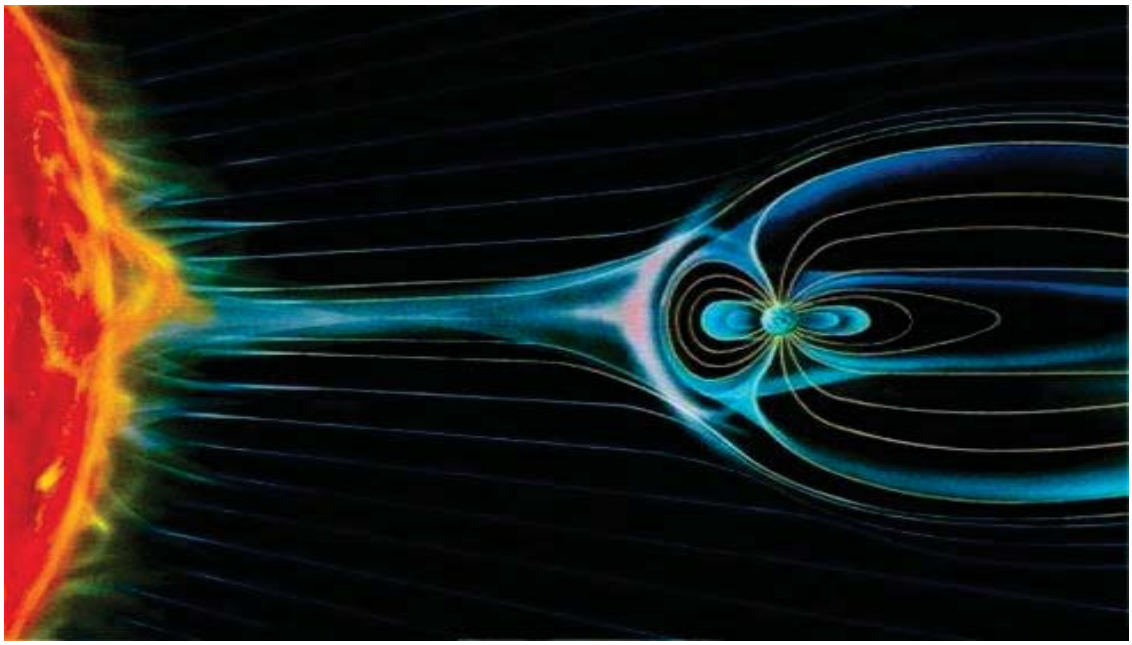
5th
IAPT National Student Symposium on Physics

10–12 November 2017



Indian Association of Physics Teachers

and

Department of Physics, Panjab University, Chandigarh

Supported by: DST - Chandigarh Administration ● PSCST - Punjab

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

MESSAGE

I am pleased to know that Department of Physics, Panjab University, Chandigarh and Indian Association of Physics Teachers (IAPT) are jointly organising the Fifth National Students Symposium on Physics (NSSP) from November 10-12, 2017. The continuity of NSSP is itself the measure of its success.

I trust that the students will have the opportunity to present their original research ideas and the experts from diverse fields of specialisation will educate and inspire the students to continue with physics career. This will help the students in translating the new ideas of fundamental and applied physics for the welfare of humanity. I congratulate the physics faculty for taking the lead in this motivational programme for the young students. I am sure that this teacher-taught confidence building programme for creative research will take India ahead in the scientific achievements. This unique tradition must continue in the Department.

I wish the symposium a great success and send my best wishes to the young students for their bright future.

