New Frontiers in Science

22 October 2019

BOOK of ABSTRACTS

**Acharya Narendra Dev College
(University of Delhi)
Govindpuri, Kalkaji, New Delhi – 110 019**

Acharya Narendra Dev College
(University of Delhi)

DBT Star College Scheme

One Day inter-disciplinary exhibition presentation

New Frontiers in Science

Schedule

Time	Events
09:00 am to 09:30 am	Registration
09:45 am to 10:30 am	Inaugural Talk
10:30 am to 11:00 am	Break
11:00 am to 01:30 pm	Exhibit Presentation
01:30 pm to 02:30 pm	Lunch
02:30 pm to 04:00 pm	Exhibit Presentation
04:00 pm to 04:30 pm	Valediction

New Frontiers in Science – 2019

Patron
Dr. Ravi Toteja
Acting Principal

Convenors
Dr. Ravneet Kaur (Electronics)
Dr. Harita Mehta (Computer Science)

Coordinators
Dr. Archna Pandey (Biomedical Sciences)
Dr. Rashmi Sharma (Botany)
Dr. Sunita Hooda (Chemistry)
Dr. Arijit Chowdhuri (Physics)
Dr. Seema Makhija (Zoology)

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ABSTRACTS

1. **Use of quadruplex binding ligands against prion diseases**

Purva, Abhijit Nayek and Prashant Pradhan

Human *PRNP* gene encodes a cell surface protein called PrP^C. PrP^C is involved in plethora of cell regulatory functions but once gets misfolded causes neurodegenrative disease called prion's disease. This misfolded protein will trigger the misfolding of other proteins in their vicinity that led to neuronal death. Recently, it has been shown that cellular prion protein i.e. PrP^C specifically bind to G-quadruplex (GQ) motifs. Later, it was found that GQ motif (Q2) is present in *PRNP* promoter region and help in auto-regulation. It was shown that Q2-PrP^C establish dynamic interactions which increases gene expression. So, if we block this interaction by using GQ binding ligands, this will decrease the *PRNP* gene expression. Therefore, in this study we will analyze comparative binding of Q2 with different GQ binding ligands using UV spectroscopy. Later, kinetics of binding will be studied using surface plasmon resonance.

2. Compartmental model for traffic congestion

Pushkar Pandey, Kunal Pant and Sarita Agarwal

Traffic in Mega Cities has become a major problem. In order to improve this situation in the future it is necessary to gain a good understanding of the processes involved. Some ways of predicting how the situation may change as a result of current management is vital. We need to be able to predict how the number of vehicles or concentrations varies over time and under different conditions.

For this purpose, we studied the traffic flow in Delhi and constructed a compartmental model on it. Delhi, a political and economic hub of the nation attracts a lot of people. Delhi has good connectivity through railways but it is predominantly dependent on road-based transport systems. In terms of traffic volumes, it handles annually about an approx. of 36 million passengers and 0.56 million tonnes of cargo traffic a year. The transport infrastructure is overloaded, volume to capacity (V/C) ratio on the Delhi roads has crossed to 1; at many places it has even crossed 2 also. Public Transport System is also inadequate for the uncontrollable traffic.

3. Isolation and characterization of mycobacteriophages from soil and in-vitro analysis of phage derived recombinant endolysins against *Mycobacterium smegmatis*

Ritam Das and Urmi Bajpai

Antimicrobial resistance is one of the major threats to human lives globally. Bacteriophages (Phages for short) are nature's own 'bacteria-eater' and are the most abundant biological entity (estimated to be 10^{31}). Phage Therapy is immensely gaining popularity and requires discovery and characterization of novel Bacteriophages. This study describes two lytic Mycobacteriophages isolated from soil samples with *M. smegmatis mc^{2}155* as the bacterial host and characterization of phage-derived enzymes. Phage plaques obtained were clear (3.6&5.0±0.3 mm in size) with an expanding halo and their TEM analysis revealed siphoviral morphotypes. From the high titer phage preparations (1×10^{12} pfu/ml), gDNA were isolated followed by

digestion with methylation-specific restriction enzymes which showed their non-methylated status. Further, cluster classifications of the phages were performed using primers for conserved region in the TMP gene and by using Phage Enzyme Tools v2.0.

In vitro activity (33.33 μm PNP/mg/min) of a phage-derived endolysin (LysinB, previously purified) was determined using pNPB as the substrate. Additionally, the enzyme spot test also showed lysis of mycobacterial cell. On a promising note the predicted function of gp65 was validated by optimizing its expression and purification as a recombinant protein (to 95% homogeneity) and demonstrating its ATPase activity (7units/mg) by a microtiter assay.

4. Mathematical sketch of symmetric group of degree 5

Ajay Gupta, Vipul Mishra, Mahak Gupta and Sarita Agarwal

In this project, we worked on the symmetric Group S_5 , did its mathematical analysis and made the sketch of S_5 , using its normal rotation. Considering one of 5-cycle of S_5 , we get 5 different cycles using its rotation. Again we have 5!/5 =24 choices of different cycles and hence 120 distinct 5- cycles. In this manner we plot these 120 elements and get a symmetric figure in 2 dimensional plane whose points are interconnected in 3 dimensional space. In the similar manner we plot the points of A_5 and get a structure, similar to Ashoka Chakra which is the part of National Emblem.

5. RFID based attendance system

Aditya Kumar, Gagan, Anju Agrawal and Dinesh Kumar

The main objective of this project is to record the attendance of students using Student's ID Cards. Each student is provided with his/her authorized ID card to swipe over the reader to record their attendance.
In classrooms, it takes too much time in roll calls as it is done manually. In this proposed system, each authorized student would be having his/her ID card containing RFID tag. This tag contains an integrated inbuilt circuit that is used for storing, processing information through modulating and demodulating of the radio frequency signal that is being transmitted. Thus, the data stored in this card is referred as the identification and attendance of the person. Once the student places the card in front of the RFID card reader, it reads the data and verifies it with the data stored in the Arduino UNO Memory. If the data matches, then it displays a message on the LCD screen confirming the entry of that student else displays a message denying the attendance. The status of a student's attendance can be retrieved from this system by pressing the status button interfaced to the Arduino Board. Hence, lot of time can be saved by storing attendance directly in the data base.

