3rd
IAPT National Student Symposium on Physics

17–19 September 2015

Indian Association of Physics Teachers

and

Department of Physics, Panjab University, Chandigarh

Supported by: DST - Chandigarh Administration

NATIONAL STUDENT SYMPOSIUM ON PHYSICS

Twenty-first century is the knowledge century. The innovations are supreme. To foster a culture of innovation and creativity among the young students, IAPT has instituted the annual National Student Symposium on Physics to provide a national forum to young students to present their new ideas and innovative work at an early stage, which will lead to their growth as creative and original researchers.

Professor A.K. Grover
Vice Chancellor

PANJAB UNIVERSITY
CHANDIGARH, *India* 160 014

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MESSAGE

It is a matter of great pleasure for me to know that Department of Physics, Panjab University, Chandigarh and Indian Association of Physics Teachers (IAPT) are jointly hosting the third National Students Symposium on Physics (NSSP) from September 17-19, 2015.

The continuity of NSSP into the third consecutive year reflects its motivational impact on the young minds. The overwhelming participation of students from all over India speaks volumes of its unique approach and perseverance in motivating and guiding the students towards a career in Physics.

The symposium gives the opportunity to the students to present their novel research ideas and to have an interaction with highly experienced teachers and researchers. I congratulate the Physics faculty for taking the lead in this very inspiring programme for the young students. This is a distinctive activity and I am sure that this teacher-taught confidence building programme for creative research will take India ahead in the scientific pursuit.

I wish the great success for the symposium and send my blessings to young students.

(Arun K. Grover)

MESSAGE

One of the major ideas in modern teaching methods is cognitive apprenticeship. Students, especially in professional fields, can be considered as apprentices who learn from teachers who are like practicing master craftsmen. Essentially this is the thought that drives the students' research programs all over the world. Such programs give students opportunities to learn how scientists do their work, to learn how to do research at times from practicing master scientists themselves. The National Students' Seminar in Physics (NSSP) is one such program. The program jointly undertaken by Department of Physics, Panjab University and Regional Council 3 of Indian Association of Physics Teachers is running into its third successive year and its organisers deserve great admiration. As the President of IAPT I feel immensely proud of them. I am sure that the students from various parts of the country who are attending the program derive utmost benefit from it and return with life-long zest to pursue science. I wish the program a resounding success.

H.C. Pradhan
President, IAPT

MESSAGE

It is a matter of immense pleasure that Indian Association of Physics Teachers (IAPT) and Department of Physics, Panjab University, Chandigarh are holding the third consecutive IAPT National Students Symposium on Physics (NSSP) during September 17-19, 2015 in the Department of Physics at Panjab University. The continuity itself proves that the students and teachers are committed for innovation and research in physics. The students present their original research work at national forum at the graduate level of their career. They interact with learned teachers and with fellow researchers. This inspires them to grow as creative and original thinkers and they get motivated to pursue their original ideas in the laboratory till the final scientific result is achieved. The IAPT is committed to this great tradition to achieve the great dream of Honourable President of India "The Noble Prize in Science under National Flag." I congratulate the IAPT members and faculty of Physics Department for their sincere efforts to continue this program. My very best wishes are for the young students, teachers and for the grand success to NSSP 2015.

Satya Prakash
Ex-President, IAPT

Third National Student Symposium on Physics
Convener's Address

Good morning. Welcome to the third National Student Symposium on Physics. At the outset let me thank and congratulate the Panjab University, and specially the vice chancellor Prof. Grover for hosting the third National Student Symposium on Physics, in addition to hosting earlier the first and second NSSP in a row. The success of the last two Symposia, and the enthusiasm of the students for the present one, heralds a new era in the Undergraduate and Postgraduate Physics education in our country. It is a matter of great solace to IAPT that, our students are resonating well with the call of the 21st century for the innovation and research. This is more so when there is desperation in all spheres, because of the widely prevailing symptoms of degeneration in higher education in India. We cannot take it lightly, or wish it away, as the data emerging in the several international studies unequivocally point it out. Indian universities and other higher teaching institutions like IITs and IISERs etc. are not able to occupy a single spot in the list of top two hundred universities in the world when countries like Malaysia and Saudi Arabia do. It has entered into the folklore of our country being repeated in various for a routinely in the last couple of years. Recent study by the journal Nature reveals more startling facts that in 2013, the scholarly citation impact of India is nearly 30% lower than the world average. The number of patent applications filed per million of the people in 2013 is the lowest, being only 17 compared to 541, 910, 2268 and 3716 for China, USA, Germany and Japan respectively. What is most perplexing is that India spends $171,000/- per researcher, more than many advanced western countries like Britain, Canada, Spain and Hungary given by $155,000/-, $157,000/-, $154,000/- and $122,000/- respectively.

Notwithstanding the fact that India has achieved excellence in some areas like space science, agriculture, nuclear science and pharmaceutical etc., one often wonders how the picture could be so dismal when compared with our contributions to basic sciences in the pre-independence era in 1920s and 1930s when the country had hardly a dozen of universities. Looking further back to the ancient period, India's contribution is simply breathtaking. While all civilizations endeavoured relentlessly to discover the way to write big numbers, it is only India which succeeded by inventing 'zero' and Decimal Place Value system. All branches of knowledge like science, mathematics and commerce etc., and in fact, the entire human civilization developed and flourished with it as the cornerstone of its foundation. It is amazing in Europe, roman system of writing numbers was followed up to as late as 17th Century in which one has to go on inventing newer symbols like I, V, X, L, C etc. with the increase of the largeness of the number, limiting its practical use up to couple of thousands. Rig Veda is supposed to have been written 5000 years back when the rest of the world was hardly literate.

What could be the possible causes for present state of decline? Out of many reasons the most important one is the long foreign rules of our country. India is the only country in the world which has been ruled by foreigners for about a thousand years. What incalculable and invisible harm it does to the native population is the erosion of the faith, self-confidence and self-esteem in themselves. It is easier to fight with an empire but difficult to fight with the legacy left by it. Although India got independence 68 years back, we are still fighting in various spheres to get back the faith in ourselves. The sooner we get the better it is. This process can be accelerated by our relentless conscious effort. The present symposium

meant to instill spirit of innovation and creativity in our young students, is a step in that direction. Swami Vivekananda has said “Difference between a man and man is owing to the existence or non-existence of faith in oneself. It is the faith, and faith, and only faith in yourself is the secret of all achievements.”

Wishing you a very successful symposium and enjoyable stay in this beautiful City of Chandigarh. Thanking you.

L. Satpathy

ABOUT IAPT

A voluntary organization of Physics Teachers (at all levels), Scientists, professionals and other interested in physics (Science) education in the country

Indian Association of Physics Teachers (IAPT) was established in 1984 by dedicated physics teacher and visionary (Late) Dr. D.P. Khandelwal with active support from likeminded features with the aim of upgrading quality of physics teaching at all level in the country. Since then it has grown into a major organisation with about 6000 members spread over throughout the country and abroad, besides annual members, student members and sustaining members. All IAPT work in voluntary, no remuneration is paid to members for any IAPT activity.
The Association operate through its 20 Regional Councils (RCs) grouped into 5 zones. These is a central Executive Council (EC) which controls and coordinates all its activities.Regional Councils also have a similar structure.

Current Activities of IAPT

Publications
Bulletin – a monthly (32 pages) with the record of uninterrupted publication since 1984. Besides reporting IAPT activities it also carries articles on developments in physics and physics education. Free to the members, it also serves as a vehicle of expression and communication amongst them.
Journal of Physics Education – The IAPT has taken over the publication of this quarterly (previously published by UGC) publication since April 2001 (volume 18). Life members of IAPT can get it at concessional rate. It carries research articles on Physics education
Prayas – A quarterly journal carries out articles and research reports by UG/PG students. It also carries invited articles from physicists of repute, now rechristened as *Student Journal of Physics.*
Pragami Trang – This bilingual (Gujarati & Partly English), has been started since 2009 by Gujarat RC.
Horizons of Physics – In a book series brought out for physics teachers and students. Each volume contains about 15 review articles written by experts, taking off from the B.Sc. level and leading to the frontiers of the field.

National Standard Examinations
National Standard Examinations are held at 3 levels with the objectives: to enable the student judge him/herself against a national standard; to present correct perspective of physics; to enhance the students-teacher interaction through discussion on the Q-paper. Members or students are identified, duly honoured and awarded medals and token prizes. These examinations constitute the first step towards participation in International Olympiads in respective subjects. The responsibility of selecting and sending the Indian team to the international Olympiads rests with the Homi Bhabha Centre for Sciences Education (HBCSE) with whom IAPT works in close collaboration.

Evaluation of experimental skills
IAPT started this evaluation with NSEP and NGPE, examinations since 1992, essentially to stress the point that no evaluation of a science student is complete without inclusion of an evaluation of experimental skills.

Extra Low-Cost Book (ELCB) programme

Under this programe life members are offered quality physics books at a considerable discount, under arrangement with publishers. The aim is to help teachers build up their personal libraries.

For Teachers

NCIEP (National Competition for Innovative Experiments in Physics): This programme is being held since 2003, to encourage Physics Teachers to conceive and set up original innovative experiments in Physics. The Competition is held every year at the venue of The Annual Convention. The high quality of entries shows the usefulness of the programme.

National Competition for Computational Physics (started 2011)

Essay Competition: Gujarat RC of IAPT organizes a National Essay Competition for all teachers for the last few years.

Anveshikas (Experimental Physics Centres)

The first such centre was established at SGM Inter College, Indira Nagar, Kanpur in 2001. It provides a base for generating interest in Experimental Physics in young students. upto +2 level through learning by doing. Facilities exist for conducting Teachers Orientation Programmes for encouraging them to undertake class room teaching through demonstrations. A mobile unit gives demonstrations in schools by prior appointment. Each demonstration session is of about 2-3 hour duration. This programme generates interest is students for Physics and clarifies the basic principles. A number of such centres are now coming up in the country.

NANI: It has been decided to establish a National Anvashika Network of India (NANI) of 100 Anveshikas. Already (2011) nearly 15-20 Anveshika's have come into existence others are in the offering.

Centre for Scientific Culture (CSC): The Centre established at Midnapore College, Midnapore (WB), provides an year round exclusive facility, of working experiments in Physics. It is also engaged in developing laboratory experiments exercises in physics at school level.

Orientation Programmes/Seminars/Workshops for Teachers

These are organised regularly by Regional Councils in both, theoretical and Experimental Physics. A number of such programmes have been carried out with the support from MHRD, Infosys Foundation and other such agencies.

Conventions

A 3-day National Convention is organised every year, since 1984 on some specific theme. Papers are presented by members and lectures are delivered by experts in the field. Presentation of innovations in teaching methods, demonstrations and lab experiments is a regular feature in all conventions.

Regional Councils also organise regional conventions at their convenience. Teachers' talent in various aspects of Physics education is identified and rewarded by organizing contests during conventions.

ABOUT DEPARTMENT OF PHYSICS, PU

The Department of Physics was established in 1947, in Govt. College, Hoshiarpur (Punjab). In August 1958, the department was shifted to the present campus. At that time, the department was headed by Prof. B.M. Anand who had worked with Nobel laureate C.F. Powell. The faculty numbered about a dozen and Prof. Anand soon established a high-energy particle physics group (nuclear emulsion) and optical UV spectroscopy group. The experimental nuclear physics group and mass spectrometry section came into existence soon after.

With Prof. H.S. Hans joining the department in the late sixties, the research activities got a major fillip—cyclotron was installed. Three major research groups in nuclear physics, particle physics and solid-sate physics including both theory and experiments were strengthened and mass spectroscopy laboratory was modernised. Since then the department never looked back. It has UGC Special Assistance Programme (SAP) from 1980 to 1988 and College Science Improvement Programme from 1984 to 1991. With the success of the above programs and of research activities in particle physics, nuclear physics and solid-state physics through national and international collaborations, the department became a major research centre amongst Indian universities.

In 1988, the department was accorded the status of Centre of Advanced Study (CAS) by UGC with three major thrust areas, particle physics, nuclear physics and solid-state physics, which is a unique feature in itself. The department is now in CAS forth phase. At present the department has a strength of 29 faculty members, 47 non-teaching/administrative staff, around 120 research students, 15 M.Phil. students, 10 Post-M.Sc. Course in Accelerator Physics students and about 350 graduate and undergraduate students. Our students clear various entrance examinations, like GRE, BARC, TIFR, DRDO, UGC/CSIR test for research and career in teaching, besides entering professional courses, like M.Tech., MCA, etc. About 30 research projects worth eight crore rupees under national/international collaborations are operating in the department.

Besides imparting quality education to the department students, the faculty also teach specialisation subjects, like nano-technology, nuclear medicine and medical physics to name a few.