Arun Kumar Grover

(Arun K. Grover)

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MESSAGE

The National Students' Seminar in Physics (NSSP) is a unique program. The program jointly undertaken by Department of Physics, University of Punjab and Regional Council 2 of Indian Association of Physics Teachers is running into its fifth successive year. I have great admiration for the organizers of the program for their consistency and dedication and for their love of the students. It has become a flagship national program of IAPT and as the President of IAPT I feel very proud of it.The idea of students doing research while they are still in their undergraduate or postgraduate years has caught on in many countries in the world. Such programs give students opportunities to learn how scientists do their work, to learn how to do research. One of the major ideas in modern teaching methods is cognitive apprenticeship. Students, especially in professional fields, can be considered as apprentices and their scientist-teachers as practicing master craftsmen from whom the students learn the art of research. NSSP indeed has this aim I consider the students from various parts of the country who are attending the program to be very fortunate. I appeal to them to derive maximum benefit from it and return home inspired with a desire to pursue science life-long. I wish the program a resounding success.

H. C. Pradhan
President, IAPT

MESSAGE

Passion, Aspiration and Mission It is indeed a happy occasion that Physics Department, Panjab University is hosting the fifth National Student Symposium in Physics in continuation of their organization of all the four Symposia in this series since inception. I congratulate them for this unique contribution to IAPT in general, and advancement of Physics in particular. It is a pious hope that this series will inspire our students at UG and PG level to aspire for a creative role in advancement of Physics through innovation and research in their career. The resulting reorientation in their attitude in the very early stage of their career will enliven their spirit by unlocking the creative potential lying hidden in their consciousness. 'Innovate or Perish' is the call of the 21st century for the world as a whole. It is more so for our country at the moment, when India is not able to figure in the top 250 universities in the international ranking. What can be more frustrating for the country when we realize that it is the oldest civilisation, with the unique feature of continuity to date without any break, endowed with the credit of producing the oldest text of Rig-Veda in the world? It is a well recognized fact that young minds, being fresh and free from prejudices and load of bitten ideas, are more suitable for germination of new ideas. Keeping this in view IAPT has instituted National Students Symposium in Physics. It is heartening that our students from all parts of the country have responded to this call through their enthusiastic participation. I thank them all from the core of my heart.

It must be realized that the successful organization of NSSP annually cannot be the aim and goal in itself, unless the ideas generated through them are widely propagated in the national and international spheres. Realizing this, IAPT has expanded the scope of Student Journal of Physics by converting it to an International Journal since 1st January 2017. The innovative ones presented in the Symposia will be published in the journal and reach the global scientific community without delay. The aim of this journal is not mainly the advancement of Science but mainly the advancement of budding scientists. We hope the two institutions NSSP and SJP will prosper symbiotically and nurture the budding future scientists from our country.

L. Satpathy

MESSAGE

The science and scientific research is an age old Indian tradition. It is said in Bhagvat Gita "*gyan vijyan sahitam yajgyatva mokshse ashubhat"*. With the achievement of knowledge with science and knowledge with experience, all the evils are eliminated. Lord Budddh, the world's greatest philosopher explicitly said " do not believe in any thing because you have heard it ...because it is spoken and rumored by many .... but after observation and analysis when you find that any thing agrees with reason and is conducive to the good and benfit of one and all, then accept it and live upto it,"

There are great names in the ancient Indian science, to name a few Bhaskracharya , Patanjali, Kanad, Brahamgupat, Nagarjun, Arya Bhatt, Barahmihir, Charak, Chyavan, Bhrigu and so many in the field of Mathematics, Astronomy, Astophysics, Metallurgy, Chemistry, Medicine, Physics, Geography, Agriculture and so on. Their work was followed all over the known world at that time.

Even with the advancement of modern science in the western world in the post independence era, we had J.C. Basu, P.C.Ray, C.V. Raman, S.N.Bose, M.N.Saha, K.S. Krishanan, G.N.Ramachandran and others, a bright spectrum of Indian Scientists. These people with their commitment to Indianness and Indian sciencepicked up new concepts and technologies and created the world recognized original work on different aspects of scientific problems. Even for the economic development of India Sir C.V. Raman had very clearly stated " *there is only one solution to the Indian economic problems and that is science, more science and still more science"*

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In the post independence era many research laboratories were setup, however the university research laboratories could not grow in the ratio of increase in the students strength. The end result has been that the bright researchers moved to western world, followed the western science and even won Noble Prize. However the concerns of Indianness and Indian science could hardly sustain in these great minds.