6. Isolation and characterization of novel mycobacteriophages from the collected soil samples

Garima Kalakoti and Urmi Bajpai

The relentless spread of antibiotic genes among microbial pathogens has started to threaten the viability of antimicrobial therapy for bacterial infection. The universal decline in the effectiveness of antibiotic drugs has generated a renewed interest in non-antibiotic therapy. Phage therapy uses bacteriophages, which are called natural predators of bacteria and constitute an essential part of the natural ecosystem (the estimated number is 10^{31}). This study shows the discovery of 4 phages from soil samples (6) that could possibly infect *Mycobacterium tuberculosis* (Mtb) or other non-tubercular mycobacterium (NTM). Double agar overlay method was used to isolate Mycobacteriophages using *M. smegmatis* mc^{2}155 (a fast-dividing, non-pathogenic mycobacterium) as the bacterial host and a high titer lysate (10^{11}-10^{12} pfu/ml) for each phage was prepared. Genomic DNA from these phages was purified using Phenol-Chloroform Extraction Method and their methylation status was determined by digesting the genomes using methylation-sensitive/resistant restriction enzymes (*Dpn*I & *Dpn*II). We found genomic DNA to get digested by *Dpn*II indicating their non-methylated status and suggesting that the isolated phages had not infected any Mycobacterium sp. earlier. Further, given the diversity in mycobacteriophage genome sequences, phages are grouped into clusters and sub-clusters based on the similarities in their nucleotide sequences. Phages belonging to Cluster K and sub-clusters of A cluster have earlier been reported to infect Mtb. We did cluster analysis of the four isolated phages and out of these, three were found to belong to cluster B1 and for one phage, no cluster could be assigned. The preliminary data suggests them to infect other species of Mycobacterium that might have the potential to infect other disease-causing species of Mycobacterium, which can significantly give rise to antimicrobial resistance.

7. To ascertain the most efficient working hours of the faculty in Acharya Narendra Dev College (ANDC) within the frame work of 9AM to 4PM.

Aatiruddin Khan, Alisha Ansari, Muskan Gupta, Sunita Jetly and Archana Pandey

The working efficiency of an individual increases when it's body works according to the body circadian rhythm. To ascertain the circadian rhythm of the faculty members a standardized test was used which was correlated with 5 manually taken tests namely (i) D2 test, (ii) Trail making test, (iii) Digit span, (iv) Test of performance and (v) Quick sum test. The overall 5 tests would indicate whether the faculty members are adapted to their working hours in Acharya Narendra Dev College within the framework of 9am-4pm or not. The most common chronotype according to the survey was Intermediate type (58%) and the overall result of the attention span was that extremes were missing and 80-90% of the faculty members were either good or very good. Both the above results correlated very well which indicated that most of the faculty were well adapted within the framework of 9am-4pm perhaps because minimum teaching experience of the teacher were 3-4 years.

8. Online ranking of educational websites

Prakhar Agrawal, Shubhang Upadhyay and Sharanjit Kaur

Website of any organization is an virtual showcase of its functional departments, variety of tasks being managed and therefore establishes its credibility. Importance of a website depends upon its ease of use, simple interface and availability of desired information. Keeping these factors in mind, we intend to build an application for ranking the websites of educational institutes which will allow individuals to compare websites of selected educational institutes. Keeping this view in our mind we proceed with the project 'Online Ranking Of Educational Web-Sites' which provide an individual plenty of information about the College like NAAC Ranking, Information about functional departments, Extra-Curricular Activities being held, Ongoing Research Programme, etc. Tools used during the design of the project were: Bootstrap, CSS, Python, BeautifulSoup, Pandas, and Matplotlib. A front end was designed for choosing the college and judging criteria. Once input is taken from the user, the data is scrapped from the websites, searching the desired tags. Afterwards, ranking points are assigned on the basis of criteria matched. At the end, user is given with visual outputs showing comparison among different websites. The end product of the project is a tool which has an easy-to-use GUI using which user needs to select the desired educational institutes and criteria for comparison.

9. Real Time Passenger Counting System (R.T.P.C.S)

Yash Varshney, Abhishek, Dinesh Kumar and Anita Kumari

In any public transportation system, crowd management is a huge problem. In Delhi, where approximately 4 million passengers travel on the daily basis in 6000 buses (estimated). As a passenger one has the right to know how many buses are on his route and where they are at that instant of time? How many passengers have already boarded on that bus? When a crowded bus arrives at the bus stop, the passenger boards on it anyway, but if the passenger would have known that another bus is on the way and is close to his bus stand, he wouldn't have boarded on the crowded bus he is in now. He would have preferred to travel in that next less crowded bus. This problem needs a method or system which counts number of passenger in a bus in real time. Every entry and exit should be observed by system or method. This information should be accessible to everyone who wants to use it. In this project a counter system has been made which count number of passenger's enter and exit through gates of a bus. The counter system is made using low cost LASER's and light dependent resistor's. A database has been created on 000webhost during this project for storing data. A good algorithm is designed which distinguish between entry and exit of passenger from bus. Actually the analog value of LDR's which are packed in a box is constantly noted down by arduino. When a passenger passes between LDR and laser drastic change is been observed in analog value of LDR's. The algorithm manipulate the same change tell whether passenger has entered or exit the bus. This algorithm calculates the total number of passenger in a bus. This number is further transmitted to NODE MCU using UART communication, which upload data to the website database using HTTP protocol by accessing php page.

10. Gesture controlled robot

Phulender, Pushkar Baranwal, Anju Agrawal and Gauri Ghai

The current emerging technology in the field of science is Robotics. In order to enhance the contribution of robot in our daily lives we need to find an effective way of communicating with robots. One common form of communication is gestures that are not only limited to face and body but also hand gestures. In order to increase the use of robot in places where conditions are not certain like rescue operations, robots can be made to follow the instructions of human operator and perform the task accordingly. This proposes an integrated approach of tracking and recognition of hands which is intended to be used as human-robot interaction interface. This project deals with the design and implementation of an accelerometer-based hand gesture-controlled robot, operated wirelessly using a small low cost, 3-axis accelerometer. A novel algorithm for gesture identification has been developed to replace the approach of conventional controlling mechanism of robots via buttons by an innovative hand gesture-based controlling. There are total five conditions for Gesture Control that has been studied. Specific inputs are to be fed to the analog port of the Arduino and the digital output from Arduino is fed to the transmitter circuit. Gestures provide the user with a new form of interaction that mirrors their experience in the real world. They feel natural and require neither interruption nor an additional device. Furthermore, they do not limit the user to a single point of input but instead offer various forms of interaction. It provides immense aid for people for whom mobility is a great challenge.

11. Arduino based solar tracking system

Prahlad Prajapat, Ankita Shukla, Udaibir Singh and Dinesh Kumar

Solar power is one of the fastest growing means of renewable energy. The aim of this project is to present a solar energy collection technology. To present this efficient solar distributed generation system, "Arduino based solar tracking system" is designed. In order to maximize the conversion from solar energy to electrical energy, the solar panels have to be positioned perpendicular to the sun. Thus, the tracking of the sun's location and positioning of solar panel are important. The tracking system moves the solar panel so that it is positioned perpendicular to the sun for maximum energy conversion at all time. four light dependant resistors (LDRS) are used as sensors in this system. The system consists of LDRs, Arduino circuits, two Servo motors and one solar panel By these LDRs analog signals are provided to Arduino circuit. According to Arduino programming signals are provided to servo motor. one of them rotates solar panel in vertical plane and another servo motor rotates it in horizontal plane. servo motors always rotate in such a way that maximum sun light falls on solar panel, hence maximum power is obtained. This system will output up to 40 % more energy than solar panels without tracking systems.