The department participates in various national and international research initiatives and also hosts various conferences, seminars, meetings etc. of research interest regularly. The department has an 11-inch telescope to encourage/inculcate the scientific temper among public and with particular emphasis on college and school students.
The department houses Indian Association of Physics Teachers (IAPT) office and actively leads in IAPT and Indian Physics Association (IPA) activities.

RUCHI RAM SAHNI – A MULTIFACETED PERSONALITY

Ruchi Ram Sahni (1863-1948) was born barely 14 years after the British annexation of Punjab and lived to see India become independent. His life thus spans a very important period of history. He was the first person from Punjab to make a career in science. He was the first Indian officer in the India Meteorological Department (1885). Moving by choice to teaching, he became the first Indian science professor at Government College Lahore which he served from 1887 till his retirement in 1918. The University instituted Ruchi Ram Sahni Declamation Contest Prize in his honour. He is also India's first nuclear scientist who published two research papers in 1915 and 1917 working in the laboratory of Ernst Rutherford in Manchester where he interacted with Niels Bohr. (Interestingly, in his laboratory work, he was assisted by his son Birbal Sahni, the well-known paleobotanist, who was at the time studying in Cambridge.) He remained a member of Punjab University Senate and of Syndicate for a number of years, till 1921. In 1923, he entered Punjab Legislative Council as a member of the Swaraj Party. Ruchi Ram was a conscientious and inspiring teacher who spent six months learning carpentry for the sake of laboratory work. His instructor in the craft who also doubled as his teacher in art and aesthetics was Bhai Ram Singh, later the celebrated architect of Khalsa College, Amritsar. Having been a student who came up in life through scholarships and help from well-meaning people, he took his mentoring role very seriously. One of his students whom he mentored in various ways was Shanti Swarup Bhatnagar, who was appointed Director of Scientific and Industrial Research in 1940, and who set up a string of national laboratories in independent India. Ruchi Ram, his geologist son Mulk Raj Sahni, Birbal Sahni and Bhatnagar were invited by C. V. Raman to be foundation fellows of Indian Academy of Sciences established in 1934. Coincidentally, the Sahnis' ancestral home town Bhera, now in Sargodha district, Punjab, Pakistan, is also Bhatnagar's birthplace.

Ruchi Ram was in addition a social and religious reformer, science popularizer, text book writer, and author and after retirement an active follower of Mahatma Gandhi. Product of a liberal composite culture, he learnt Urdu and Gurmukhi besides physics and chemistry and came to appreciate the intrinsic beauty of the Persian language. As Kapurthala Alexandra Scholar at Oriental College, Lahore he delivered lectures on science in Urdu to its students, and even translated a book on conservation of energy from English into Urdu. It is a separate matter that the translation could not be published because of lack of funds.

He was an enthusiastic advocate of Punjabi (and regional languages in general) 'as a vehicle of scientific ideas'. He gave public lectures in Punjabi in Lahore, other towns and even remote villages. All his lectures were 'illustrated with easy experiments, often with simple apparatus which any one could make for himself'. His own estimate was that he gave about 500 popular lectures in all under the auspices of the rather short-lived Punjab Science Institute which he co-founded in 1885. In conjunction with the Institute he set up a workshop as business venture for repairing old instruments and making new ones. A great votary of employment-oriented technical education, he played an important role in the

movement that maintained that 'if Hindu and Sikh youth were provided with suitable means of instruction in technical subjects, many fresh openings could be made for them and the present pressure on agriculture and the services largely diminished'. As a result, Victoria Diamond Jubilee Hindu Technical Institute was set up in Lahore in 1897 and Ruchi Ram given the honour of delivering the inaugural address. The Institute was headed by the famous poet-scientist Puran Singh during 1904 -1906. Having experienced both opulence and poverty in his childhood, Ruchi Ram was very keen to promote science as a producer of wealth. In 1934, as the President of Northern India Chemical Manufacturers' Association, he strongly objected to 'the economic resources of the province' being 'mortgaged beforehand to a foreign concern [Imperial Chemical Industries]', and wanted 'the interests of indigenous chemical industries' to be protected. A life-long adherent of the Brahmo Samaj principles, he held all religions in high esteem. In or after 1945 he wrote Struggle for Reform in Sikh Shrines, which was later edited by Dr Ganda Singh and published by the Shiromani Gurdwara Prabhandak Committee (SGPC). With his characteristic thoroughness, he preserved all the press communiqués on the subject which SGPC had issued from time to time and subsequently presented a complete set to SGPC whose own collection had gaps. Ruchi Ram Sahni belonged to the first generation of University students in Punjab who were 'practically without any guidance from our elders'. Very conscientiously he set out to remedy this deficiency for the coming generations of students. On a personal level, he sought knowledge and strove to live in accordance with it. As member of the society, he strove even harder to apply his intellect, learning, analytical skills and organizational abilities for the benefit of his countrymen. It is in this context that he continues to be relevant today. Ruchi Ram Sahni (1863-1948) was born barely 14 years after the British annexation of Punjab and lived to see India become independent. His life thus spans a very important period of history. He was the first person from Punjab to make a career in science. He was the first Indian officer in the India Meteorological Department (1885). Moving by choice to teaching, he became the first Indian science professor at Government College Lahore which he served from 1887 till his retirement in 1918. The University instituted Ruchi Ram Sahni Declamation Contest Prize in his honour. He is also India's first nuclear scientist who published two research papers in 1915 and 1917 working in the laboratory of Ernst Rutherford in Manchester where he interacted with Niels Bohr. (Interestingly, in his laboratory work, he was assisted by his son Birbal Sahni, the well-known paleobotanist, who was at the time studying in Cambridge.) He remained a member of Punjab University Senate and of Syndicate for a number of years, till 1921. In 1923, he entered Punjab Legislative Council as a member of the Swaraj Party.

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85.	Sahana K S	Maharani Lakshmi Ammanni College for Women, Bangalore
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90.	Shaik Sikindar Mohaseen	Sri Chaitanya Educational Institutions, Vijayawada
91.	Shallu	GGDSD College, Chandigarh
92.	Shamsuddeen Idris Mu'azu	Sharda University , UP
93.	Shankar Dutt	GNDU Amritsar
94.	Shreti Garg	Maharani Lakshmi Ammanni College for Women, Bangalore
95.	Shreya Mahendru	Department of Physics, PU
96.	Shriyog Shrikant Kokare	Abasaheb Garware College, Pune
97.	Shubam	Lyallpur Khalsa College , GNDU
98.	Siddharth	Nayagarh Autonomous College, Nayagarh
99.	Simrandeep Kaur	Department of Physics, PU
100.	Sneh Lata	GGDSD College, Chandigarh
101.	Sonia Rani	GGDSD College, Chandigarh
102.	Sreeraksha.P.S	Maharani Lakshmi Ammanni Collage, Bangalore
103.	Sukhjeet Kaur	Punjab Agricultural University, Ludhiana
104.	Swati Chhikara	GGDSD College, Chandigarh
105.	Tanishka Soni	Fergusson College, Pune
106.	Twinkle Pahwa	GGDSD College, Chandigarh
107.	Vachhani Dhyey T.	Christ College, Rajkot
108.	Vansh Lakhina	UICET, PU
109.	Vardan Mongia	Department of Physics, PU
110.	Vekaria Brijesh Dharmendrabhai	Sir P.T. Sarvajanik College of Science, Surat
111.	Vikas Chand	UICET, PU
112.	Vinod Kumar	Kurukshetra University
113.	Visave Dharini Gnyaneshwer	Sir P.T. Sarvajanik College of Science, Surat
114.	Yash Shekhar Deorukhkar	Ruia College, Mumbai
115.	Yogesh Nagendra Pandey	Fergusson College, Pune
116.	Zubairu Ahmad Usman	Sharda University , UP

INVITED SPEAKERS

Prof. D. P. Roy, HBSCE, Mumbai
Title: Basic Constituents of matter and their Interactions
Title: Why LHC ?

Prof. Sudipta Mukherjee, IOP BBSR
Title: Renormalisation in Quantum Mechanics

Prasanta K Panigrahi, IISER Kolkata
Title: Quantum Mechanics in Action

Abstract: We start with the basic principles of quantum mechanics, which are finding applications in the area of quantum computation, and explain how quantum mechanics allows one to carry out faithful teleportation, better than 'Star Trek'!. Principles of quantum mechanics can be used in a host of applications, where utmost security is desired, such as in 'Quantum Key distribution, 'Quantum Cheques' etc. Use of quantum mechanics in carrying out accurate measurements of change in length and other observable. Basic understanding of matrices is assumed.

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O-2	Ashutosh Padelkar	Examining The Variation in Beta Decay Rates of Tritium
O-3	Chhabil Dass	Robust Spin Gapless Semiconducting Characteristics of Mn_2CoAl with Ga Disorder
O-4	Habibu Ahmad Ibrahim	Areview of The 3 Tesla (3t) Mri Machineartifacts and How it Affects Image Quality
O-5	Hansraj	LEDs: The Most Energy Efficient Lighting Device
O-6	Harishchand S. Nishad	A Simple Lamp from Waste Material (E-waste management)
O-7	Kanav Sharma	A Theoretical Explanation for The Einstein's Remark on Bending of Light due to Huge Mass
O-8	Manan Jain	Classical System Underlying A Diffracting Quantum Billiard
O-9	Manpreet Singh Jattana	The Turning Mystery of a Spaceship
O-10	Mohiniraj R. Dange	Affordable Fuel Free Spray Pump for Green Agro Applications
O-11	Mudassir Umar Ali	The Schrödinger Equation of Linear Potential Solution Specializing to The Stark Effects
O-12	Paramvir Singh	A Case Study of Population I Stars In The Big Dipper Asterism
O-13	Phalak Takkar	Big Bang Theory: The Ultimate Explosion of Space
O-14	Sahana K. S.	Diffraction Pattern, Reveals The Inner Beauty
O-15	Sanjay Kalita	ATM Security System
O-16	Shaik Sikindar Mohaseen	How Life has Come From Mars to Earth?
O-17	Shamsuddeen Idris Mu'azu	Effect of Radiation on DNA
O-18	Shankar Dutt	Thermoluminescence Characteristics of Nanocrystalline Materials
O-19	Shreti Garg	Quantum Anharmonic Oscillator- A Computational Approach
O-20	Shriyog Kokare	X-Ray Crystalography- A Tool for Material Characterisation
O-21	Yogeshri S. Kokare	Scanning Electron Microscopy: A Tool to Know The Materials Morphology
O-22	Zubairu Ahmad Usman	Effect on Image Quality and Patient Dose of Various Types of Ct Detectors
O-23	Raminder Kaur	Synthesis Technique of Nano-ZnO for Antibacterial Study: A Review
O-24	Vikas Chand	Developments in Conducting Polymers for Organic Solar Cell: A Review
O-25	P. Ghotane	Systhesis and Characterization of Innovative Multilayer, Multi Metal Oxide Thin Films by Modified Silar Deposition Method