Those who continued in India also could not refrain from following the innovations in the western world. Therefore science in India became the follow up of the scientific ideas developed in the west. Leave aside the great ideas of ancient science, the work of contemporary scientists Raman, Bose, Basu, Saha, Ramchandran, could not be pursued. Had it been done, the pioneering work in lasers, quantum field theory, astrophysics, genetic engineering would have been from India. The power of imagination, innovation, creativity and originality was lost and we became the followers. Even the science of breathing "Yoga" was not pursued vigorously in India. The Chinese who persuaded the Chinese way of treating the mosquito based disease got the Nobel Prize.

For the present science in India, it is often said that the standard of science education is declining rapidly and alarmingly and unless some thing is done to remedy the situation, the country is heading for disaster. The performance in basic sciences has come down markedly in quality and quantity of publications.The best minds do not turn to sciences and those who do, do not remain in science.

The Indian Association of Physics Teachers (IAPT) established in 1984 felt equally concerned about the state of science teaching in the country. As the commitment of IAPT for the quality of physics teaching, it was decided to catch hold and motivate the young graduate (UG) and post graduate (PG) students, bring them together, inspire them to do science though interaction with learned teachers, scientists and among themselves. To achieve this goal IAPT decided to hold the "National Student Physics Symposium on Physics" (IAPT NSSP) each year.
The first IAPT NSSP was organized by IAPT in collaboration with Department of Physics, Panjab University Chandigarh on Feb. 25-27 2013 . To our surprise, the students from all over India even from rural colleges participated. These students worked hard with their full intellectual strength for all three days They presented their project and research work and had intensive discussions with the learned motivators. The new concepts and techniques were identified and the students were encouraged to persuade their scientific innovations. The proceedings of NSSP was published in "Student Journal of Physics".

The enthusiasm and involvement of young students in the scientific research encouraged us to hold the second IAPT NSSP which was done here itself in Jan 2014. Again the response and participation of students was enormous and the expectations from IAPT were still higher. Believing that IAPT will come up to the expectations of the young students, IAPT is holding NSSP each year to motivate young physicists. This is 5th IAPT NSSP again in collaboration with Physics Department, Panjab University, Chandigarh. I, on behalf of IAPT would like to express my sincere thanks to Honorable Vice- Chancellor, administrative staff and Physics family of Panjab University and associated institutions for their untiring efforts to this continuity.

This year again the young UG and PG students are from all parts of the country. The learned teachers have very kindly agreed to motivate the students. I welcome them all and express my sincere gratitude to them and as well as the respected members of the organizing committee for their sincere efforts and wish the 5th NSSP a grand success in all respects.

Satya Prakash
Convener, NSSP- 5

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 CoIlege, 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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ACKNOWLEDGEMENTS

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- Indian Association of Physics Teachers
- Department of Physics, Panjab University, Chandigarh
- Department of Science & Technology, UT Chandigarh
- Punjab State Council for Science & Technology, Chandigarh
- Pyramid Electronics, Parwanoo

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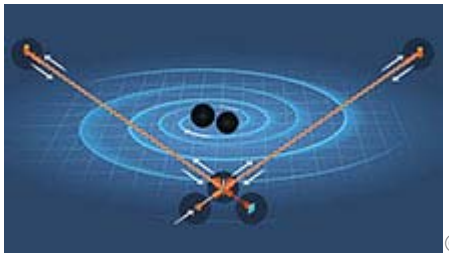
The Nobel Prize in Physics 2017



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The Royal Swedish Academy of Sciences has decided to award the Nobel Prize in Physics 2017 with one half to

Rainer Weiss
LIGO/VIRGO Collaboration

and the other half jointly to

Barry C. Barish
LIGO/VIRGO Collaboration

and

Kip S. Thorne
LIGO/VIRGO Collaboration

"for decisive contributions to the LIGO detector and the observation of gravitational waves"

Gravitational waves finally captured

On 14 September 2015, the universe's gravitational waves were observed for the very first time. The waves, which were predicted by Albert Einstein a hundred years ago, came from a collision between two black holes. It took 1.3 billion years for the waves to arrive at the LIGO detector in the USA.