12. Piezoelectric energy harvesting system

Avinash Kumar Lal, Abhishek Bhadana, Ravneet Kaur, Monika Bhattacharya and Gauri Ghai

The primary objective of the project is to explore and study the use of piezoelectric sensors in order to generate ample amount of energy such that it can charge a power source which can further be used for electrification purposes. Piezoelectric Sensors are a type of transducers which work on the principle of "Piezoelectric Effect" exhibited by certain piezoelectric materials such as quartz, tourmaline, Rochelle salt etc. When piezoelectric material is placed under mechanical stress, a shifting of the positive and negative charge centers in the material takes place, which then results in an external electrical field. When reversed, an outer electrical field either stretches or compresses the piezoelectric material. In this way, 'piezoelectric effect' is the basis of piezoelectric sensors to generate an electric charge in response to applied mechanical stress. One of the unique characteristics of the piezoelectric effect is that it is reversible, meaning that materials exhibiting the direct piezoelectric effect (the generation of electricity when stress is applied) also exhibit the converse piezoelectric effect (the generation of stress when an electric field is applied). The piezoelectric effect is very useful within many applications that involve the production and detection of sound, generation of high voltages, electronic frequency generation, microbalances, and ultra fine focusing of optical assemblies. It is also the basis of a number of scientific instrumental techniques with atomic resolution, such as scanning probe microscopes (STM, AFM, etc). The piezoelectric effect also has its use in more mundane applications as well, such as acting as the ignition source for cigarette lighters etc.

13. Magnetic resonant anti-collision system

Reya Negi, Lalit Shukla, Ravneet Kaur and Gauri Ghai

An Electromagnetic anti-collision device is proposed in this project which is capable of avoiding vehicular head to head/back collision by estimating the distance between the two vehicles under extreme traffic condition. The system uses magnetic resonance, to prevent or reduce the severity of a collision. Once an impending collision is detected, it provides warning to the driver by a buzzer that starts beeping when the vehicles are very intimate. When the collision become imminent, they take actions automatically by the means of servo motor brakes. It incorporates distance finding between two vehicles using ultrasonic range finder. The vehicle collision and its impact emerged as the major problem in the last two decades when the use of the automobile increased to a subsequent number. In order to avoid vehicle collision/ road accidents this system will work in two stages:- A Range finder will continuously track the distance between two vehicles moving and using these inputs if it finds the vehicle in the vicinity of the other it will automatically actuate the sensor programmed with Arduino uno and brakes will be applied. This system is reliable, cost-efficient and fault tolerable. These characteristics enable the vehicle anti-collision in adaptive control environment.

14. Data transfer through CPU fan

Anurag Saxena, Ravneet Kaur and Gauri Ghai

Data has become an integral part of technology. This project is about a unique way of data transfer. Data transfer through the CPU fan is unique because it is impossible to trace the receiver's address at the time or after data transfer using this method. This project can help in data transfer in secure and stealthy way. It can also be used to steal data from a computer ethically. This project uses the acoustic noise generated by the CPU fan to transfer the data to a nearby microphone or receiver.

15. Creation of online repository of ciliates of Delhi region, India

Rishabh Jain, Shubham Khari, Jaya, Vishal Kumar, Jeeva Susan Abraham, S. Sripoorna, Swati Maurya, Seema Makhija, Ravi Toteja, Preeti Marwaha and Harita Ahuja

Ciliates are single celled eukaryotic microorganisms and are considered to be most evolved and complex protists. Ciliates are cosmopolitan and more than 8000 species of ciliates are known to exist. Ciliates are very important component of microbial food chain. In India, there is scarcity of data regarding diversity of ciliates. There is a need to create repository of ciliate diversity. Effort has been made to make on line data base of ciliates. The website is generated on the base of HTML (for webpage), CSS (for styling), JAVA-Script (programming), PHP (connection to database) and database(store information about ciliate) in the XAMPP server (Php environment). The website shows the information of ciliate like Classification, Morphological Characteristics, Measurements, Food, Ecological, Similar Species, Phylogenetic. The different elements of website are Gallery (connected to google photos for Lab and Ciliate's pictures), Techniques (different methods of performing certain experiments), Classification (the classification chart and information about the ciliates). The creation of online web pages would surely help us in understanding the huge diversity of ciliates.

16. Android App development (Attendance App)

Shivani Saxena, Priyanka, Rishabh Jain, Harita Ahuja, Preeti Marwaha and Gunjan Rani

After examining the complexity of attendance applications in nowadays in colleges and schools we have built a simple and basic application for marking attendance which can be used by anyone especially those who does not know much about software's. The way and buttons from which one can proceed for marking attendance and storing it in database are basic English words like add class, mark attendance and etc. In this app we can add new classes and even can see the list of students and their attendance of existing classes as every year new students join schools and colleges, we can further add new students details in existing class as new students frequently got transferred to other institutions. Many app does not allow marking attendance of past classes whereas our app allows the user to mark attendance of any past class. And storing the attendance and taking a glance at it anytime is also possible, the buttons for these both functionalities are available on a single page which avoids useless increment in number of

pages and procedures consuming less time of processor and does not exceed the storage space. Languages used for this application are **JAVA** and **XML** and for storing the details and attendance of students we have used **DATABASE** using **MYSQL**.

17. A computer application for editing multiple image document

Prince Sharma, Ankit Negi and Vandita Grover

The goal of the project is to design a GUI based application that enables image editing on a large scale. With this application, a user can add unique pieces of information to create multiple unique documents (like certificates) by running simple image editing algorithms on an image. This will help automate the certificate editing process. So an institution like our college where various events are organized the automated Certificate Generation Application can serve as a utility tool on a day to day basis.

18. Electrostimulation on plants

Kunal Sharma, Praval Bisht, Lalit Upreti, Ravneet Kaur and Gauri Ghai

Plant electrostimulation is a very efficient method for evaluation of biologically closed electrical circuits in plants. The information gained from plant electrostimulation can be used to elucidate and observe the intracellular and intercellular communication in the form of electrical signals within plants. Monitoring the electrical signaling in higher plants represents a promising method to investigate fast electrical communication during environmental changes
The project was performed on the software called LabVIEW via DAQmx card to acquire the data from plant and the study of LabVIEW has also been done through this project.

It has been seen from the present work that plant conducts electrically under a very low voltage and shows variation in its voltage (its amplitude) under different temperature conditions. Basically many other physical parameters of plants can be obtained through this electrical simulation in which we can acquire a data through data acquisition (Daq-MX) and obtain a plot or graph showing variations.

The information gained from plant electrostimulation can be used to elucidate the intracellular and intercellular communication in the form of electrical signals within plants. Monitoring the electrical signaling in higher plants represents a promising method to investigate electrical communication during environmental changes. Moreover natural endogenous voltage gradients not only predict and correlate with growth and development but also drive wound healing and regeneration processes in plants. This would be helpful in determining the exact growth rate of a plant and observing the self healing capability of a wounded plant with time. Proper ambience could be provided according to the data obtained from electrostimulation for a healthy growth of a plant

19. Quartz Crystal Microbalance (QCM) based biosensing

Anudeep A. S., Viren Tyagi, Mr. Amrit Dutta, Arijit Chowdhuri and V. Bhasker Raj

A sensor is a device that detects any signal, physical, chemical or biological, e.g. a thermometer is a simplest sensor, which senses the ambient temperature and gives a direct readable reading. A sensor senses a change, processes and converts to a desired presentable format via a transducer. Biosensors are a special class of sensors that typically incorporate a biologically active component (receptor) in contact with an appropriate transduction element (electrical, thermal, optical, etc.) for the detection of analyte bio-molecules. Typical components of any biosensor include – a) Analyte b) Receptor c) Transducer and d) Display. Quartz Crystal Microbalance (QCM) sensor module consisted of AT-cut quartz crystal configured with Arduino® Microcontroller for data acquisition and out to a computer. During investigations the QCM sensor was noted to be highly sensitive to any change in its ambient conditions and that it was also able to recover fully, hence can be used repeatedly without any drift in its baseline.