List of Poster Presentations

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P-1	Aditi Joshi, Nilima Akolkar	Visual Observation of Geminides-2014
P-2	Avneet Kaur	Nonlinearity as a New Branch in Science
P-3	Avneet Singh	Tin Oxide/Reduced Graphene Oxide nanocomposites
P-4	Brijesh D. Vekaria, Nidhi B. Bakori	Li-Fi: Light fidelity (LiFi) is a Wireless Optical Networking Technology That Uses Visible Light From Leds for Data Transmission
P-5	Barinder Kaur	Determination of Mass Attenuation Coefficient of Teak Wood Sample
P-6	Chetna Sood	Determination of Mass Attenuation Coefficients of Guava Leaves Using Beta Attenuation
P-7	Dharini Visave G.	The Fundamental Particle: Higgs Boson
P-8	Devangi Grover, Swati Chhikara	Synthesis of Graphene Oxide for Water Remediation from Heavy Metal Ions
P-9	Devansh Desai	Importance of Light-in Physics and Technology
P-10	Gunvir Kaur	Effect of Magnetic Field on Properties of Hard Water
P-11	Heenam, Richa, Shallu	The Origin of the Universe
P-12	Ishita Aggarwal, Arushi Arya, Vikas Chand	Organic Solar Cells: Sustainable, Green and Innovative Source for Smart Future
P-13	Jaishree Phoolia	Study of Dielectric Properties of Different Dairy Products
P-14	Jasleen Kaur	Effect of Ohmic Heating on Electrical Conductivity of Soymilk
P-15	Jyoti Pareek	Water Purification by Using Oxide Nanomaterials
P-16	Kanika, Komal Sharma	Saturn's Moon Titan - Alive or Dead
P-17	Lovina, Parrydeep Kaur Sachdeva	Screenless Displays - The Future of Technology
P-18	Mansi Garg	Deposition of Barium Strontium Titanate Thin Film using Pulsed Laser Deposition
P-19	Nakum Sanjay B.	LIGO - A New Way to Explore the Universe
P-20	Nareeya K. Jitendrabhai	Aero Braking space problem at Neptune
P-21	Navdeep Kaur	The Variation of Viscosity with Temperature in Light and Dark Coloured Honey
P-22	Nivedita Pan, Nandita Pan	The Utilization of Wind Energy in Vehicles
P-23	Nupur	Functionalized Carbon Nanotubes for Decontamination of Water from Heavy Metal: Mercury
P-24	Priya Shekhawat	Application of Biosensors
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P-26	Ragandeep S. Sidhu, Amandeep Kaur	Neutrino: The Ghost Particle!
P-27	Rahul Vishwase	Comparative Study of Humidity Sensing Properties of Tin Oxide Thin Film and Nanoparticles
P-28	Sakshi Saini	A Review on Dielectric Relaxation Studies of Some Impotant Polar Aromatic Compounds and of Some Fruits and Vegetables at Microwave Frequencies.
P-29	Sandeep Kaur	Non-Extensivity of Entropy in Multiparticle Production at High Energy
P-30	Shreya Mahendru, Paramvir Singh	Age Estimation of Solar and Late-M Type Stars, and NGC 6811 Cluster Using Gyrochronology
P-31	Simrandeep Kaur, Pankaj Bhardwaj, Deepti Rana, Anshu Gupta	Antimatter
P-32	Sreeraksha P.S.	Coriolis Force
P-33	Sukhjeet Kaur	Origin of Solitons
P-34	Tanishka Soni	Low-Temperature Susceptibility of Rock, Volcanic Ash and Sediment Samples
P-35	Twinkle Pahwa, Himani Chawla, Sonia Rani	Nanomaterials: Introduction and Applications
P-36	Vansh Lakhina, Jayant S. Sood, Raminder Kaur	Fuel Cell: Journey from Laboratory to a Greener and a Cleaner Future
P-37	Vardaan Mongia	Blackholes: Quantum Mechanics Vs General Relativity
P-38	Yash Deorukhkar, Ketan Pimputkar	Gesture Controlled Car using Accelerometer
P-39	Vachhani Dhyey, Rajesh Purohit	Physics in Entertainment
P-40	Yogesh Pandey	Determination of Hubble's Constant
P-41	Ziad Modak	An Amateur Radio Telescope Using a Satellite TV Dish Antenna
P-42	Akash Gulati, Ikchit Singh Sangha	Programmable magnets: Working and application

Abstracts of Oral Presentations

The Inprovement of Radiographic Visualisation Using Tissue Harmonic Imaging in Comparison with Standard Ultrasonic Imaging Mode

Abubakar Sani Garba, Habibu Ahmad Ibrahim and Mudassir Umar Ali
(M.Sc. II)
Department of Physics, Sharda University, Greater Noida

The application of physics in medical practices for example in ultrasonography has evolved over the last few decades and will continue to improve as physics and technological advances are incorporated into daily medical practices. This article reviews the conventional ultrasound machine in comparison with Tissue harmonic imaging (THI) which is a new grayscale imaging technique. It creates images that are derived solely from the higher frequency, second harmonic sound produced when the ultrasound pulse passes through tissue within the body. Tissue harmonics uses various techniques to eliminate the echoes arising from the main transmitted ultrasound beam ("the fundamental frequencies"), from which conventional images are made. Once the fundamental frequencies are eliminated, only the harmonic frequencies are left for image formation. Indeed, the quality of the harmonic image is primarily dependent on the complete elimination of all echoes derived from the transmitted frequencies. Tissue harmonic imaging offers several advantages over conventional pulseecho imaging, including improved contrast resolution, reduced noise and clutter, improved lateral resolution, reduced slice thickness.

Examining The Variation in Beta Decay Rates of Tritium

Ashutosh Padelkar
(B.Sc. II Physics)
Dept. of Physics, Ramnarain Ruia College, Mumbai

This experiment examines the variation in beta decay rates of tritium to investigate the claims that the decay rate depends upon the distance between the earth and the sun[1]. The experiment† consists of two photodiodes measuring the light output of a tritium lamp. The apparatus is kept at a constant temperature. Data recorded over a period of one year is stored on EEPROM memory. The data from three consecutive years (May 2012 - May 2015) is studied in this analysis. The results, while not very consistent, suggest that the measured decay rate corresponds to the average value near the equinoxes, with maximas in the winter months and minimas in the summer months. This may hint at correlation between the beta decay rates and the earth-sun distance. More experimentation is necessary to validate these claims, possibly using different detection apparatus at different locations.

Robust Spin Gapless Semiconducting Characteristics of Mn_2CoAl with Ga Disorder

Chhabil Dass, Vinod Kumar, Renu and Manish K. Kashyap
CD, VK, Renu (M.Sc. II)
Department of Physics, Kurukshetra University, Kurukshetra-136119, Haryana (INDIA)

The effect of substitutional disorder of sp-element (Al) by Ga in inverse Heusler alloy Mn_2CoAl has been demonstrated using Full potential linearized augmented plane wave (FPLAPW) method. We have found that this stoichiometric Heusler alloy is robust spin

gapless semiconductor even in the presence of 25% Ga disorder. Further no change in magnetic moment of Mn_2CoAl via Ga disorder has been observed. The robustness of spin gapless nature and magnetism makes the studied alloy easy to synthesis without worrying small amount of sp-element disorder.

A review of The 3 Tesla (3t) Mri Machineartifacts and How it Affects Image Quality

Habibu Ahmad Ibrahim
(M.Sc. II)
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The Whole-Body MRI machines or scanners that operate at high field strengths are becoming widely available, such as the newly3 Tesla (3T) MRI models machines which are launched in the recent years. This generation of 3T scanners offers exciting possibilities for radiological Diagnosis. The primary advantage of 3T scanning machines is to increase the signal-to-noise ratio. Which can be used to cut magnetic resonance (MR) scan or to increase the resolution of image quality. The magnetic resonance imaging MRI which is performed with 3T usually have a higher chemical shift separation, which produces spectral peaks that are farther apart. This advantage of the 3T MRI scan can be used to eliminate the balance against an increase in chemical shift artifacts in the image quality. This results is often used for a better background suppression during MR angiography, and better vessel/tissue contrast. Nevertheless one of its drawbacks is that it decreases the contrast between gray and white matter. The image quality effect will also increase, when the magnetic field is increased from 1.5T to 3T. Thus, the MRI will have higher sensitivities but also more susceptibility artifacts. Because scanning at high field strengths can also cause problems with the specific absorption rate (SAR) limit. Which means excess of radio frequency in the body, due to the longer scan times.

LEDs: The Most Energy Efficient Lighting Device

Hansraj
(M.Sc. II)
Department Of Physics, Central University of Haryana, Mahendergarh

LEDs are the best known optoelectronic device which emits visible, invisible, coloured or white light by the electroluminescent. For a long time, the high cost of producing LEDs has been a roadblock to using wide spread use of it. LEDs are extremely energy efficient solid light bulbs. The directional limitation of LED bulbs can be over come by using diffuser lenses and reflectors which are used to disperse the light more like an incandescent bulb . Here I like suggest to introduce a new material namely silicon carbide for production of LEDs. By using it the cost of LEDs can be reduced considerably.

A Simple Lamp from Waste Material (E-waste management)

Harishchand S. Nishad
(B.Sc. II Physics)
Siddharth College, Mumbai-400001, India (Affiliated to Mumbai University)

This paper describes a very simple circuit of a lamp made from waste material. In this lamp all materials used is waste material except the LED (Light Emitting Diode) and switch. This

is very easy to construct. In this lamp I had used scrap cell phone battery or used cell phone battery, Diode, LEDs, switch, charging socket, wires etc .We can charge the battery up to 15 to20 minutes, Once its charged. It can glow up to 3 or 4 hours. If the condition of battery is good then it can glow for the whole night. It doesn't require any specific charger .It can be charged by mobile charger.

A Theoretical Explanation for The Einstein's Remark on Bending of Light due to Huge Mass

Kanav Sharma
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GGDSD College, Chandigarh-160030, India

Electromagnet waves are emitted from sun in the form of photons. EM waves carry energy, momentum and angular momentum. There are two types of angular momentum – orbital and spin angular momentum. In spin angular momentum, electric and magnetic field rotate about the axis of propagation of em waves. And when it strikes on center of particle it makes that particle to rotate. So about the rotation of earth around its axis, we say that earth rotates by spin angular momentum of em waves. As $E = hc/wavelength$, taking average wavelength 500nm gives energy of photon as $E = 10^{-17}$ in SI units. This energy is not sufficient to rotate or move any particle. In this work, we assumed an example of particle accelerating due to photons. Using some typical values for model parameters, the number of photos is calculated required for rotation of particle. Assuming, particle of mass as 10^{-3} kg and accelerate to 10^{-3} m/s^2 , number of photons required to be 10^8 for displacement of 10^{-3} m. As $E = mc^2$, mass of photon = 10^{-34} kg , so as gravitational force $f = GM_1M_2/r^2$. If M_1 is considered 10^{-34} kg then it is required that M_2 should be very large for force between two. Hence, for light to bend it requires other huge mass like sun.

Classical System Underlying A Diffracting Quantum Billiard

Manan Jain
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For a point scatterer placed slightly off the centre of a circular enclosure, rays are found which vividly exhibit the effect of diffraction. The Schr¨dinger equation was mapped in the complex plane by employing a fractional linear transformation which brings the point scatterer to the centre. But the mass of the particle becomes a function of space coordinates, bearing anisotropy. For the transformed problem, the corresponding classical Hamiltonian is written and solved with Snell's laws on the boundary. The solutions of the Hamilton's equations thus found constitute, in fact, the ray-manifold underying the diffraction at the level of the wave-description.

The Turning Mystery of a Spaceship

Manpreet Singh Jattana
S.G.T.B Khalsa College, University of Delhi, Delhi

A problem concerning motion of a spaceship in a fluid under certain constraints, which seems counter-intuitive at first but using concepts of fluid dynamics like pressure differences, momentum transfers, conservation laws and Bernoulli's Principle, a solution is obtained. The

qualitative approach would be convert our problem to an analogous everyday life variation of the problem, i.e. the reverse sprinkler, and simultaneously address any issues that seem to appear by introducing more analogies and ultimately grasp a better intuitive understanding of the abovementioned basic principles of Physics.

Affordable Fuel Free Spray Pump for Green Agro Applications

Mohiniraj R. Dange
(M.Sc. I)
Abasaheb Garware College, Pune

Indian Economy is the world's largest economy. Farming or agriculture is the backbone of Indian economy. To develop the economy, we should develop the agriculture. To develop the agriculture, we should develop the common middle class farmer. Farmers require various devices/instruments in their life. Spray pump is widely used in their day-to-day farming life. This spray pump requires fuel for its working. It has a storage capacity of about 15 liters. This existing spray pump requires to be carried on one's back for its operation. Hence, pollution & high expenses on fuel, limited storage capacity and probable health issues to the operators are major drawbacks of existing pump. To overcome these drawbacks a new spray pump is designed. Main features of the pump involve no requirement of any fuel or electricity, extendable storage capacity, ease of handling, affordable fabrication cost etc. The basic elements of the device are required accumulator & piston to create the required air pressure. The piston movement is materialized using the sprocket-pinion system, which can be operated manually by the operator. Each moving part of the device is fixed with a ball-bearing system to minimize the friction.

The Schrödinger Equation of Linear Potential Solution Specializing to The Stark Effects

Mudassir Umar Ali
(M.Sc. Physics)
Department of Physics, Sharda University, Greater Noida, Uttar Pradesh, India.

The Shifts in the energy level spectrum due to the external electric field is examine, for a one dimensional quantum mechanical system describe by the Schrodinger equation specializing to the linear potential which is perturbed by electric field. The 1D model of linear potential that is known as a quantum bouncer, which is define as ($v(y) = Fy\ for\ y > 0 \wedge v(y) = \infty\ for\ y < 0$) and the symmetric linear potential which is $(v(y) = Fy)$. In this case the Airy function property is use to give a close result the shift in energy level under the electric field (Stark Effect), The approximate and exact result is compared.

A Case Study Of Population I Stars In The Big Dipper Asterism

Paramvir Singh and Parit Mehta
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Star formation in stellar nurseries takes place at a very high rate of a few hundred stars per year. These stellar groups of newly formed stars are called star clusters. After formation, some clusters remain bound to the central gravitational system and some evolve into anopen

non-symmetric star clusters. Yet the physical and chemical properties of stars remain largely samewithin a cluster. Ursa Major (UMa)movinggroup is an example of such an open cluster containing nearly220 stars. Big Dipper is central to the evolution and kinematics of UMa moving group. Analysis of spectral data obtained from the sixstars in this prominent asterism, the Big Dipper, is used to discern their respective spectral classes. Most stars are A type suggesting temperatures of around 10^4 K with the exceptions of one B type and G type star each differing in temperature by about $\pm 5x10^3$ K respectively. Big Dipper members generally showcase a radial velocity away from the earth indicating positive redshifts which can be calculated from spectral data.Using spectral line widths, elemental abundances can be found. Such estimation suggests these stars to be relatively young at around 500 Myr old and justification of their subsequent classification as Population I.Further analysis of spectroscopic data reveals more information about spectral class of individual stars and entails estimation for the whole cluster. Elemental abundance data from spectra combined with literature based information, coupled with H-R diagram gives more detailed results for the mass and age of cluster, pointing towards a commonorigin of the stars.

