the primitively used Natural air cooler were overcome by constructing some changes based on the results obtained, which could be used as an alternative to the digital air cooler, which has an adverse effect on the environment.

Physics-10 (Team)

Growing of Crops During Flood

Trishna Moni Saikia

Gayatri Boruah

Chariali Academy

Sonitpur, Assam

Assam is mainly an agricultural state. Nearly 80% of the people of Assam depends on agriculture. Every year the agriculture is affected by heavy floods. During flood, the cultivators of Assam have to face heavy paddy seed crisis.

Paddy seed can be grown on the 'Bhur' made of banana tree. Banana trees float on water and can be preserved nearly for two months or so on. So banana trees have certain advantages for the cultivators of the flood affected areas.

To grow paddy seed on the 'Bhur', first the 'Bhur' is to be plastered with damp soil and make it a seedling bed. On this seedling bed paddy seed can easily be grown and paddy seed grown in this way on several seedling bed can solve the seed crisis of the flood-affected cultivators.

(#)"Bhur"- A boat like floating device made of banana plant.

Physics-11 (Team)

A Simple Device for Gas Level Indication in Cylinders

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Sudana Residential School

Puttur, Karnataka

The major problem with the use of domestic gas cylinders is the delay in supply whenever it is required as there is always a shortage in stock and supply. This problem is acutely felt in single cylinder households. This device will be of immense use in such houses.

Our device works on the simple principle of water displacement and does not use any source of energy. The cylinder is placed on a plank which is suspended by 4 springs. The weight of the empty cylinder is adjusted such that it touches the water bag kept below the plank and indicates the level marked as zero. But when the full cylinder is placed on the plank, the plank is pushed further down which in turn presses the water bag and the water level goes up in the indicator. This indicates the amount of gas present in the cylinder. The indicator is marked red below a certain level, to indicate the time to book a new cylinder.

Zoology-01 (Team) (Jr)

A Novel Way for Making Plastic

Md Mukarram F A Q Mulla

Md Mauddassir

Modern English School

Mumbai, Maharashtra

Increased human inhabitation and ever depleting forest area resulted in storage of raw material for plastic industry. In the context of such destruction natural resource there is necessity. We need to look out for other raw material for plastic like feathers rags.

Feathers are generated as a waste material during procession of chicken for meat. Chicken meat processing plant produce large amount of feather as a waste product. Major portion of this feather go as a waste and are disposal of. Thus, they create environmental problems. This study make an effort to investigate whether feather can be used as an alternative in order to replace pulp from trees for making plastics.

The cut feathers were soaked into 20% sodium hydroxide solution. Corn flour was mixed in 15ml water and was heated till it became semisolid. The chicken feathers solution was added to the corn flour in varying ratio and heated it till it became a transparent semisolid. Allowed to cool and spread on a tile. plastic was prepared. The plastic thus prepared was subjected to various tests and it had the properties of plastic.

We conclude with that the feathers can be used as an alternative raw material for plastic to other valuable natural resources.

The cost of the feathers is also marginal and most importantly gets converted into an essential useful product. Thus, generating zero waste and keeping the environment safe.

Zoology-02 (Team) (Jr)

Analysis of Colour Spectra in Hemidactylus Leschenaultii

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Karan Abrol

Inventure Academy

Bangalore, Karnataka

In our project we have analyzed the colour spectra in Hemidactylus Leschenaultii (Bark gecko) under 5 criteria for the past 8 weeks

- Habitat
- Presence of predator
- Interaction with other species & same species
- Time of day
- Choice of food (live food and dead)

We observed 6 different bark geckos and have recorded observations on the above criteria in our Experiment record sheets:

- When there is an appropriate habitat example space/ food in a Vivarium/Terrarium, the geckos are relaxed and change colour according to their
- When there is a predator nearby, such as humans or another animal like a turtle, the gecko flees and becomes a darker colour.
- When introduced to other species of gecko they are tolerant, but when we put two male geckos in the same tank, they displayed aggression and changed colour.
- In the morning and afternoon, we have observed they hide in crevices and thus their colour is a dark grey shade with black stripes/ light gray with grayish stripes. And during night they are completely pale sand colour.
- Geckos do not give up their feeding habits - they eat only live insects. Since they are nocturnal, they are pale in the night and that helps them camouflage while hunting insects near well lit areas.