20. Assessment of plants health by using Biomarkers

Mansi Arora, Harshvardhan Gupta, Bhashkar Paul, Kumud Kaul, Charu Khosla Gupta, Yash Mangla

The harmful effects of air pollution to man-kind or animals are well documented and thoroughly studied aspect. But, one can also think that: *Do plants respond to this air quality degradation*? The answer is a yes!! However information how the plants respond at biochemical, physiological, cellular levels etc. to the air pollution, is sparse. Certain studies have suggested several biomarkers i.e. accumulation of reactive oxygen species (ROS), lower chlorophyll content, water stress etc. for the purpose. The present study aimed to study the effects of air pollution on health of two native, co-occurring and vastly planted tree species 'Ashoka' and 'Neem' of Delhi. For the study following biomarkers were used: Chlorophyll content, Ascorbate content and water content. Leaf samples were collected from five different sites and compared for selected parameters. Our results indicated that at selected locations both species are responding differently. Neem is almost fighting or getting affected minimally through poor air quality of areas under study and Ashoka trees are under stress. With these results it could be proposed that neem trees plantation may lower down the air pollution of Delhi as it seems to be resilient species.

21. Isolation of native *Caenorhabditis elegans* and used them as bio-indicator for soil toxicity

Simran Gupta and Sarita Kumar

C. elegans shares homology with the human genome and widely used as a model organism for neurodegenerative disease, diabetes, ageing, etc. Small size, rapid life cycle, transparency, and

well-annotated genome make it an outstanding experimental system. Our study shows the isolation and characterization of nematodes from dead decaying vegetable matter. We observed stoma, buccal cavity, pharyngeal bulb, rudimentary teeth, cell lining, alimentary canal, intestinal cells (slightly brown), and egg cells in the nematodes by simple light microscopy that helped in the identification of nematodes. We found native *Oscheius tipulae* belonging to the same family rhabditidae as that of *Caenorhabditis elegans.* We also observed eggs inside nematode and embryos in the petri plate, and thus, we will step further for more embryological studies. The hypothesis of conducting studies is that heavy metals present in soil/leachate (lead, phosphorus) increase pharyngeal gut pumping of nematodes, and hence can act as a bio-indicator for soil toxicity. The long-term objective of the present study is to explore evolutionary trends between wild type N2 strain and native isolated *Caenorhabditis/*Rhabditidae worm.

22. Determination of ambient air pollution through estimation of chlorophyll content

Nitish Kalson, Heena Nizam, Yash Mangla, Arijit Chowdhuri and Charu Khosla Gupta

Ambient air is atmospheric air in its natural state, no contaminated by air-borne pollutants. Ambient air is typically 78% nitrogen and 21% oxygen. The extra 1% is made up of a combination of carbon, helium, methane, argon and hydrogen. The closer the air is to sea level, the higher the percentage of oxygen. Manufacturing processes and the burning of fossil fuels has directly impacted ambient air quality by releasing a high level of industrial and chemical pollutants into the atmosphere.

Air pollution has now become a serious issue of concern and many of the countries in the world such as Pakistan, Iran, India, UAE, and China etc. are formulating strategies to deal with it. There are a number of factors responsible for the altered composition of the ambient air which can be mainly categorized as natural causes and anthropogenic (man-made) causes.

In this experiment an estimate of the chlorophyll content of different plants was made and used as a bio-monitor to check the air quality of the region. Specifically, 07 sites were considered and 03 different species of plants were used for reference. Using the spectrophotometer the chlorophyll content was estimated. The least amount of chlorophyll was noted in the sample of Mulberry from the site in Najafgarh and therefore it indicates that the air quality of the very site is poor.

23. EDTA modified chitin for heavy metal ion adsorption from waste water

Narain Swami, Ravina Yadav, Drashya, Geetu Gambhir and Sunita Hooda

Since the last few decades, due to increase in population and high rates of wastewater generation, water pollution have become serious concerns. Heavy metals are amongst the main wastewater pollutants due to their ability to persist in the environment. Adsorption is one of the most popular techniques for the removal of heavy metals ions from wastewater. This method provides an important and attractive alternative for treatment of wastewater, where the adsorbent is cheap (low cost) and does not require any additional pre-treatment step before application. The aim of present study was to investigate the adsorption properties of surface modified chitin in aqueous

solution containing cadmium ions (heavy metal). For this purpose, the ligands of ethylene diamine tetra acetic acid was immobilized onto polymer matrices of chitin. The effect of dose of adsorbent, pH, treatment time and temperature was analyzed with the help of UV-Visible spectroscopy. The functionalized chitin was characterized by IR - spectroscopy. In case of cadmium, increase in adsorption was observed as the doses of adsorbent was increased. When dose of adsorbent was 0.05 g, pH 5.8, temperature 300K, and treatment time of 30 minutes, maximum adsorbent was observed with adsorption % of 31.65%, 42.325%, 38.40% and 31.65% respectively. Functionalized chitin showed a promising application in wastewater treatment.

24. Synthesis of graphene oxide, and its modification using polysaccharide for water purification

Manisha Gupta, Narain Swami, Drashya, Geetu Gambhir and Sunita Hooda

The aim of present study was to investigate the effect of temperature on yield of graphene oxide. Two methods were used to synthesize graphene oxide, one of them is Hummer's method and another one is improved Hummer's method. Two reactions were setup at different temperatures for improved Hummer's method. The yield of reaction increases by this improved Hummer's method, indicate that change of temperature effect the amount of graphene oxide formed by improved Hummer's method in different ranges of temperature. Further to modify graphene oxide, three polysaccharide- graphene oxide materials (PS-GO) were synthesized from graphene oxide (GO) and natural protein polysaccharides, Casein-obtained from milk. GO was first synthesized using Hummer's method and the casein buffer mixture was formed by suitable processing. These two components were mixed in different proportions to optimize their composition in PS-GO material for maximum adsorption of impurities from waste water. All the samples were characterised using UV-Visible spectrophotometer and the resulting curves confirmed that by optimizing the dose of both casein and GO, this composite was most satisfactory in comparison with other two samples. In these tests, PS-GO materials were found to be more efficient than synthesized GO as adsorbents for the purification. This process of water purification was found to be cost effective as well as eco-friendly.