Big Bang Theory: The Ultimate Explosion of Space

Phalak Takkar
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In this manuscript, it has been described that different mythologies have their own ruling god or giant creator who led the discovery of the world. The Einsteins thought experiments described his curiosity, due to which he led the theory of relativity describing that time and space are relative with respect to each other. Kant called the nebulae as island world because he pictured the universe as an ocean of astronomy. Cosmology also plays a part in discovery of universe and the cosmological constant of space is populated by separate island of stars and our Milky way is just one of such island of stars. Any isolated system of stars is known as galaxy. Then came Hubble's law, he measured the distance to the nebulae and proved that many of them were independent galaxies. Edwin Hubble had stamped his authority on the world of astronomy. The cosmological constant was inserted by Einstein in his equation, for the establishment view of a static and eternal universe. Paradigm shift, the battle between rival cosmological theories, which were finally resolved. Big bang means explosion of space and in this it has been described how ultimately the universe began and life started on Earth.

Diffraction Pattern, Reveals The Inner Beauty

Sahana K. S. and Sarmistha Sahu
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Department of Physics, Maharani Lakshmi Ammanni College for Women, Bangalore 560012

Quiz is a mind tickler. Finding out something practically by applying what one has studied in theory is thrilling! But, I (Sahana) had to learn Diffraction thoroughly, to reveal the mystery. *Optochem*, a company at Delhi parceled a slide saying it is "----------" (not to let out the cat of the bag). To our surprise, when illuminated with a laser we saw a pattern different from expected. Immediately, we (Sahana K S and the teacher) studied the intensity pattern thoroughly and found that the slide was not what was claimed to be. A sense of satisfaction motivated us to share it with others and make it a tool for activity based learning for students.

ATM Security System

Sanjay Kalita, Kuldip Nath, Dhrubjyoti Hajong and Md. Yasser Arafat
(B.Sc. III)
Department of Physics, Goalpara College, Goalpara, Assam

In this paper, a security system is designed to prevent ATM crime. When an ATM robbery takes place or the robbers try's to dislocate the ATM, the LDR circuit gets activated which is placed inside the ATM, as because the LASER source placed at the base of the ATM gets disrupted. The LDR senses the difference in the light intensity and it sends a signal to a microcontroller which in turn activates a siren and a GSM module sends SMS alert to the nearest Police Station. And the location of the machine can also be tracked. This system will prevent the ATM crime.

How Life has Come From Mars to Earth?

Shaik Sikindar Mohaseen
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Sri Chaitanya Educational Institutions, Vijayawada, Andhra Pradesh, India

The life had travelled from the fourth planet from the sun that is mars. Mars is also called as the red planet because of its red color. According to the theory of late heavy bombardment, in the past around 4 billion years ago there was a heavy rain of comets in our solar system. In that situation one of the comet collided with the mars, this collision formed Argyre crater. Due to this collision, the volcanoes on the mars have erupted and they overflowed the iron containing magma from the core to surface. Thus iron came to surface. The iron reacted with the oxygen that is present at that time and formed rust iron (red color). The heat produced by the collision and volcanoes burned the life (organic molecules) of that time. Mars atmosphere was oxygen-rich and it contained basic elements which are required for the life before 4 billion year. That was disappeared due to the collision. By burning organic molecules we get carbon dioxide, water and heat. That's the reason for high content of carbon dioxide (95.32%) in atmosphere. As the recent research of NASA suggests that there was ocean on mars which is larger than Arctic Ocean. Water of that ocean had gone into space some 4 billion years ago. During the collision some land masses of mars containing life rose up in space and traveled to earth. This was collided. From these Martian meteorites the life came on earth and evolved.

Effect of Radiation on DNA

Shamsuddeen Idris Mu'azu
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Sharda University, Greater Noida, U.P

DNA **(**Deoxyribonucleic acid) is a critical molecule for living things. It is commonly being repaired through a number of different mechanisms. Radiation is all around us and it has been this way since the creation of Earth. As such, life on Earth has evolved in an environment exposed to various types of radiation, both Ionizing and Non-ionizing. It comes from space (cosmic radiation), the ground (terrestrial radiation), from air, water and even food. These radiations have direct effect on DNA, causing DNA damage when exposed. The effect of radiation on DNA may include chemically altered bases, break in sugar phosphate backbone or break in hydrogen bonds. Thus, this study is done to review the effect of various

types of radiations on DNA and to study the damaging effects so that some remedies can be made to prevent chromosomal mutation caused by radiation.

Thermoluminescence Characteristics of Nanocrystalline Materials

Shankar Dutt
(B.Sc. III)
Guru Nanak Dev University, Amritsar

Thermoluminescence dosimetry is one of the best dosimetry technique. It is very cheap and efficient. For its study different samples of five Nanocrystalline materials, $CaSO_4$:Ce, $CaSO_4$:Sm and $CaSO_4$:Dy, $CaSO_4$:Sm,Dy, $CaSO_4$:Ce,Dy were synthesised. Nanocrystalline Materials were prepared by chemical co-precipitation method. Different samples of same host material were formed by varying the amount of dopant. Mainly, the concentration of the dopant was varied as 0.05mol%, 0.1 mol%, 0.2 mol%, 0.35mol%, 0.5 mol% in the samples. These set of samples were exposed to 300Gy of gamma radiation and the optimum concentration was found from Glow curve Study. The optimised samples were exposed to different doses i.e. 30 Gy ,60 Gy, 100 Gy, 200 Gy, 350 and 500 Gy of gamma radiation in the gamma irradiation chamber. Radiation creates electronic excited states in crystalline materials. In some materials, these states are trapped, or arrested, for extended periods of time by localized defects, or imperfections. Heating the material enables the trapped states to rapidly decay into lower-energy states, causing the emission of photons in the process. To study the thermoluminescence characteristics of the Nanocrystalline materials, the different samples (which were exposed to different radiation doses) were studied using a TLD reader (Thermoluminescence Dosimeter) by taking small quantity (5mg) of the samples each time. The study was done by heating the sample in TLD. Accordingly, the glow curves of these samples were plotted. Comparative studies were thus done and the role of thermoluminescence in radiation dosimetry was understood.

Quantum Anharmonic Oscillator- A Computational Approach

Shreti Garg, Sarmistha Sahu
(B.Sc. III)
Department of Physics, Maharani Lakshmi Ammanni College for Women, Bangalore 560012

What is *anharmonicity?* What happens to the *energy levels* of an anharmonic oscillator? What is *dissociation energy*?
Many such questions can be answered by the computational method. The *computational methods* used for solving the second degree differential equation (Schrödinger's equation) is by Runge-kutta fourth order method using Microsoft-Excel. For anharmonic oscillator, the accuracy of the results is fairly good.

X-Ray Crystalography- A Tool for Material Characterisation

Shriyog Kokare[#], Dr. Shrikant Kokare and Dr. Ashok Shinde
([#] M.Sc. I)
Department of Physics, Abasaheb Garware College, Pune

X- rays are used in medical and many industrial applications. Not only can this but it be also used in material characterisation. The structural characterisation along with its crystal

structure can be determined using the X- rays. For this purpose the principle of brags condition ($2d \sin\theta = n\lambda$) is used and the brags spectrometer heaths to characterize the material. Further this X- ray crystallography is used to identify the quality of drugs. The paper gives the details of material characterisation and identifying quality of drugs through the X- ray crystallography.

Scanning Electron Microscopy: A Tool to Know The Materials Morphology

Yogeshri S. Kokare
(M.Sc. I)
School of Physical Sciences, Solapur University, Solapur

A scanning electron microscope (SEM) is a type of electron microscope that produces images of a sample by scanning it with a focused beam of electrons. The most common SEM mode is detection of secondary electrons emitted by atoms excited by the electron beam. The number of secondary electrons depends on the angle at which beam meets surface of specimen. Back scattered electron imaging, quantitative X-ray analysis, and X-ray mapping of specimens often requires that the surfaces be ground and polished to an ultra-smooth surface. Specimens that undergo WDS or EDS analysis are often carbon coated. In general, metals are not coated prior to imaging in the SEM because they are conductive and provide their own pathway to ground. In a typical SEM, an electron beam is thermionically emitted from an electron gun fitted with a tungsten filament cathode. Tungsten is normally used in thermionic electron guns because it has the highest melting point and lowest vapor pressure of all metals, thereby allowing it to be heated for electron emission, and because of its low cost. This Paper describes applications of scanning electron microscope to know the materials morphological structure.

Effect on Image Quality and Patient Dose of Various Types of Ct Detectors

Zubairu Ahmad Usman
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Sharda University Knowledge Park III Greater Noida Utter Pradesh

A CT (Computer Tomography) scanner use a series of X-ray beam to build up image of the body in ‘’slice’’ several individual scan may carry out to create detailed image of the area that is being investigated. Ct scanning can detect hundreds of density and is used to produce picture of many different part of the body.The ease of use and the short time required for the complete investigation make the CT very attractive, particularly in children. However, according to the recent literation its radiation exposure represent a major concern , main in children and its use should limited whenever possible as recommended by the FDA 2009. The ct scan have emerged as valuable noninvasive cardiovascular diagnostic tools capable of producing information picture, providing unique anatomic and functional information not available by any other diagnostic modality currently available.

Synthesis Techniques of Nano-ZnO for Antibacterial Study: A Review

Raminder Kaur
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Development of nano-technology has shown a new way to protect, preserve and process the food by reducing the action of bacteria and increasing the shelf life of the product. Lu-E Shi *et al.*, discussed about nano-particles (nano-clays, nano-films) that due to their size in nm range, enhancement in the properties of material such as diffusivity, strength, chemical reactivity, reduced spoilage due to micro-organisms and pathogen content in processing and packaging without migrating into the food product. Nano-particles can be synthesized from various metal oxides such as ZnO, TiO_2, Ag, Au; and among these ZnO has been in recent trends due to its non-toxic nature. It is enlisted in GRAS material as one of the five Zinc compounds and is recommended by Food and Drug Administration. Release of Reactive Oxygen Species, production of H_2O_2, and formation of strong electrostatic bonds between negative and positive charge of cell surface and Zn^{2+} ions resp., is the mechanism of action for dwindling of bacteria. For nanotechnology to improve its application in food products should use green synthesis method for the formation of nanoparticles using natural sources like plant extracts, leaves, seeds, stems etc with use of reducing agents that may be chemical or even natural like polyphenols, amino acids, terpenoids, sugars etc. which acts as strong reducing as well as binding agent. Green synthesis takes less time, cost-effective and doesn't pose any harmful risk on human body. It is found that *Aloe barbadensis* Miller leaf extract was used for the production immensely stable poly dispersed spherical nanoparticles of Zinc Oxide using Sol-Gel Method. N.A. Samat *et al.* (2012), in his experiment found that nano-ZnO synthesized from *Citrus aurantifolia* have proved to be an excellent substitution against chemical methods. Different methods of synthesizing ZnO nano-particles are available such as Sol-gel route, Hydrothermal process, Mechano-chemical method, Vapour Phase method, Co-Precipitation, Microwave synthesis, Pulsed layer deposition, etc. S. Gunalan *et al.*, investigated the antibacterial property of nano ZnO prepared from chemical and green method for pathogens such as *Staphylococcus aureus, P. mirabilis, S. marcescens* and *C. freundii***.** He revealed that green synthesized ZnO nanoparticles were more effective against these bacteria than chemically synthesized. Author is thankful to their mentor Richa Bhardwaj(Res Scholar, Phys Deptt) and Dr. Sanjeev Gautam(sgautam@pu.ac.in)

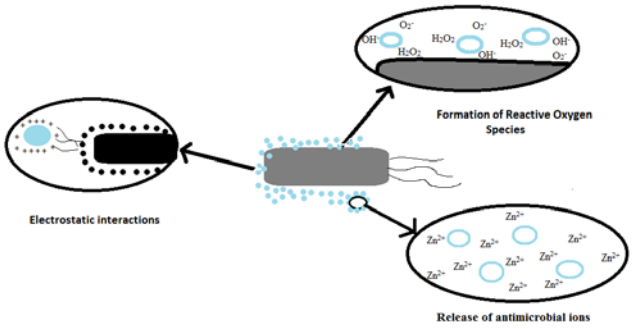

Figure 1: Action of nano-ZnO on growth of micro-organisms.