The observations till now show that the change of colour in the Bark Gecko depends largely on these 5 criteria. To conclude on this, we are continuing to repeat the experiments.

Zoology-03 (Team)

Effect of Castor Oil on Growth of *Helicoverpa Armigera*

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Lakshmi Arora

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Helicoverpa armigera is the most devastating pest whose larvae are known to feed on a wide array of plants including a range of plants cultivated by humans. *H. armigera* is able to adapt to various cropping systems: high polyphagy, wide geographical range, mobility, migratory potential, facultative diapause, high fecundity and propensity to develop resistance to insecticides are physiological, ethological and ecological factors that have strongly contributed to its pest status.

This project aims at reducing the huge crop loss caused by this pest by controlling its population. It suggests an eco friendly solution: Castor Oil which has ability to inhibit the molting of *H. armigera* from larval stages to adult.

In the research the feeding of *H. armigera* on tomato fruit in the presence of varying concentrations of castor oil was observed and it was inferred that the feeding by the pest reduced by large amounts in the presence of castor oil, diminishing completely in 1 M concentration. Another parameter observed was that the life cycle of the pest also gets affected when larva are fed with castor oil treated leaves. The fecundity reduced by almost 98% whereas the same trends were observed in adult emergence, pupa weight and mortality.

The research conducted by us is limited to *H. armigera* there are possibilities of castor oil being effective on other pests as well, so this is an open research which can be further studied.

Zoology-04 (Team)

Effect of Fennel on Milk Production

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In today's world, population is one of the major concerns. It has created a great demand of all resources. And one of the challenging task in front of us, in fulfilling the demand of food sustainably.

As we know, milk is one of the major components of food which is considered as a complete food due to its nutritive value in India, where the population is second highest in the world, the number of cattle is highest. With the help of mews development and techniques, we have tried to increase the production of milk, yet availability per person is very low as compared to many other countries. With limitation resources, pace, time and money, it is difficult for us to increase the number of milk producing animals, but we have the option of increasing the milk production per animal. Now, we have high yielding varieties of animals, better and scientific food material and techniques, which are helpful in increasing production. In this aspect, as there are some findings we can use the fennel to increase milk production in animals.

The cattle which have given birth to young ones (lactating cattle) were selected and of same breed.

The fodder which is generally used to feed cattle is mixed with different concentration of fennel to study its effect on milk production. The feed was given twice a day (morning 5.00am and evening 5.00pm). The effect of feed given in evening will be observed in morning milk, effect of feed given in morning will be observed in evening milk. A gap of 12 hours was maintained between feeding and milching. Milching was done at 5.00am and 5.00pm. The mean of milk obtained at both the times was taken and recorded in table. Each concentration of fennel oil was tested on four different cows and mean observation was recorded in table for that concentration of oil. Same procedure was repeated with different concentration of fennel and result is recorded in table. The same experiment was repeated with buffaloes and goats. After various experimentation it was observed that fennel is highly effective in increasing milk production to a significant amount in all three animals.

So, from this novel approach we can conclude that if this oil is effective in increasing amount of milk in cattle. Same can be used as a topic of research by scientists to study its effect on human beings as it can solve the medical problem of lactating mothers.