25. To extract the coloured component of *Hibiscus rosa-sinensis* flower and study its potency as a pH indicator

Kirti Chugh, Ramandeep, Ishika Sagwal, Neeti Misra, Pankaj Khanna and Kavita Mittal

Natural indicators with the pigments extracted from natural sources like plants, animals, minerals, etc. have been grown in the past decades due to its potential applicability over a wide range of applications and the availability of the resources. Although, these natural dyes have been used for centuries, its durability is considered as the main drawback for their applicability. However, they are eco-friendly, biodegradable, and non-carcinogenic in comparison to synthetic pigments. Furthermore, chemical indicators such as phenolphthalein, methyl orange, etc., are more expensive and hazardous in nature and thus, lead to affect the environmental sustainability. Therefore, these natural indicators could be excellent replacement materials for conventional indicators. In this research work, the pigment was extracted from *Hibiscus rosa-sinensis*, and the extract was used as an indicator over acid-base titrations and ph range was determined.

26. Effect of sonication on graphite and graphene oxide (GO).

Meghna Singh, Sneha Mahar, Drashya, Sunita Hooda and Geetu Gambhir

The aim of this work is to study the effects of sonication on Graphite and Graphene oxide. From last few years, Graphite and Graphene Oxide have become very popular topics in the field of research. Graphite is an allotropic form of the element carbon consisting of layers of hexagonally arranged carbon atoms in a planar condensed ring system. Graphene oxide is having a 2D lamellar structure and is arranged in a honeycomb lattice. The graphene honeycomb lattice is composed of two equivalent sub lattices of carbon atoms bonded together with sigma bonds. The graphene oxide was synthesised using graphite flakes by Hummer's process. The graphite and graphene oxide were sonicated using a water bath type sonicator at different time intervals i.e., 120 min, 150 min, and 180 min. The sonicated graphite and graphene oxide were characterised using UV - VIS Spectrophotometer and their absorbance was checked. From the UV results obtained, it was observed that the absorbance of Graphite and Graphene oxide increased with the increase in sonication time hence they had maximum absorbance at 180 minutes due to increase in the yield of reaction. With the increase in time interval of sonication, the exfoliation of graphene oxide becomes better.

27. Detection of adulterants in milk from different sources and synthesis of metal complexes of schiff bases using sonication

Harshita Madaan, Saatwik Suman, Neeti Misra, Pankaj Khanna and Kavita Mittal

A. Milk is one of the basic necessity and is widely used as a nutrient in households and because of its vital properties it is widely adulterated. This project presents a review of the basic milk adulterants and their harmful effects on Human body and their detections. Milk samples from different sources were taken and were chemically tested to check the adulterants present. Effects of centrifugation on milk was studied with an attempt to quantify Starch content in milk colorimetrically.

B. Schiff base metal complexes are synthesized using sonication. Schiff bases and their complexes are versatile and are synthesized from the condensation of an amino compound with carbonyl compounds. They have a wide use in industrial purposes as well as they exhibit a broad range of biological activities.

Schiff bases are a very important class of organic compounds because of their ability to form complexes with transition metal ions and of their pharmacological properties. Transition metal complexes containing Schiff bases have been of much interest over the last years, largely because of its various applications in biological processes and potential applications in designing new therapeutic agents.

28. Text to speech converter

Aditya Raj Singh, Ravneet Kaur and Gauri Ghai

Text-to-speech (TTS) is a speech synthesis application that is used to create a spoken sound version of the text in a computer document, such as a help file or a Web page. TTS can enable the reading of computer display information for the visually challenged person, or may simply be used to augment the reading of a text message. Current TTS applications include voice enabled e-mail and spoken prompts in voice response systems. TTS is often used with voice recognition programs. There are numerous TTS products available, including Read Please 2000, Proverb Speech Unit, and Next Up Technology's TextAloud. Lucent, Elan, and AT&T each have products called "Text-to-Speech."

First of all, an amplifier circuit is made using the circuit components. The positive and negative of the amplifier would be connected to both Arduino and 9v battery. If connect the amplifier to low power battery or low voltage the volume of the speaker will be less. The positive terminal of the pin 3 of the IC will be connected to any Arduino PWM pin (most better is pin 3) and the positive terminal of the pin 5 of the IC will be connected to the positive terminal of the speaker. Solder all the parts on a perfboard according to the circuit.

29. Moina: A prospective model organism to study Parkinson's disease

Amit Babu, Akhila A and Sarita Kumar

Model organisms (MO) possess the wealth of biological data making them attractive to study natural phenomena that otherwise are more difficult to study directly. More and more of model organisms are, thus being employed in investigating the pathophysiology, diagnosis and cure of the disease(s). Parkinson's disease is one of the progressive incurable neurodegenerative disorders/diseases, caused due to the degeneration of dopaminergic neurons and marked by deficits in movement and locomotion including hypokinesia (slowness in movement), bradykinesia (decrement in movement), akinesia (no movement), etc.

We propose *Moina* as an effective model system to study Parkinson's Disease. *Moina*, also called water fleas, belonging to the family of crustaceans, have combined characteristics of any other vertebrate MO such as; rodents, primates, fishes; and of invertebrate MO like; *Drosophila melanogaster*, *Caenorhabditis. elegans*. It offers convenience with its easy culture conditions, small size, high reproductive capacity, and genetic similarity with humans. Additionally, besides being free from ethical issues, *Moina* has transparent body for easy viewing of internal organs, characteristic quantifiable movement patterns and similar human behavior induced deficits. However, most importantly, the existence of simple nervous system (ganglionic brain), presence of dopaminergic neurons, exhibiting characteristic locomotory movements, and showing sensitivity towards chemicals and environmental conditions make it preferable prospective animal for modeling in movement disorders.

30. *Drosophila melanogaster:* A potent model organism for advanced studies in behavioural science

Komal Kotra, Maryada Arya and Sarita Kumar

Drosophila melanogaster is a very well-known species of fruit flies, hugely studied in laboratories with various perks to be a best workable model system. *Drosophila* turns out to be effective for studying peculiar behavioral studies in current investigations. The study was conducted to understand behavioral interactions between *Drosophila* and it's designed surroundings by performing self-designed experiments with Canton-S flies as control.

Induced dietary behavioral study was carried out using borax in corn meal agar media which was found to be fatal for *Drosophila* indicating toxic effects of the borax to Canton-S and Native *Drosophila.* Another study showed harmful impact of UV treatment to both types of flies causing mortality post 2 hours of treatment. The cannibalistic behaviour exhibited by nutritionally challenged *Drosophila* larvae was tested by a crude experiment on a total of 5 larvae (Three 2nd instar and two 3rd instar) reared under starvation. After a span of 24 h, 2 larvae disappeared without leaving any larval debris confirming cannibalism in nutritionally challenged *Drosophila* larvae.