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Developments in Conducting Polymers for Organic Solar Cell: a review

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The availability of solar energy is the best source of clean energy and therefore research in this field has attracted many researchers. Conventional inorganic solar cells are being used from long time and lot of research has been done, which mainly include silicon solar cells and heterojunction solar cells. The first working p-n junction silicon solar cell (SSC) was developed by Bell laboratories in 1950s [1]. The Power Conversion efficiency has been reported upto 24.7% [2] for SSC, and 42.3% for multifunction solar cells[ref]. Although Silicon based devices has played major role in bringing Solar cell to the consumer market, but they also have some drawbacks to limit their application such as complex fabrication and high cost, and hence cannot be manufactured in large sizes industrially [3]. In view of such shortcomings, search for other materials for fabrication of PV has resulted in Organic solar cell (OSC).

A Organic Solar Cell is a device whose active layer is composed of polymers, small molecules or both, with or without the use of nano-particles. The discovery of conducting polymers in OSC has led to their use in many applications. These Polymer Solar Cells also named as Plastic Solar Cells, are having much simpler processing techniques as compare to small molecules solar cells [4]. When two polymers are mixed in same solvent, different phases are formed after solvent evaporation. Thus better exciton dissociation and bulk heterojunction can be achieved due to low entropy of mixing than the small molecules based devices[5]. All Polymer Solar Cell based on polymer donor and polymer acceptors are having many advantages. The energy levels of polymers can be tuned more easily, which is helpful in getting the dissociation of excitons at Donor Acceptor Interface. The viscosity of solutions can be flexibly controlled in Polymer blends, which is helpful in the production of Organic Photovoltaic devices on large scale by solution processing [6]. The solar cells based on Cyanated Polyphenylene Vinylenes (CPV) were fabricated [7]. The Benzothiadiazole Polymer solar cells using different solvents [8,9] and then Perylene and napthalenediimide based polymers have been investigated for their application in Organic Photovoltaic device [10] and latter was efficient as compared to other polymer solar cells. Although, OSC are advantageous, but less efficient. The performance of OSC based on polymers can be improved by using hybrid structures, dye sensitization, graphene and carbon nanotubes. Authors acknowledge the guidance and support by their mentors Amardeep Bharti and Dr. Sanjeev Gautam(sgautam@pu.ac.in).

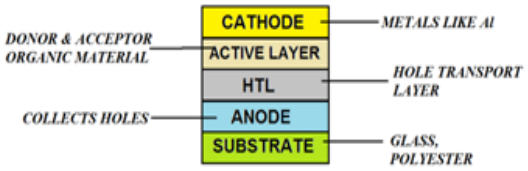

Figure 2: Basic structure of Organic Solar Cell.

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Systhesis and Characterization of Innovative Multilayer, Multi Metal Oxide Thin Films by Modified Silar Deposition Method

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Multilayer, multi-metal oxide ($CuNiO_4$) thin films are deposited on glass substrate by modified SILAR deposition method. The chemicals copper chloride and Nickel acetate act as a cationic precursor solution and KOH as a anionic precursor solution. The SILAR is mainly based on the immersion of the substrate into separate cationic and anionic precursor solution and rinsing between each immersion with water to avoid precipitation. Effect of preparative parameters such as concentration, time, pH etc were studied and optimized to get uniform films. These thin films are found to be very useful in many applications like solar cells, sensors, temperature controller satellite etc. These films were characterized by X–ray diffraction and SEM techniques. The X–ray diffraction (XRD) data was used to determine of crystal structure. X-ray diffraction study reveals that the films are amorphous and optical study estimated the band gap value 1.9 eV.

Abstracts of Poster Presentations

Visual Observation of Geminides-2014

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A meteor is a bright streak of light that appears in the sky when meteoroid is heated because of friction with Earth's atmosphere. Meteor shower is a celestial event in which number of meteors are observed to radiate or originate from one point in the sky called as the radiant. Every year in mid-December (13-14 Dec) this meteor shower appears to come from the constellation of Gemini, its radiant, hence the name Geminids. This meteor shower occurs when Earth crosses the orbit of asteroid 3200 Phaethon. Geminids are considered to be the most intense meteor shower. On 13-14 December 2014, observations were taken from Paud, near Pune, having coordinates 18.52420° N, 73.6158° E. Its Zenithal Hourly Rate (ZHR) was calculated and compared with the ZHRs of Geminids for the last 10 years. Moreover we tried to calculate the orbital period of parent body.

Nonlinearity as a New Branch in Science

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In physics and other sciences, a nonlinear system is a system which does not satisfy the superposition principle – meaning that the output of a nonlinear system is not proportional to the input. In mathematics, in a nonlinear system the equation(s) cannot be written as a linear combination of the unknown variables or functions that appear in them. It does not matter if nonlinear known functions appear in the equations. In other words, the behavior of a nonlinear system is described by a nonlinear system of equations. Nonlinear problems are of interest to engineers, physicists and mathematicians and many other scientists because most systems are inherently nonlinear in nature. Nonlinearity in plasma physics originates from harmonic generation involving fluid advection, nonlinear Lorentz force, trapping of particles in wave potential etc. The nonlinearity in plasma contributes to localization of waves, leading to different coherent nonlinear wave structures such as solitary waves and shock waves. In this poster, detailed information about this new branch of science also known as nonlinear science will be presented.

Synthesis of Graphene Oxide for Water Remediation from Heavy Metal Ions

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Water quality has become a major global concern due to ever increasing human development activities, depletion of natural resources and pollution of surface and groundwater. The drastic environmental changes and rapid industrialization led to change of water quality. The most common heavy metals contaminants in water are arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc. Arsenic enters into water environment due to natural minerals

like arsenopyrite, orpiment and realgar and human activities like pigments, insecticides, herbicides, wood preservatives, glass manufacture, feed additives, electronics and catalysts. The World Health Organization (WHO) report in 2012 set a maximum permissible concentration of 0.01 mg/l for arsenic in drinking water. Central Ground water Board North Western region Chandigarh has reported the presence of traces of arsenic in the wells of Amritsar, Kapurthala and Ropar districts of Punjab. Conventional methods such as membrane separation, nanofilteration, reverse osmosis, electrodialysis, coagulation, lime softening and sorption are used to remove arsenic from drinking water, but all these are non selective and ineffective at low concentrations of heavy metal traces present in water. So, there is growing need of material that carries property of selective and should be capable of removing metal ion contaminants present at low concentration in water. Present study focuses on the preparation of Graphene Oxide (GO) which can act as adsorbent for the removal of heavy metal ion (Such as Arsenic) contaminants from water. Preparation of graphene oxide was carried out by Modified Hummers method. Graphite powder (Extra pure 3991D Loba Chemicals) was mixed with solution of sulphuric acid and orthophosphoric acid to exfoliate the layers of graphene and intercalation was formed upon oxidation by potassium permanganate. On keeping the solution undisturbed for a day after the addition of hydrogen peroxide and water to it, it gave bright yellow colour followed by drying at 60°C. Synthesized graphene oxide was analyzed by spectroscopic and electron microscopy techniques.

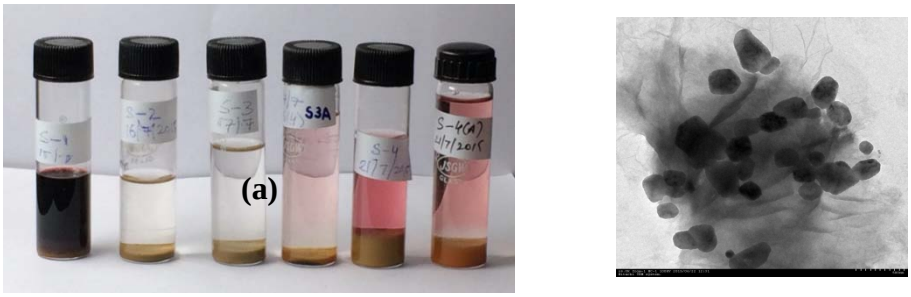

Figure: (a) Image of Synthesised Graphene oxide, (b) Transmission Electron Microscopy of synthesized Graphene Oxide.

Li-Fi: Light fidelity (LiFi) is a Wireless Optical Networking Technology That Uses Visible Light From Leds for Data Transmission

Brijesh D. Vekaria, Nidhi B. Bakori
(B.Sc. II)

Li-Fi, as coined by Prof. Harald Haas during his TED Global talk, is bidirectional, high speed and fully networked wireless communication, like Wi-Fi, using light visible to human eye. Visible light communication uses light emitting diodes (LEDs), for the dual role of illumination and data transmission. With this leading edge technology, data including video and audio, internet traffic, etc, can be transmitted at high speed using LEDs. Data from the experimental system shows that data density of 0.41 bits/second/Hz/m^2 is being achieved from a VLC implementation which is 10^3 times greater than the wireless radio system which is just 4 x 10^{-4} bits/second/Hz/m^2 . That means in visible light spectrum, one can have the data density is 10,000 times more comparing to radio spectrum. THIS IS THE WINNING SOLUTION TO THE RADIO SPECTRUM PROBLEM.

Determination of Mass Attenuation Coefficients of Guava Leaves Using Beta Attenuation

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The mass attenuation coefficients of fresh and dry leaves of guava are determined using radioisotope Tl^{204} (with end point energy 0.776MeV). The Geiger Muller Counter is used as detector for the measurement of beta attenuation for leaf samples. It is observed that transmitted intensity decreases exponentially with the increase of leaf thickness. Thus the study explores the validity of exponential absorption law. The slope of fitted line for the data of leaf thickness versus logarithm of relative transmission intensity provides attenuation coefficient. The measured value of mass attenuation coefficient agrees well with that calculated from statistical regression method. The mass attenuation coefficient of dry leaves is found to be more than that of fresh leaves. The attenuation coefficient values are useful for quantitative evaluation of interaction of beta particles with plant leaves. These coefficients play an important role in agriculture, industry and forestry sciences.

The Fundamental Particle: Higgs Boson

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Sir P.T. Sarvajanik College Of Science, Surat, Gujarat

As per Standard Model, all the particles that came into being just after the big bang have zero mass. The question is then how do particles have acquired mass? It was suggested by Prof. Peter Higgs that as the universe cooled down and the temperature fell below a critical value, an invisible force field called Higgs field was formed together with an associated particle, called Higgs Boson. Particles acquire their characteristic mass by interacting with Higgs field. The field requires explanation that why some but not all fundamental particles have mass. The Large Hadron Collider (LHC) was built to find the answer of the unresolved question in particle physics. In this paper, I have tried to discuss this fundamental question. The recent development in this field is the discovery of “pentaquarks”. The theorists realize that the standard model also allows the formation of five quarks, in the same particle.

Tin Oxide/Reduced Graphene Oxide nanocomposites

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Nanotechnology is an emerging field in this present era. Nanostructures and nano sized devices are making our appliances more compact and easily assessable. Moreover, the various properties like optical band gap, electrical conductivity, absorption spectra and many more changes drastically when the size of a material is controlled within few nano meters of scale. Thus to engineer the properties of materials, nanotechnology is the best option. When a material is fabricated in the form of nano structures, its surface to volume ratio is enhanced, which make them an ideal candidate for sensing applications. So in the present study, an attempt has been made to grow nano structures of tin oxide (SnO_2) and reduced graphene oxide (rGO), which can be utilized for the various sensing application like UV detection, gas

sensing, etc. SnO2 is found to be a potential material for sensing application because of its high rate of adsorption and desorption. However there are few problems with SnO2 based sensors like selectivity, high operating temperature etc. So rGO has been incorporated in the form of thin nano sheets. SnO_2 has been prepared using conventional sol gel method and rGO is prepared using modified hummers method followed by reduction using ascorbic acid. X-ray diffraction (XRD) and transmission electron microscope (TEM) were employed to characterise the prepared samples.