IRIS National Fair 2009 Participants

By State

State	Participant	Subject Category
Andhra Pradesh	Ankit Kaushik FIITJEE Junior College, Hyderabad	Behavioural Sciences
Andhra Pradesh	Yuga Bargavi & S Jyothi K G B Vidyalayam, Kuppam	Chemistry
Andhra Pradesh	Sivaraj Thanga Barath & Mohan Kumar Vasuki Vinayaka English Medium School, Kuppam	Engineering
Andhra Pradesh	Hari Krishna Srinivasulu & M V Murali Krishna Z P High School Gutharlapalli, Kuppam	Environmental Science
Andhra Pradesh	Dharani Anand & V Varalakshmi Z P High School, Shantipuram	Environmental Science
Andhra Pradesh	Dharani Palani & V Supriya Z P High School, Kuppam	Physics
Assam	Arijit Deka Maharishi Vidya Mandhir Senior Secondary School, Silpukhuri	Engineering
Assam	Gaurab Dutta & Rajesh Kaitha Little Star School, Biswanath Chariali	Physics
Assam	Trishna Moni Saikia & Gayatri Boruah Chariali Academy, Sonitpur	Physics
Bihar	Gaurav Jha & Dinesh Kumar R D and D J College, Munger	Botany
Delhi	Ravina Gulati & Nikunj Sharma Maharaja Agarsain Public School, New Delhi	Botany
Delhi	Anuj Bhardwaj & Ankush Gupta DPS, R K Puram , New Delhi	Computer Science
Delhi	Aneesh Pasricha The Shri Ram School, New Delhi	Environmental Science
Delhi	Diksha Gupta & Lakshmi Arora Maharaja Agarsain Public School, New Delhi	Zoology
Delhi	Tanvi Sharma & Disha Jain Maharaja Agarsain Public School, New Delhi	Zoology
Goa	Radiya Mahale Dr K B Hedgewar School, Panaji	Botany
Gujarat	Darp P Raithatha Shree G K Dholakiya School, Rajkot	Botany
Gujarat	Pooja Dholakiya Shree G K Dholakiya School, Rajkot	Botany
Gujarat	Riddhi Suva & Heena Nakum Shree G K Dholakiya School, Rajkot	Engineering
Gujarat	Jay Kagathara Shree G K Dholakiya School, Rajkot	Engineering

State	Participant	Subject Category
Gujarat	Rutvi Merja Shree G K Dholakiya School, Rajkot	Engineering
Gujarat	Abhishek M Maru & Kishan Alodariya Mabuchi L G Dholakia School, Rajkot	Engineering
Gujarat	Raj Geriya Shree G K Dholakiya School, Rajkot	Environmental Science
Gujarat	Ankur Vaishnav & Hetal Vaishnav Shree P V Modi School, Rajkot	Environmental Science
Karnataka	Vineet Simhan Sishu Griha Montessori and High School, Bangalore	Behavioural Sciences
Karnataka	Bhoomica M N Kendriya Vidyalaya MEG and Centre, Bangalore	Bio-Chemistry
Karnataka	Haritha M B & Tanisha Shetty Sudana Residential School, Puttur	Botany
Karnataka	Kripa Puthila & Savitha Bhat Sudana Residential School, Puttur	Botany
Karnataka	Kshitheesh R Rao & Prathyusha Kateel Sudana Residential School, Puttur	Botany
Karnataka	Kaushik Srivatsan Jawahar Navodaya Vidyalaya, Mandya	Botany
Karnataka	Sharanappa Kallappa Kadabinakatti Jawahar Navodaya Vidyalaya, Gadag	Botany
Karnataka	Tejas S G Sastry Kendriya Vidyalaya Yelahanka, Bangalore	Botany
Karnataka	Vaishnavi Shankar & Nanditha Ramachandra MES Kishore Kendra, Bangalore	Chemistry
Karnataka	Shwetha Prabhu St Raymond's English Medium High School, Mangalore	Computer Science
Karnataka	Hitesh S Vagdevi Vilas School, Bangalore	Computer Science
Karnataka	Somak Maitra Kensri School , Bangalore	Engineering
Karnataka	G R Suma Kalidasa Pre University College , Tumkur	Engineering
Karnataka	Pratheeksha Tiebbae & Nimisha P J Sudana Residential School, Puttur	Engineering
Karnataka	R Lakshmi & Vibha Suresh V V S Sardar Patel HS, Bangalore	Engineering
Karnataka	Darshan Nagaraju Jawahar Navodaya Vidyalaya Shivaragudda, Mandya	Environmental Science
Karnataka	Himanshi Adlakha Kensri School , Bangalore	Environmental Science
Karnataka	Sitanshu Shah Kensri School , Bangalore	Environmental Science