31. Effect of diet on the growth and haemolymph protein profile of *Helicoverpa armigera*

Vatsal Bhargava, Parikshit Sahotra, Harshita and Sarita Kumar

Helicoverpa armigera Hubner (Lepidoptera: Noctuidae) is one of the extremely critical and polyphagous insect pests of field crops. *Helicoverpa* larvae feed on a wide range of plants, including cotton and pulses. Current study investigates the effect of diet on the growth and protein profiling of *Helicoverpa armigera* larvae. The larvae were reared on two different diets; *viz.* natural diet (Castor leaves) and artificial diet. The potential effect of different diet composition was thus assessed on the larval growth, development and protein content of the haemolymph. The results revealed rapid growth of the larvae fed on artificial diet as compared to naturally fed larvae which were observed to be prone to infections. However, the larvae fed with natural diet exhibited higher protein concentration of 60.24 µg/mL in comparison to 55.32 µg/mL proteins observed in artificial diet-fed larvae. The SDS-PAGE analysis of proteins showed that dietary differentiation varied the polypeptides present in the haemolymph of *Helicoverpa armigera*. The haemolymph of larvae fed on natural diet exhibited polypeptides in the range of 33.2 to 69.9 kDa in contrast to the 33.8 – 73.7 kDa polypeptides found in larvae fed on artificial diet. This indicates the effect of diet on the gut physiology of the insect impacting the digestion, absorption and assimilation of proteins.

32. Qualitative analysis of water from different sources for concentration levels of different pollutants

Payal Singh, Ankita Negi, Yash Mangla, Arijit Chowdhuri and Charu Khosla Gupta

Water pollution is contamination of water bodies as a result of human activities. Water bodies include for example lakes, rivers, oceans, aquifers and groundwater. Water pollution results when contaminants are introduced into the natural environment. India is a developing country with 70.6 million people below poverty level. Safe and clean drinking water is one of the basic necessities not easily available to most people. Water pollution gives rise to many water borne diseases like Cholera, Typhoid, and Dysentery etc. and may even cause death.

Our qualitative study aims to portray existing scenario of water pollution by analyzing various parameters like pH, Ammonia, Residual Chlorine, Nitrate, Iron, Hardness, Chloride, Phosphorous and Alkalinity of water from different sites and sources. We have compared the data observed from different sites against the BSI standards to check the extent of pollution from water of each site and source.

Water quality of 10 samples from various areas of Delhi and Haryana was analyzed. Water near Sewer area contained high amount of ammonia while water near factory was alkaline in nature and contained high amount of fluoride, residual chlorine and iron. The water near slum area was high in nitrates and hardness. The water of Delhi Jal board contained slightly high amount of chlorides.

33. Surface Plasmon Resonance (SPR) a tool to detect change in refractive index.

Tamanna, Sudeepta Singh, Sansi Bansal, Sarang Saini, Archna Pandey, Charu Khosla Gupta and Arijit Chowdhuri

Surface Plasmon Resonance (SPR) is a physical phenomenon that involves resonant oscillation of conduction electrons at the interface between negative and positive permittivity material stimulated by incident light. SPR is the basis of many standard tools for measuring adsorption of material onto planar metal (typically gold or silver) surfaces or onto the surface of metal nanoparticles. It is the fundamental principle behind many colour-based biosensor applications and different lab-on-a-chip sensors. SPR based on Kretschmann configuration is very popular and is widely employed as an alternative method to detect adulteration of many substances including liquids and gases. In the present study we seek to understand working principle of SPR besides gaining valuable hands-on experience in using a table-top model. A biosensor is typically an analytical device, used for detection of an analyte that combines a biological component with a physicochemical detector. The sensing biological elements are biometric components that interact with recognized components like tissue, microorganisms, antibodies, nucleic acids etc. and analysis of the same is carried out. The sensitive biological elements can also be generated by biological engineering. The detector elements transform the signals from the interface of analyte with the biochemical elements into other signals. Land transducers are utilized for their measurement. In recent years, SPR based biosensing has been a new technology for the rapid

detection of pathogens and toxins because of its simplicity in concept, ease of use, low cost, online monitoring, shorter analysis time and suitability for label-free measurement.

34. Cell phone detector

Avinash Kumar Lal, Abhishek Bhadana, Shashank Nagar, Anmol Dogra, Anju Agarwal and Gauri Ghai

Cell phones have become an integral part of today's world. While it is important for people to stay connected with each other, however there needs to be a cap on the usage of mobiles. Over usage of cell phones can lead to security and health risks. It also leads to inefficiency at workplace and educational institutes due to lack of concentration of the user. The primary aim of the project is to develop a simple and low cost cell phone detector. This device is capable of sensing presence of cell phone in close range. This way we can sense the use of cell phones near us. This device is capable of detecting any receiving and transmission activity of a cell phone up to a range of 2-3 meters. This range can be improved further.

35. Physicochemical and biological analysis of leachate from Okhla landfill

Pranjal Sharma, Deepika Joshi, Swati Maurya, S. Sripoorna, Jeeva Susan Abraham, Ravi Toteja, Seema Makhija and Pooja Bhagat

Ciliate Biology Laboratory, Acharya Narendra Dev College, University of Delhi, Delhi, India

Leachate from a landfill varies widely in composition depending on the age of the landfill and the type of waste that it contains. It can usually contain both dissolved and suspended material. Leachate toxicity has been studied using laboratory bioassays on various organisms like protozoans. The present study aims to characterize and investigate the relationship between physicochemical parameters and ciliates in the leachate sample from Okhla landfill. The presence of ciliates can serve as an important and sensitive bioindicator of leachate quality. Various physicochemical parameters of the leachate samples were studied and analysed for interstitial water, pH, conductivity, total organic carbon, total organic matter, total nitrogen and phosphorous content, using standard protocols and for ciliates, the non-flooded petri-dish method was used. The study implied that the habitat conditions of site are unfavorable for ciliates to flourish as only three ciliates were found to be present in the leachate sample. A full understanding of soil ciliate diversity and physicochemical parameters helps to assess the quality of leachate in the landfill and the waste that is present over there.

36. Isolation and characterization of macronuclear DNA of ciliates

Ruchika Bhardwaj , Deepanshu Vats, Rajanshi Mishra, Naeem Ahmed, Shushank, Mustabin Ahmed , Swati Maurya, S. Sripoorna, Jeeva Susan Abraham, Ravi Toteja, Seema Makhija

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Ciliates are unicellular eukaryotes possessing two types of nuclei; (i) Somatic nucleus, macronucleus which provides templates for transcription of genes required for vegetative

growth; (ii)) gametic nucleus, micronucleus which carries germline of the cell. Due to their unique genomic structures, ciliates have been models for researches in genetics, genomics and cell biology. They are an important part of the microbial loop as recyclers, remineralizes of organic mineral in terrestrial and aquatic ecosystems. They prey upon bacteria and smaller protists thus maintaining ecological balance. Also, they can be used as biological indicators of toxicity in soil and sewage. In this study, *Colpoda* sp collected from Okhla landfill was employed. The cells were cultured in-vitro using Pringsheim's medium to which boiled cabbage was added to promote bacteria on which Colpoda feeds. The study aims at isolating and sequencing the macronucleus DNA. Genomic DNA was isolated using DNeasy Blood and tissue kit (Qiagen, India). The genomic DNA was amplified using a primer (C4A4)2C4. Visible DNA bands were cut and eluted using Qiagen QIAquick gel extraction kit. The eluted product will be sequenced to analyse the macronuclear genome of *Colpoda.*

37. Identification of cysteine rich domains in the ciliate, *Tetmemena* using systematic bioinformatics tools

Ankush Singh, Khushboo Dalal, S. Sripoorna, Jeeva Susan Abraham, Swati Maurya, Ravi Toteja and Seema Makhija

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Ciliates are single-celled, motile eukaryote that are easy to handle, cost-effective and have short-life cycle which make them suitable for eco toxicological studies. These ciliate species have various stress-inducible genes to combat the environmental toxicity. Most of the stress-responsive proteins (eg. metallothionein and methionine-sulfoxide reductases) expressed during environmental stress are known to have cysteine-rich regions. Thus, this present study is conducted to identify and annotate the cysteine-rich protein sequences from the whole genome sequence data of freshwater ciliate, *Tetmemena* SeJ-2015 available in GenBank by using a systematic bioinformatics approach. In this study, around 1000 contigs were analyzed out of which 36 contigs were found to be cysteine-rich ranging from 5–8 %. Maximum cysteine-rich proteins were detected to have zinc-binding domains. Their functional networking showed that most of them were involved in cell signalling and cell rescue.