Importance of Light-in Physics and Technology

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The Light plays a central role in all human activity. The famous Sanskrit quote"तमसो मा ज्योतिर् गमय, मृत्योर मा अमृतम् गमय" shows the importance of light since ancient times. Light in simple terms means visible light. However the visible light constitutes only a small part of the electromagnetic spectrum. Light has dual nature: wave nature and particular nature. The study of light is divided in to three broad categories: physical optics, quantum optics and geometrical optics which use the wave model, particle or photon model and considers light as a straight line ray respectively.Photonics devices are those in which the basic particle of light-photon plays a very important role. Photonic devices can be divided in to three groups: a) Devices as light sources that convert electrical energy in to optical radiation-LED (light emitting diode) and diode LASER. b) Devices that detect optical signals-photo-detectors. c) Devices that convert optical radiation in to electrical energy- the photovoltaic cell or solar cell. LIDAR is an instrument similar to radar in the optical range using optical frequency. Light application in instrumentation and control is also very important because optical signals have a very high frequency and hence the smallest wavelength. Due to this highly precise and accurate measurements with high resolution are possible using light wave as probe or a tool. Pigments appear the colours they are because they selectively reflect and absorb certain wavelengths of visible light. Today printing technology has created revolution where multi colours high quality single copy printing on paper photographic paper, large size banners and posters are affordable to common man. LCD, or Liquid Crystal Display, is the fundamental display technology used by most monitors, televisions, tablets and smart-phones. There has been lot of advancement in the field of communication by using optical fibre communication. Optical fibre acts as "pipe for light" and the optical fiber communication is based on the principle of total internal reflection. We can control the flow of light and make it move from one place to another along any path with turns, twists, curvatures and not necessary a straight line path. The bandwidth available in case of optical fibre communication is 10^4 to 10^5 times more than microwave systems. Solitons are special very narrow, high intensity optical pulses that are sent at rate of 10 GB/s over 12,200 Km using optical amplifiers and special modulation techniques.Recent experiments have shown how light can be trapped and also the speed of the light within a medium can be a controlled (retarded) to extent required. This is like saying that with our technological advancement we have been able to control one of our *"panchambhut-TEJAH i.e. light."*

Effect of Magnetic Field on Properties of Hard Water

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Water is an odorless, tasteless and transparent fluid which forms the world's streams, lakes, oceans and rains. It is a major constituent of all fluids of living things. As a chemical compound, a water molecule contain one oxygen and two hydrogen atoms that are connected by covalent bonds. Water is also called as universal solvent because of it's ability to dissolve or dissociate most compounds. As water seeps through soil and aquifers, it often contacts minerals such as limestone and dolomite. Under the right conditions, small amounts of these minerals will dissolve in the ground water and the water will become "hard". The magnetic treatment of hard water is a physical method and a simple approach by which the hard water that needs to be treated is placed in a magnetic field. Magnetic water treatment is still a controversial method. So the study of inherent properties of hard water such as electrical conductivity, TDS and pH will give more insight to the concept of magnetic water treatment. The main purpose of the present study is to investigate the effect of magnetic field on the electrical conductivity (EC), total dissolved salts (TDS) and pH of 0.05% concentration of $CaCl_2$ solution (hard water). The EC, TDS and pH of hard water are measured under the different strengths of magnetic field varies from 0.05T-0.20T respectively. It is experimentally observed that under the exposure of magnetic field, there is no variation in the EC, TDS and pH of hard water. So, data collected during the experiment indicates that under the effect of magnetic field the change in the EC, TDS and pH of hard water found non-significant.

The Origin of the Universe

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In this presentation, we explain basic question about the universe, for example- how it originate, how will it end, how is it structured. These aspects can be explained in the framework of cosmology. The beginning of the Universe is thought to have happened through the "Big Bang". We also studied about expansion of universe using the concept of Doppler Shift. The universe comes into the existence as singularity. Singularities are zones which thought to be exist at the core of black holes. Black holes are stars that have collapsed into one very small point. The boundary of the black hole is called the event horizon. Black holes are difficult to find because they do not let out any light. Universe started in the explosion called the Big Bang. The Model for this is called the "Hot Big Bang model". When the Universe was first beginning, it was infinitely hot. The temperature of the Universe cooled and the things inside the universe began to clump together. The theory combines the electromagnetic force, weak nuclear forces, and the strong nuclear forces are known as Grand Unified Theory 'GUT'. This unified interaction is characterized by one larger gauge symmetry and thus several force carriers, but one unified coupling. Cosmology is the science which attempts to give a satisfactory answer to this question regarding the understanding of the phenomenon behind the cosmos. This is particularly true in the case of objects at very great distances. We attempt to understand the true physical as well as geometrical nature of the universe.

Organic Solar Cells: Sustainable, Green and Innovative Source for Smart Future

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Solar cells have been providing profitability and efficient solution to global power crisis. The conventional Solar cells are prepared from inorganic thinfilm, but high cost of production and toxicity of inorganic compounds lead research towards organic material based technology. Organic solar cells works on the principle to generate the excitons (electron-hole pair) which are produced by absorbing energetic solar photons [1]. Organic materials offer economic, flexible [2] and sustainable technology to solar cells industry. The first generation of organic photovoltaic was based on single layer sandwiched between two metal electrodes of different work functions (η =0.5%) [3], later Metal-insulator-semiconductor (M.I.S) (η=0.7%) were developed. Increased efficienc y have been achieved by bilayered solar cells (η=0.95%) [1] and recently polymer tandem Cells (η =10.6%) [4]have been produced. The present organic tandem photovoltaic cell operates typically around 12%. Two key components of organic solar cells are the organic electron donor in the polymer with its delocalized electrons while organic electron acceptor is typically fullerene and these are sandwiched between two electrodes as shown in the Fig.1.

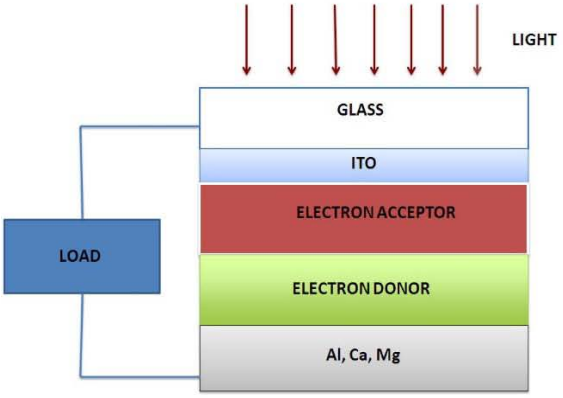

Figure 3: Schematic diagram of organic solar cell.

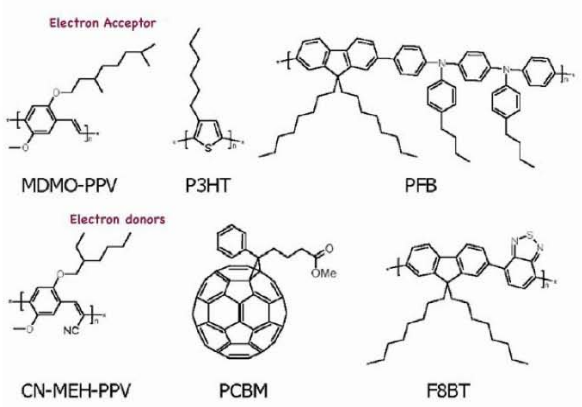

Figure 2: Organic materials used as acceptor/donors in solar cell.

Some organic materials has been shown in the Fig.2, which are widely used as acceptor/donor layer in the solar cell.Low external quantum efficiency due to large band gap of organic materials and short life time is the major problem in the organic device industry [2]. To overcome this problem many areas of organic solar cells are being studied. In this work, a review has been presented on the current status of organic solar cells and discusses the historical progress from the beginning. The main areas of study include -Altering band gap by the modification of film morphology [7] and controlled growth of heterojunction [5]. Device degradation due to instabilities against oxidation and reduction, recrystallization and temperature variation has also become the areas of research. Plastic electronics is also an emerging area of research [2]. Organic solar cells possess the potential of controlling global warming and dwindling fossil fuel reserves by making its efficient and sustainable use in industries. The authors acknowledge the guidance of their mentors A. Bharti (abarti@pu.ac.in) and Dr. S. Gautam (sgautam@pu.ac.in).

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Study of Dielectric Properties of Different Dairy Products

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Dielectric properties provide information about material's interaction with electromagnetic energy during microwave dielectric heating. Dielectric constantε' and Dielectric loss ε'' of dairy products (cheese,butter, powdered milk) have been studied by using specially designed dielectric cell and two point method with transmission line. Results are found at different frequencies which show dielectric properties depend on amount of moisture. This paper covers theoretical aspects of dielectric properties, their measurement techniques, standard results, literatures, paper presented and significance.

Effect of Ohmic Heating on Electrical Conductivity of Soymilk.

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Development of new thermal treatments to food materials is of great scientific use. Ohmic heating is one of these methods which provides uniform and rapid heating to food materials, resulting in less thermal damage to the food products. Taking its name from Ohm's law, ohmic heating is a thermal process in which heat is internally generated by the passage of alternating electrical current (AC) through a body such as a food system that serves as an electrical resistance. This technique has certain advantages as compared to conventional techniques like it provides uniform heating to food materials and retain its nutritional value. In this study, ohmic heating treatment was applied to soymilk of TSS (Total soluble solids) 3˚Brix and was observed that heating rate of soymilk was highly influenced by its electrical conductivity. Five different voltage gradients were applied (6,8,10,12 and14 V/cm). Temperature measurements were made from 32C to 70˚ C and showed a linear increase in conductivity values with increasing temperatures. Other parameters such as viscosity, pH and TSS were observed. It was observed that pH and TSS were approximately same before and after ohmic treatment. However, viscosity shows a decreasing trend after ohmic treatment. System performance coefficient (SPC) was calculated for different voltage gradients. It was observed that SPC value was higher for lower voltage gradient and lower for high voltage gradient.

Water Purification by Using Oxide Nanomaterials

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Recently water purification is the major problem in various developing countries like India. Nearly a billion of people do not access to clean drinking water and this is the main cause of various diseases in human. To purify the water for human, it is essential to remove the impurities like chemicals include metals such as copper (Cu), lead (Pb), mercury (Hg), zinc (Zn), algae, viruses & bacteria and fungi. These impurities can be detected by pH value measurement, TDS value or by naked eyes. Nowadays, nanotechnology has made possible some new water purification technologies that clean water very simply, effectively with very little power. Nanomaterials like nanoparticals, nanotubes and nanomembrane of metal oxides are used to detect these chemicals and germs. However, metal oxide nanomaterials are often used for the purification of water due to their large surface area, easy surface modification and selective catalytic activity turned out to be an effective adsorbent for water purification. Ultrasonic irradiation also helps in treating bacteria for some time but treatment using nanoparticles enhances the antibacterial effect. In future, combination of both may be used in large scale water purification. Metal oxide, especially Fe_2O_3 , ZnO, MgO, TiO_2 and Al_2O_3 have been used for identification of impure water and its purification.

Saturn's Moon Titan - Alive or Dead

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The extraterrestrial life, the life outside our Solar System and galaxy has always been of great interest to Astronomers. With a thick atmosphere teeming with organic compounds and stable liquids on its surface, many believe that Titan is among the most likely locations for life. The majority of our knowledge about Titan can be credited to the Cassini- Huygens mission conducted by NASA which confirmed the presence of liquids on Titan's surface. The Earth-like climate system reinforces Titan's status as the most similar planetary body to our planet. Gravity on Titan is about 14 percent that of Earth, or just a bit weaker than the gravity of Earth's Moon. The Titan Aerial Daughtercraft has been put forward by the NASA Innovative Advanced Concepts (NIAC) programme with the aim of sending a small quadrupole drone to Titan, alongside a motherside. The drone would operate above the moon's surface landing on the ground to take samples when required. It has also been proposed that Titan may be a better choice than Mars. The azotosome is made up of carbon, nitrogen and hydrogen, all of which exist in the seas of Titan. The astronomers are looking forward how these cells would function within Titan's methane environment.

Screenless Displays - The Future of Technology

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To display or transmit the information without the help of a screen or a projector is the main aim of screenless displays. Screenless display currently uses interactive projection

technology with visual display and 3D projection. This technology can be divided into wide three categories-projection into human retina, open space projection and even to human brain. Optical technology enables screenless displays by projecting images and data from computers, DVD players into the viewer's eye, displaying them in the visual field of the viewer. We will explore the future possibilities of this technology and an insight into the wide rande of applications it can have, taking into the consideration the current scenario of technology in this field including 3D technology and holography.

Deposition of Barium Strontium Titanate Thin Film using Pulsed Laser Deposition

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Barium Strontium Titanate thin films have been extensively exploited for the development of various devices starting from filters to tunable resonators. For the progress of integrated circuit technology, there is a need for the establishment of highly stable materials having high dielectric constant and tunability. Among various metal oxides, Barium Strontium Titanate (BST) is the most promising candidate. BST thin film can be utilized widely for the applications in wireless communication and can make the national research society independent. The properties of the BST thin film can also be easily tuned by varying the composition of either barium or strontium. In the present work, authors have taken initiative to grow a high quality BST (50/50) thin film using Pulsed Laser Deposition (PLD) technique. BST thin film was deposited on platinized silicon wafer using PLD technique. The deposition was carried out at 200mTorr and 700^{o}C substrate temperature. The pulsed NdYAG laser of wavelength 355nm was used to ablate the BST target and the repetition rate was fixed at 10 Hz. The fluence of the laser was kept at 2J/cm^2 which was enough to ablate the BST. The structural characteristics as well as optical studies were carried out to study the BST thin film. BST thin film deposited using PLD technique at the optimized parameters was found to be polycrystalline. No extra phase was observed from the X-Ray studies revealing the formation of single phase material. Moreover, the optical studies verify the band gap and transmission properties of the BST thin film with that reported in literature.