State	Participant	Subject Category
Karnataka	Achyutananta Padaki Sri Vani Public School, Bangalore	Environmental Science
Karnataka	Anisha Reddy M & K N Bhanu Theja Bangalore	Environmental Science
Karnataka	Pavan Srinivas & M J Shashank Vidyaniketan School, Bangalore	Environmental Science
Karnataka	Varun G & Rakshith Ramesh Sishu Griha Montessori and High School, Bangalore	Mathematics
Karnataka	Vidya Ramaswamy Kensri School , Bangalore	Mathematics
Karnataka	Abhin K Uday Parachute Regiment School, Bangalore	Physics
Karnataka	Sruthi Namratha Rayavarapu Mallaya Aditi International School, Bangalore	Physics
Karnataka	Manjunath Chatti Jawahar Navodaya Vidyalaya, Koppal	Physics
Karnataka	Sarangamath Sangamesh Jawahar Navodaya Vidyalaya, Koppal	Physics
Karnataka	Jyotsna Alva & Pooja Prabhu Sudana Residential School, Puttur	Physics
Karnataka	Arincheyan Gerald & Karan Abrol Inventure Academy, Bangalore	Zoology
Madhya Pradesh	Ranu Chouhan Shard HS School, Anjad	Engineering
Maharashtra	Venkatesh Vidya Modern English School, Mumbai	Behavioural Sciences
Maharashtra	Keerthana Devarajan Modern English School, Mumbai	Bio-Chemistry
Maharashtra	Shireen Jaiswal Centre Point School, Nagpur	Botany
Maharashtra	Shailaja Sashikumar Modern English School, Mumbai	Botany
Maharashtra	Drashti Dantara & Soumil Shah Shree A A B V V Engineering, Mumbai	Botany
Maharashtra	Uday Wagh & Shazad Chinoy Bhavans Hazarimal Somani College, Mumbai	Botany
Maharashtra	Meenakshi Ramesh Modern English School, Mumbai	Chemistry
Maharashtra	Jigyasa Mishra Modern English School, Mumbai	Chemistry
Maharashtra	Abhay Nainan & Abhimanyu Vasishth Dhirubhai Ambani International School, Mumbai	Engineering
Maharashtra	Neha Sharma Swami Vivekananda Jr College, Navi Mumbai	Engineering

State	Participant	Subject Category
Maharashtra	Akshara Srinivasan Modern English School, Mumbai	Environmental Science
Maharashtra	Ankita Amol Paradkar Modern English School, Mumbai	Environmental Science
Maharashtra	Sudarshan Sridharan Modern English School, Mumbai	Environmental Science
Maharashtra	Devavrat Kulkarni K V No 1 - Colaba, Bangalore	Physics
Maharashtra	Md Mukarram F A Q Mulla & Md Mauddassir Modern English School, Mumbai	Zoology
Maharashtra	Lakshmi Priya Narsimhan Modern English School, Mumbai	Botany
Punjab	Karan Bhagat & Dushyant Uppal Police DAV Public School, Jalandhar	Computer Science
Rajasthan	Ashwin Gandhi Army School, Kota	Engineering
Tamil Nadu	M R Durgaa Subbiah Vidyalayam Girls' HSS, Thoothukudi	Botany
Tamil Nadu	Vishnu Jayaprakash Chettinad Vidhyashram, Chennai	Physics
Uttar Pradesh	Manisha Shrivasthava & Ishani Goomer Amity International School, Noida	Environmental Science
Uttar Pradesh	Anviksha Agrawal & Pratiksha Jain Amity International School, Noida	Environmental Science
West Bengal	Aritra Chowdhury South Point High School, Kolkata	Chemistry
West Bengal	Anarta Roy & Manosij Ghosh Dastidar South Point High School, Kolkata	Engineering
West Bengal	Saptarshi Mitra & Krishnendu Chowdhury Dum Dum Kishore Bharati HS, Kolkata	Engineering
West Bengal	Abhiroop Lahiri South Point High School, Kolkata	Mathematics
West Bengal	Vishal Midya & Kaustav Das Ramkrishna Mission Vidyalaya Narendrapur, Kolkata	Mathematics
West Bengal	Sourav Sarkar Ramkrishna Mission Vidyalaya Narendrapur, Kolkata	Physics



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