38. A study on the process of regeneration in ciliate, *Tetmemena sp*.

Harshvardhan Sahu, Vanya Garg, Khushboo Garg**,** S. Sripoorna, Jeeva Susan Abraham, Swati Maurya, Ravi Toteja, Seema Makhija and Pooja Bhagat

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Ciliates, being unicellular organisms, is capable of performing all the functions that multi-cellular organisms can perform. Their simplicity allows to study the structure and functions of a eukaryotic cell in a more efficient manner. The ciliate protozoans with macro and micro nuclei have excellent potentiality to regenerate into a complete form from a tiny fragment provided each cut fragment has a macronuclei node. The indispensability of macronucleus in the process

of regeneration has been documented in various ciliates like *Stentor* sp., *Epistylis articulate* and *Blepharisma* sp. Earlier studies on the fresh-water form *Stylonchia mytilus* have shown that regeneration is closely connected with a profound reorganization of the whole body of the protist. In the present investigation, regeneration studies were carried out in the fresh-water ciliate *Tetmemena sp*. The cells were damaged chemically using Urea. The damaged cells regenerated their organelles and other body parts completely within 24 hours. This shows that *Tetmemena sp.* has regeneration capabilities. When the same cells were treated again with Urea, it required comparatively high concentration of Urea to damage the cells suggesting that the cells have developed resistance against urea.

39. Investigating the effect of cadmium and ethidium bromide on DNA using Surface Plasmon Resonance (SPR) technique

Chaitanya Raj, Senjuti Sengupta, Seema Makhija, Ravi Toteja, Charu Khosla Gupta and Arijit Chowdhuri

Rapid and unrestrained industrialization has led to alarmingly high concentrations of heavy metals percolating our immediate environment and which in turn has caused a lot of concern. Heavy metals produce reactive oxygen species that bring about changes in the repair mechanism of DNA and are extremely toxic for humans and other animals.

Surface Plasmon Resonance (SPR) is an optical biosensing technique that literature reports indicate is label-free and which is highly sensitive towards biomolecular interactions. SPR biosensors offer a higher sensitivity as the fine variations occurring at the vicinity of the dielectric due to biochemical reactions are understood to vary the refractive index and hence characteristics of the surface plasmon wave. Ethidium Bromide is an intercalating agent that is commonly used in detection of nucleic acids in laboratories. It is believed to act like a mutagen in high concentrations and several reports indicate its ill effect on human health.

In the current study changes caused by Cadmium (heavy metal) and Ethidium Bromide on the DNA of ciliate Tetmemena Pustulata have been reviewed through a series of SPR based experiments. Reflectance curves indicate a shift in angle from metal-air interface to metal-DNA interface whereas shift in angle from metal-control DNA interface to metal-Cadmium treated DNA interface is also clearly discernible.

40. Molecular markers for authentication of highly traded controversial medicinal plants in India: A compilation

Radhika Verma, Sakshi, Sumit Sahni, Vineet Kumar Singh and Manoj Kumar Singh

Adulteration of medicinal plants with spurious drugs is posing threat to the health of mankind and to the credibility of the indigenous alternative medicine industry. Paucity of authentic plants, carelessness in collection, confusion in vernacular names and lack of standard protocol for identification of medicinal plants and/or to enhance profitability led to adulterations in herbal drugs. Various markers (morphological, chemical and molecular) have been identified to

authenticate the variety of medicinal plants from their inferior counterpart, but the studies were sporadic. So, in present study first the list of controversial medicinal plants was compiled whose annual traded volume was >1000 metric tonnes from National Medicinal Plant Board (NMBP) website. The plants selected for the study were Punarnava, Shankhpushpi, Bhringraja, Pashanbhed, Patha, Danti, Agnimantha, Haridra, Vasaka and Adhapushpi. This was followed by systematic mining of research articles related to markers identified in abovesaid medicinal plants. Of the 656 articles found, 40 were screened (in accordance to the PRISMA guidelines 2009) for the compilation of markers for authentication these 10 highly traded controversial medicinal plants.

For the plants where molecular markers are unavailable, in-silico identification of Barcode quality sequences from four conserved loci, nrITS, ITS2, matK, and rbcL, is under process.

41. A review of lignin degradation and its bioconversion

Chetna, Kalpana, Manoj Kumar Singh and Sumit Sahni

Lignin is a complex, naturally occurring, and second most abundant organic biopolymer found in plants. It is a potential compound generated as byproduct in pulp and paper industry. It can be used as an abundant resource for synthesising energy-dense fuels, phenolic chemicals, different polymers, carbon fibers and many other value-added products. Because of abundant availability, low cost, and product competence corresponding to the petroleum-derived products projects it as a highly potent naturally occurring feedstock. There are many microbial stains reported which can degrade and convert lignin in many value added products. This review attempts to compile microbial lignin degradation, current advancements in its bioconversion and applications. Polyhydroxyalkanoates (PHAs) is one of the most important bioproducts can be derived naturally by microorganisms using lignin as substrate. The increasing research on lignin degradation and its bioconversion has led to the foundation of compiling the findings in the form of a review presented herewith. In this reviews the chemical structure of lignocellulosic biomass and the changes occurring during it biodegradation by different microorganisms were incorporated. Many ligninolytic microorganisms releasing oxidative enzymes responsible for the mineralization of lignin were also discussed.

42. Computational analysis of natural antagonists for design of anti-thyroid drugs

Ashwin Uday and Gagan Dhawan

Thyroid hormones (T4 – Thyroxine and T3 - Triiodothyronine) are very essential hormones required for the development and maintenance of the body systems. Thyroid related problems – hyperthyroidism and hypothyroidism are common in India, especially among women. The currently available drugs for hyperthyroidism though are effective in keeping the hormone levels under control, there is a high chance of recurrence of the disease condition which forces the patients to be on long and repeated courses of the drug. Thyroid hormone synthesis is done by an enzyme called – Thyroperoxidase (TPO) is inhibited by the currently available drug Methimazole (MMZ). This project aimed at analyzing the interaction of the drug MMZ with TPO using computational tools. TPO structure was modeled using 'Swiss Modelling server' and

MMZ structure obtained from DrugBank. The structures were docked together using 'Patchdock' and were observed in 'PyMol'. The site of drug docking and the known active site residues were compared. The interaction between drug and enzyme was studied using 'PyMol' and 'LigPlot'. The available knowledge and data obtained would be used to compare with other potential molecules which will be obtained by virtual screening, and thus aid in designing an antithyroid drug that can provide better and faster treatment to hyperthyroid patients.