LIGO - A New Way to Explore the Universe

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LIGO is an acronym for "Laser Interferometer Gravitation Wave Observatory". It is used for the detection of cosmic gravitational waves. The laser interferometer at LIGO uses the fringe pattern of a divided laser beam to measure any lengthening or shortening of space due to gravitational waves. The divided laser beam will travel through two steel vacuum tubes oriented at a right angle. When a gravitational wave distortion causes one beam to lengthen and the other to shrink, the resultant interference pattern of the two beams will be out of phase. LIGO was first designed to have an effective range of ~70 million light years. LIGO is an instrument for sensing the presence of matter, whether shinning or dark, in the distant reaches of the cosmos. LIGO does this by detecting the gravitational waves-ripples in the force of gravity, created by violent events such as the collisions of stars and the vibrations of black holes. Thus, we can say that, LIGO is a new way to explore the universe.

Aero Braking space problem at Neptune

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Aero Braking is crucial for the planetary science missions. Present day study is being carried out for "Aero Braking space problem at Neptune planet". For a space craft to enter into a circular orbit around another a planet, it must change its trajectory and must decelerate significantly. As a result, it requires some amount of fuel for such maneuver. (1) If we consider that the only forces acting on the spacecraft are gravity and thrust, then the amount of fuel required to decelerate the spacecraft is significant as percentage of the initial mass m_o = 2500 kg. Present study calculates fairly accurate estimate of this percentage. (2) Another way to achieve the appropriate deceleration without more use of fuel is atmospheric entry in Neptune's atmosphere in which, the resulting drag will decelerate the velocity of the spacecraft at no fuel cost. In this study, we have also derived the equation of motion for a spacecraft experiencing drag and gravitational attraction in the atmosphere of Neptune and trajectories depend on the angle θ, at which the spacecraft enters in the atmosphere of Neptune. We have also solved for the range of θ in which the spacecraft is able to emerge from the atmosphere with a velocity that allows for a transition to the circular orbit at R_{atm}.

The Variation of Viscosity with Temperature in Light and Dark Coloured Honey

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Viscosity is one of the most significant physical and sensory characteristics of honey, which affects the quality of the product as well as the design of honey processing equipment. It is greatly influenced by temperature change. The aim of this study is to investigate the influence of temperatures (20, 30, 40, 50, 60, 70 and 80°C) on the viscosity of two honey samples one of processed honey (light coloured) available in the market and other unprocessed honey sample (dark coloured). The viscosity of honey samples was measured at 20 rpm shear rate using Brookfield DV2T Viscometer (accuracy ± 1.0% of full scale range) having temperature regulator water bath. It was found that the viscosity ranged from 24.77 to 0.32 Pa.s for processed honey and from 19.44 to 0.50 Pa.s for unprocessed honey. The viscosity of both the honey samples decreased as power function of temperature and the rate of decrease was very high when the temperature was increased from 20 to 30°C. Activation energy which is an indication of sensitivity of change of viscosity with evolution of temperature is also calculated for both the samples.

The Utilization of Wind Energy in Vehicles

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We all know that wind energy is a wide source of renewable energy. But mostly it is used in onshore or offshore areas,which is far from cities .Although cities has high demand of

electricity and power. Here we have introduce a idea of generating power by wind energy in vehicles. When we drive vehicles e.g.-cars, bus, trains etc. then it face heavy retarding force (due to wind force).we can utilize this wind energy and can convert to it as mechanical or electrical energy. Mostly wind farms are of greater height and large blade diameter to achieve the high speed winds .But in case of trains or cars moving at height speed we can establish small size wind turbines (of both VAWT,HAWT types) at the roof or in front space of vehicles by suitable techniques. Now let us approximate what amount of power can be extracted in this case .Let the roter diameter is about 1 meter. Here in case of small wind turbines have speed of 100-300 RPM range. So roter speed V**t** = 3.14 DN , where D is roter diameter (in this case let diameter is **1 m**) and N= 300 RPM (assumed). Now in case of trains we can take inlet velocity Vi as 27 m/s .So by formula Vt = Vi (1-a) ,where **a** is called axial flow induction factor . Solving we get **a=0.42 .**So Power coefficient Cp =$4a(1-a)^2$ =0.565 , it mens we can extract 56.6 % of wind energy. So Pi = $0.5\rho A(Vi)^3$ =9987.17 watt , so Pmax =5642.75 watt . above calculation shows that approximately **5.65** kwatt power is obtained from one turbine of such diameter. So if we can utilize this energy it can save much fossil fuel also.

Functionalized Carbon Nanotubes for Decontamination of Water from Heavy Metal: Mercury

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The rapidly declining source of clean water, the shrinking levels of surface water, waste water pollution, and contamination of environment by toxic pollutants has emerged as the most serious problems facing our globe in the twenty-first century. The major toxic metal ions hazardous to humans as well as other forms of life are chromium, iron, selenium, vanadium, copper, cobalt, nickel, cadmium, mercury, arsenic, lead, zinc etc. Mercury (Hg) is one of the most toxic heavy metal found in water sources and affects the human health in many ways. WHO has prescribed acceptable limit for mercury to be 1µg/L (Kumar and Puri, 2012) but it is found 250 times more than its permissible value in Malwa region (Sharma 2014) and various parts of the country. Therefore, removing mercury from water system is an important challenge. Various traditional methods like ion-exchange, coagulation, solvent extraction, ultra filtration etc. is being used to remove Hg ions from water bodies but due to their low removal efficiency and their requirement for additional treatment methods makes them unfit in present scenario. So, it becomes necessary to design a technology for developing an adsorbent that can afford high efficiency and selectivity for Hg (II) ion removal. The presented study focuses on effective functionalization of carbon nanotubes (CNTs) to increase their selectivity towards target contaminant and exploring the potential for adsorption of mercury ions. Surface modification of CNTs with thiol groups is found to be better for Hg (II) ion adsorption as they show strong tendency to interact with Hg (II) ions through soft acid- soft base interactions. Carboxylic derivatized single walled carbon nanotube (SWCNT-COOH) and multi walled carbon nanotube (MWCNT-COOH) powders were synthesized by dispersing CNTs in HNO_3, sonicated for about 15-30 minutes at room temperature and then refluxed for about 24hr at 80^{o}C. The reaction mixture was then allowed to stand overnight and the suspension was filtered using 0.22µm poly (tetraflouroethylene) (PTFE) membrane under vacuum and CNTs suspension was washed until the filtrate pH comes close to neutral value. The obtained suspension was dried under vacuum at 60^{o}C in an oven. Thiols groups were attached, via successive carboxylation, reduction, chlorination and thiolation, to the open ends of the CNTs, the results of study performed were analysed using

electron microscopy and spectroscopical techniques. The IR spectra show all the characteristic peaks corresponding to groups attached.

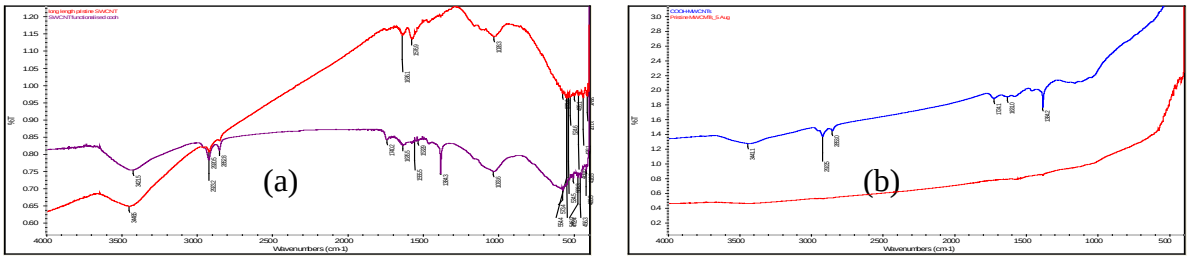

Figure: Comparison of spectra of pristine and functionalized (a) SWCNTs (b) MWCNTs

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Application of Biosensors

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A new tool is now available for the detection of drugs and explosives:- Biosensors. The biosensor is based on simple but advanced technology. It is able to screen people, baggage, cargo, buildings, vehicles, and aircrafts. The biosensors promise to radically improve the detection of drugs, explosives, and other illicit and dangerous substances at airport. As such it will greatly improve airport safety and security.

Real World Application of Quantum Mechanics

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For thousands of years, humans relied on their intuition to understand how the world works. Slowly but surely, humanity gained an understanding of everything from the laws of motion to thermodynamics, and all of it made intuitive sense. And then came quantum mechanics, the absolutely baffling branch of physics exploring the very smallest types of matter. The study of quantum mechanics led to some truly astounding conclusions. For instance, scientists found that electrons behave both as waves and as particles, and the mere act of observing them changes the way they behave. Revelations like this one simply defied logic, prompting Einstein to declare "the more success the quantum theory has, the sillier it looks." More than a century after humanity's first insights into the quantum world; quantum mechanics makes perfect sense mathematically but defies our intuition at every turn. So it might surprise you that, despite its strangeness, quantum mechanics led to some revolutionary inventions over the past century. From the bird robin using one of the most bizarre effects in physics –quantum entanglement, a process which seems to defy common

sense to the most personal human experience our sense of smell is touched by ethereal quantum vibrations, according to the latest experiments our noses are listening to smells , and the most famous law of physics – uncertainty principle is obeyed by plants and trees as they capture sunlight during the vital process of photosynthesis .

Neutrino: The Ghost Particle!

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We aren't even aware that neutrinos are everywhere. They can be found in our galaxy, in our sun and even, every second, tens of thousands of them are passing through our body. But they are very difficult to pin down. They are nearly massless, have no electric charge. They are almost nothing. But Big Bang produced them which are still wandering around us in our space like ghosts. They have other origins too. The research over these gave rise to Solar Neutrino Problem and the solution of which raised the question on Standard Model prediction that they are massless.Also the existence of right handed neutrinos of massive GUT scale mass is puzzle as we don't have any experimental evidences .Scientist have learned a lot about stars with study of these but there is a lot more to study about Cosmos.Nature of neutrinos whether it is Dirac or Majorana is also not known. To take a new step in new physics, the understanding of the operation of these Ghost Particles i.e. neutrinos, is essential.

Comparative Study of Humidity Sensing Properties of Tin Oxide Thin Film and Nanoparticles

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Tin Oxide (SnO_2) thin film and nanoparticles were synthesized using spray pyrolysis and solid state route respectively to study the humidity sensing properties. XRD pattern of the samples were recorded using CuK α radiation. XRD confirms polycrystalline nature of SnO_2 pellet and thin film is observed to be oriented in one direction. Crystallite sizes of SnO_2 film and pellet were found to be 17 nm and 15 nm respectively when calculated using Scherrer's formula. And lattice constants were calculated using indexing method and found to be a = b = 4.7549 Å, c = 3.1740 Å for film and a = b = 4.7058 Å, c = 3.3297 Å for pellet. UV-VIS spectra of these samples were also recorded to study band gap which confirm the direct band gap nature. The energy band gap (Eg) of SnO_2 film and pellet is 3.88 eV and 3.45 eV respectively. The comparative study of humidity sensing properties of thin film and pellet was also carried out. Humidity response was found to be higher in pellet than thin film which could be due to the porous nature of pellet than the film.

A Review on Dielectric Relaxation Studies of Some Impotant Polar Aromatic Compounds and of Some Fruits and Vegetables at Microwave Frequencies.

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The study of dielectric properties reveals the storage and dissipation characteristics of the material interacting with the electric and magnetic field, and hence its suitability for various applications can be determined. . Dielectric spectroscopy investigation mainly probes the effect of weak forces and helps to understand intermolecular re-orientational dynamics of the solute and solvent molecules. Dielectric characterization has great potential in studying the phenomenon like, H-bond interactions, dipolar alignment, hydrogen bond connectivity etc. to understand intermolecular re-orientational dynamics of the solute and solvent molecules. A review on dielectric relaxation studies of some important polar aromatic compounds and of fruits and vegetables at microwave frequencies convey some important results. This may prove to be a useful guide for storing of fruits and vegetables. It gives useful information needed for their processing and preservation. One of these two: Vector Network Analyzer Method and Two point method using a solid dielectric cell are used for this purpose.

Non-Extensivity of Entropy in Multiparticle Production at High Energy

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Entropy is a measure of the number of specific ways in which a thermodynamic system may be arranged, commonly understood as a measure of disorder. In statistical thermodynamics, a macro-state of the system can be described in terms of macroscopic parameters e.g. P,V,T. Entropy of the system is the measure of the number of microstates of the system in a particular macro-state. Normally entropy is extensive in nature in gaseous systems. It has been recognized that the concepts of equilibrium statistical physics can be applied in multiparticle production in high energy collisions. The probability of production of particular number of particles in high energy collisions follows various statistical distributions such as Maxwell's distribution, Negative Binomial distribution, Modified NBD. It is realized that there is an existence of some degree of non-extensivity of entropy in multiparticle production. Theoretical predictions agree with the experimental observations when we consider entropy to be non-extensive in nature which leads to a new kind of distribution called "Tsalli's distribution" with entropic index q>1. Application of this concept for the particle production in e+e- collisions at high energy is discussed.

Age Estimation of Solar and Late-M Type Stars, and NGC 6811 Cluster Using Gyrochronology

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As elegant as it sounds, gyrochronology rests on the attribute of stars about revealing their own age by their rotation periods. These rotation periods can be calculated by observing star spots, which traverse the star’s surface at regular intervals. Stars with known ages, including our Sun can be used as calibrators for these chronometers. This nearest calibrator is

essentially categorized as a G type star, and can be used to determine the chronology of similar stars. The age dependence of the stars has been estimated to vary as a function of square root of their time period. The method involves bracketing a star into C or I sequence, the method being presently applicable to only I (interface) sequence stars. Infant stars have a core rotating with a higher angular velocity than that of the surface. Such stars, classified as C sequence (convective) gradually mutate to form I sequence (interface) stars due to strong magnetic fields of the star dragging the surface along with the core. I sequence stars can be discerned primarily by their colour, seconded by their mass. Gyrochronology has been studied for many clusters, one of them being NGC 6811, whose 71 stars have been estimated to deduce that the Cluster is about 1 GYr old. With an average of 21 day period of rotation of the observed stars, the time period can be compared to that of the Sun, which is 25 days and is about 4.6 GYr old.

Antimatter

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The matter-antimatter asymmetry in Universe is one of the most fascinating enigmas in physics. Matter and Antimatter are created and destroyed together, it seems the universe should contain nothing other than the leftover energy. Nevertheless, a tiny portion of matter – about one particle per billion – managed to survive. And that's what we're seeing today. Soon after the big bang, an unimaginable amount of energy transformed into symmetric amounts of matter and the 'antimatter'. But since then, almost all the antimatter had disappeared and only a tiny fraction of matter was enough to create the stars, planets, and our universe. Also, there exists an imbalance between the baryonic matter and the anti-baryonic matter which is also called the baryon asymmetry. And this asymmetry problem in physics is being solved by the scientists at CERN's Large Hadron Collider (world's largest particle accelerator), the place where the Higgs particle was discovered. This future discovery is based on CP violations, which means that nature treats a particle and its oppositely charged mirror-image version differently.

Coriolis Force

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In physics, the Coriolis effect is a deflection of moving objects when the motion is described relative to a rotating reference frame. In a reference frame with *clockwise* rotation, deflection is to the left of the motion; on the other hand, with counter-clock rotation deflection is to the right of the motion of the object. This is demonstrated in the kit developed by us.

Origin of Solitons

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A soliton is a self-reinforcing solitary wave that maintains its shape while propagating at a constant velocity. Solitons are caused by a cancellation of nonlinear and dispersive effects in the medium and the solutions of a widespread class of weakly nonlinear dispersive partial differential equations that describe physical systems. These are having permanent form, localised within a region, can interact with other solitons, stable and can travel long distances. From a detailed numerical study Zabusky and Kruskal found that stable pulse-like waves could exist in a system described by the nonlinear KdV equation. A remarkable quality of these solitary waves is that they could collide with each other and yet preserve their shapes and speeds after the collision. This particle-like nature led Zabusky and Kruskal to name such waves solitons. Soliton was first observed by John Scott Russell in August 1834 when he studying the motion of a small boat in the Union canal in Scotland. In this poster a detailed study about the origin and properties of solitons will be carried out, that may be helpful to understand various concepts of non linear science.

Low-Temperature Susceptibility of Rock, Volcanic Ash and Sediment Samples

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Low-temperature (~ up to -190^{0}C) magnetic susceptibility measurements can be used to find the composition of a material or even in some cases substances present in trace amounts in the material. Some rock, volcanic ashes and sediment samples are taken and their susceptibility is measured in the temperature range of -190°C to 10°C. The ideal graphs of some magnetic minerals are used as reference and compared to the resulting graphs of the samples. Most of them contain mainly Titanomagnetites while some have pure Magnetite whereas one sample was found to have Hematite. The graphs of ashes had a lot of noise due to low ferromagnetic concentration. A shift is observed in the graphs which suggest presence of impurities. Low-temperature susceptibility data when combined with high-temperature data can be very useful in other applications such as finding out Curie temperature, looking for trace amounts of minerals, etc.

Nanomaterials: Introduction and Applications

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Nanoscience is gaining importance rapidly as a most powerful technology. Nanoscience offers the potential to overcome various serious problems facing mankind over serious decades in many fields. Nanoscience includes nanomaterials which is the main need of modern world which includes: nano wires, nano electronics, nano crystals, nano medicines, nano transistor, nano-tubes etc. Nano wires are used to manufacture faster nano or computer chips, high density memory and smaller lasers. Nano electronics contain semiconductor devices, nanoscale devices and electronic system. Nanocrystals are mainly used for new

fluorescent or photonic in biotechnology, switches, lasers and LED's. Nano-medicine is specially used for monitoring, repairing construction and control of biological system at molecular levels. Nano-transistors are mainly used in switches, amplifier, photonic computing architectures and molecular electronics. Nano-tubes are very light, thermally stable, chemically inert and good conductors.

Fuel Cell: Journey from Laboratory to a Greener and a Cleaner Future

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With the continuously increasing demand of energy consumption Fuel cell is the one of the promising candidates to fulfill the requirements due to their unique low cost [1], low weight, high efficiency (upto 85%), and zero carbon emission [2] features. Fuel cells have ability to provide a continuous and reliable energy by direct and reversible conversion of chemical energy to electricity at low temperature makes them the most deserving candidates for a greener future. The actual revolution to hydrogen fuel cells appeared in 1939 when this concept of the Gas Battery was exploited further by Francois Bacon who modified the cell design with the incorporation of nickel gauze electrodes and potassium hydroxide as the electrolyte replacing corrosive sulphuric acid from the cell[1]. General Electric (GE-USA, 1955-1959) developed the proton exchange membrane (PEM) for fuel cell which increases the cell life results in enhanced efficiency. During 1970 to 1980s, research was focused on the development of materials, fuel source and optimizing the cell structure for economic technology because fuel cells proposed as a possible solution to Batteries (outset owing to weight and reliability considerations), Solar energy (expensive) and nuclear power (risky) in this context. Solid oxide Fuel Cells and Molten Carbonate Fuel Cells achieved the efficiency upto 70-85% by trapping the waste heat (co-generation) and could also be used in a Combined Heat and Power (CHP) system. But slow start-up times and their short life span due to their high operating temperatures forced their limited use in the industry. Thus today, fuel cells have to be developed to address three markets: zero emission vehicles, off-grid and distributed power generation [5] and fuel cells for portable consumer and defence electronics. The challenges of the 21st century researchers - particularly fuel security, climate change and environmental pressures -are opening up a host of opportunities for fuel cells. The paper underlines how the development of the different types of Fuel Cells makes them an innovative source for the future generations to come. Authors acknowledge the guidance and support by their mentors Baljeet Kaur and Dr. Sanjeev Gautam(sgautam@pu.ac.in) .

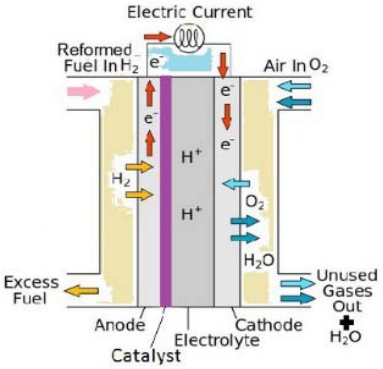

Figure 1: Fuel Cell Electrochemistry.

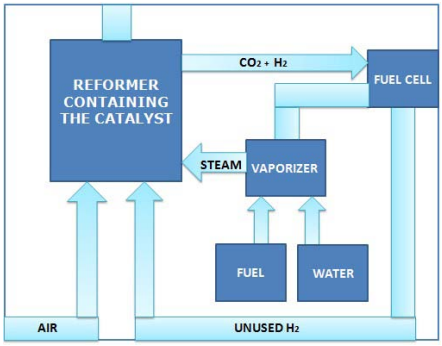

Figure 2: Steam Reforming Process (from Hydrocarbon to Hydrogen).

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Blackholes: Quantum Mechanics Vs General Relativity

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The knowledge of black hole remains shrouded in mysteries which are yet to be unrevealed by physicists. Two major theories, Quantum Mechanics (QM) and General Theory of Relativity (GTR) have both been put together to explain the characteristics of a black hole. QM applies to particles of size comparable to electron while GTR represents the black hole as a singularity in space time graph. Both these theories have been reconciled to understand the black hole better but contradictions arise out of this amalgamation. Though many attempts have been made to check out for the theory which needs correction but the needle swings to and fro amidst the two theories. The main contrasts are between information paradox and surface corrugation and the poster presents the same.

Gesture Controlled Car using Accelerometer

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In this project we have made a car whose movement can be controlled with hand gestures. We have made use of an accelerometer to achieve this functionality. Accelerometers are components that can sense a change in motion and with the help of an appropriate electronic circuit attached to it, we can use these devices in a wide number of motion sensing applications. The most common application is found in mobile phones where they are used to detect a wide number of motions and we can have several applications. We could also make use of accelerometers to make robotic arms for scientific labs that work with radioactive elements or to make gesture controlled cars that could then be attached to a robotic arm and used to diffuse bombs. Another very exciting application could be in virtual reality games which require the gamer to use gestures and hand movements to play the game.
We have just shown one of the applications this device has and that is in a gesture controlled car.

Physics in Entertainment

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Physics plays a very important role in our day to day lives but it is also applied and responsible for our entertainment purpose. Physics is widely used in gaming and in movie making industries. Physics makes our entertainment more live and interactive. Drag of car,

fight of two characters, particle effects, projectile motion, jump of hero from high cliff etc. Every year game making industries spends millions of dollars behind research and programming to make games more and more realistic. Physicist are in great demand for performing research on laws of physics that can be applied in games. Many students are pursuing PhD on games which uses laws of physics.

Determination of Hubble's Constant

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According to the Hubble's law it is known that the distant galaxies are moving apart from each other and the velocity of this motion is directly proportional to the distance between the galaxies. This relation can be mathematically expressed as $V=H_{\circ}D$, where V is the velocity of recession, $H_{\circ}$ is the Hubble's constant (Measured in Km/sec/Mpc) and D is the distance between the galaxies. By measuring the distance and velocities of galaxies and plotting the result we obtain a diagram known as Hubble's diagram. The slope in the Hubble's diagram is the value of Hubble's constant. The database referred are NASA's Extragalactic Database (NED) and Sloan Digital Sky Server (SDSS). The objects used to measure distances from this database are type IA Supernovae and Cepheid variable stars respectively.

An Amateur Radio Telescope Using a Satellite TV Dish Antenna

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Radio Astronomy is a branch of astronomy in which the radio waves emitted by the sources in the Universe are received and studied. In the present work, an amateur radio telescope has been designed and built using the components of a satellite TV dish antenna. The parabolic dish works as a reflector and the Low Noise Block (LNB) works as a receiver of the radio waves. The output of the receiver is recorded using a Satellite Finder Meter which is used by the engineers to point satellite TV dishes at the communication satellites in geostationary orbits. This radio telescope works in the frequency range of 12 GHz – 18 GHz. This whole array of instruments was intended to take radio observations of the Sun, but it can also detect radiation from the human body, geostationary satellites and Compact Fluorescent Lamps (CFL). This amateur radio telescope is designed using materials that are available off the shelf so that school and college students can easily assemble and use it at a very low cost which should expose them to the wide field of Radio Astronomy.

Programmable magnets: Working and application

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The usual magnetic behavior of material solely consists of attraction or repulsion but it is possible to alter this behavior by using various techniques. One such technique is to correlate two magnetic surfaces by forming multipole patterns on these surfaces in some specific ways

which produces a desired interaction between these surfaces. In simple words, these correlated magnets would be able attract or repel or do both depending on the distance between them can be designed to show different magnetic behavior variably with distance and orientation. These interactions could be practically employed for shear force transfer (moving gears and cogwheels) with less energy loss. In our project, we have studied the ongoing research on these programmable magnets in detail and also upon the methods of further developing and improving this technology. Present and Future applications of this technology are also considered. The multipole patterns are formed on these surfaces by using high intensity magnetic field to print emission points of different polarity and saturation. The patterns of these emission points follow a related function on both of these magnetic surfaces. These surfaces have different interaction for different orientations. The magnitude of these interactions is set in such way that the surfaces set themselves in required orientation to produce desired spatial force for a given distance. This technology has vast applications such as in making frictionless gears and magnetic separators. Development in this field can help us in using these correlated magnets to transfer energy, move an object, affix an object, automate a function, control a tool, control flow of a fluid, control flow of a gas and in security systems etc.

References:

[1] US patent publication no: US8963668 B2(Field emission system and method)
[2] Correlated Magnetics Research LLC (lab website)