43. Smartphone to digital microscope

Bisakha Das

This is a simple and inexpensive way to build a microscope that allow students to capture digital image of the object or provided specimen. Model can be prepared by using materials which are easily available such as carriage bolts, nuts, washers, piece of plywood, Plexiglas and laser pointe focus lens. Lens is extracted from laser pointer, bolt holes are drilled on the plywood, lens is embedded and specimen stand is made by using Plexiglas, all are then assembled together to form the model. Now, we are ready to explore. The sole purpose of designing and building this phone to microscope conversion stand is to provide an alternative to expensive microscopes. This set up is a viable option for underfunded science classrooms.

44. Using the Arduino for the experimental determination of a friction coefficient by movement on an inclined plane.

Avinash Kumar Lal and Tripti Varshney

In this era of technology everything is done using computers or we can say microcontroller. Technology helps us improve the rate of working and also provide us accuracy in our jobs. This makes our tedious jobs easy. But there are places where we still prefer manual measurements, like in our physics lab. The motive of this project is to device a friction coefficient detection instrument using microcontroller (Arduino). In this study, a simple Arduino- based experiment was designed to examine the movement of the object on an inclined plane and to define the kinetic friction coefficient. The experimental data on the movement of a small wooden block on the inclined plane formed from the hardwood was gathered with the help of an ultrasonic sensor. On the plane inclined at different angles, if the wooden block was allowed to shift into its own position to obtain position–time curves. The acceleration of the object and then the kinetic friction coefficient can be determined experimentally. This way we can get effective results in no time. This project is totally based on the modern day technology without any physical measurements. Even the inclination angle can be measured with the help of smart phones. Proper implementation of technology can save man power and lots of time.

45. Voice controlling car

Abhishek

Today, the only aim of technology seems to be to reduce human effort to the minimum, we have many electronic devices that reduce the mechanical work of human. Voice controlled Car is car whose motion can be controlled by the user by giving specific commands. there are a lots of

research working on to enhance the connection between humans and Car(robot). The control system of the car movement will be designed based on Arduino which is connected to smart phone android app (Arduino voice control) through Bluetooth module HC-05. And motor of our car is control by motor driver (L298) which is connected with Arduino.

46. Li-Fi- sound transmission using LED lights

Devesh Yadav

There had been many developments in the field of data transmission since decades. Li-Fi is one of the latest and also the fastest among them. It is an optical networking technology that uses light emitting diodes (LED's) for fast data transmission. This project uses LED lights to transfer sound from a phone to a speaker using a solar panel as a detector. The sound from the phone is first converted to electrical energy which is then transferred to the LED lights via wires where it gets converted in form of light. It is then transmitted to a solar panel where it is detected and converted in form of electrical energy, then transferred via wires to a speaker. Finally, it gets again converted into sound energy. The loudness of the sound depends upon the intensity of light and the distance between solar panel and LED lights. In this way, the LED light in a room is used not just to light up the room but also to play music, thus giving benefits of both worlds.

47. Laser based footfall counter

Prahlad Prajapat and Jaya

In this effort a foot fall counter is designed using Arduino programming. The project makes use of laser and LDRs to design a system which can control the lights and operation of various electrical appliances in a room. The light is turned on whenever any person enters the room and is turned off when the room is vacant. The designed system comprises of two gates. Whenever a person crosses both these gates, lights in the room will switch on and a count is maintained for the number of persons entering the room. On the contrary, whenever a person leaves the room count is decreased. The system can be extended to create an automated class room attendance taking scheme wherein a person entering the classroom is swiping his card and attendance is given to him. Further, electrical devices can also be controlled using this system as per the requirement.

48. Smart mirror

Prince Sharma and Aqil Ali

The goal of the project was to modernize the use of technology with the advancement in Artificial Intelligence and computer Vision. The project involved the smart use of two-way mirror having 70% reflective property and 30% transparency property on one side and just opposite from the other side. The smart mirror extracts weather, time and temperature from the

server and displays to the user and at the same time act as a normal mirror. Not only this raspberry Pi is programmed in such a way that it responds to user of their basic questions like 'How do I look?'. It has a capability to operate other devices as well. The project has got the ability to connect to the google account and retrieve basic pieces of information from the internet. This has been built with the help of few programming languages like node.js, python, ruby and it uses google assistant API for responding to the user's questions.

49. Assistive gadgets for visually impaired students

Ritesh Raj, Chiradeep Das, Ravneet Kaur and Gauri Ghai

During the last few decades Information and Communication Technology (ICT) has provided unprecedented opportunities in improving the quality of life. It has not only led to an enhancement in the efficacy of teaching-learning process, in development of lifelong skilled force but also in complementing the education of both ordinary as well as differently-abled learners. People with special needs often face difficulties in pursuing their education as they are not able to make full utilization of opportunities otherwise accessible to them.

Visually impaired students have better sensation of touch, smell and hearing than any normal human being. In this work, their high sensitivity toward sound has been exploited in designing the devices. With these they can perform majority of the laboratory experiments by themselves without the help of any buddy or other normal student. The assistive gadgets for visually impaired students designed and developed in this project includes

    A. Talk able Thermometer

    B. Water Level Detector

    C. Colour Detector

    D. Stop Timer

    E. Light Detector

With the developed gadgets, visually impaired students may perform various experiments in Chemistry like pH test, iodine test, litmus test, etc and in Physics they are well equipped to carryout experiments involving light with great ease using their ability to sense sound.

50. Green synthesis of zinc oxide (ZnO) nanoparticles as an efficient alternative micronutrient using aqueous leaf extract of *Ficus relegiosa*

Muskan Jindal, Astha Ahuja, Satendra Singh and Gagan Dhawan

Nanoparticles have wide applications in fields of biological, chemical and physical sciences. Zinc oxide nanoparticles have shown antimicrobial, antibiofilm, anticancer and antidiabetic activities. Other than these activities, they may be effectively used for the regulated release of Zn in the soil for the better growth of plants. There are various reported methods of synthesizing nanoparticles, but this work mainly focussed on "green synthesis", which makes use of reducing agents from plants in the form of aqueous solutions, instead of harsh chemicals. Zinc oxide

nanoparticles were synthesized from *Ficus religiosa* leaf extract under variable reaction pH. It has been found that pH- 12.39 was optimum for synthesizing zinc oxide nanoparticles. UV-Vis spectroscopy and Dynamic light scattering (DLS) studies were used to identify and characterize the zinc oxide nanoparticles. The data obtained on initial screening of synthesized nanoparticle by UV-VIS spectrophotometer and DLS showed similarity with the available literature on ZnO nanoparticles. The UV lambda max was observed at 374 nm and size estimated by DLS was 213.6nm. The synthesized ZnO nanaoparticles may have huge potential in various biomedical, bioengineering and agricultural applications.

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