The signal was extremely weak when it reached Earth, but is already promising a revolution in astrophysics. Gravitational waves are an entirely new way of observing the most violent events in space and testing the limits of our knowledge.

LIGO, the Laser Interferometer Gravitational-Wave Observatory, is a collaborative project with over one thousand researchers from more than twenty countries. Together, they have realised a vision that is almost fifty years old. The 2017 Nobel Laureates have, with their enthusiasm and determination, each been invaluable to the success of LIGO. Pioneers **Rainer Weiss** and **Kip S. Thorne**, together with **Barry C. Barish**, the scientist and leader who brought the project to completion, ensured that four decades of effort led to gravitational waves finally being observed.

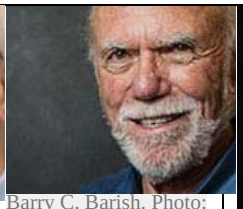
In the mid-1970s, Rainer Weiss had already analysed possible sources of background noise that would disturb measurements, and had also designed a detector, a laser-based interferometer, which would overcome this noise. Early on, both Kip Thorne and Rainer Weiss were firmly convinced that gravitational waves could be detected and bring about a revolution in our knowledge of the universe.

Gravitational waves spread at the speed of light, filling the universe, as Albert Einstein described in his general theory of relativity. They are always created when a mass accelerates, like when an ice-skater pirouettes or a pair of black holes rotate around each other. Einstein was convinced it would never be possible to measure them. The LIGO project's achievement was using a pair of gigantic laser interferometers to measure a change thousands of times smaller than an atomic nucleus, as the gravitational wave passed the Earth .So far all sorts of electromagnetic radiation and particles, such as cosmic rays or neutrinos, have been used to explore the universe. However, gravitational waves are direct testimony to disruptions in spacetime itself. This is something completely new and different, opening up unseen worlds. A wealth of discoveries awaits those who succeed in capturing the waves and interpreting their message.

Rainer Weiss. Photo: Bryce Vickmark

"Space is enormously stiff. You can't squish it."

Rainer Weiss explains why measuring the effect of gravitational waves is so very hard to achieve.



Barry C. Barish. Photo: Caltech Alumni Association

"The actual size of the signal was about one thousandth the size of a proton!"

Barry C. Barish about the LIGO detector in a short interview after the announcement.

Kip S. Thorne. Photo: Caltech

"Huge discoveries are really the result of giant collaborations"

Kip S. Thorne on how this year's Nobel Prize in Physics was a remarkable team effort.

LIST OF PARTICIPANTS

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Schedule – 5th IAPT NSSP

10 November 2017, Friday

Time	Activity	Speaker	Title
10:00-11:15	Inauguration	-	-
11:15-12:00	High Tea	-	-
12:00-13.00	Invited Talk	Prof. J. S. Bagla	Detection of gravitational waves
13.00-13:30	Oral Session -I	2 presentations	O22, O7
13:30-14:30	Lunch		
14:30-15:45	Oral Session -II	4 presentations	O20, O28,O17,O4
15:45-16:00	TEA		
16:00-17:00	Invited Talk	Prof. Y.R. Waghmare	World: A Reality or an Illusion!
17.00- 19.00	Poster Session -I		14 posters

11 November 2017, Saturday

Time	Activity	Speaker	Title
9.00 – 11.00	Oral Session -III	8 presentations	O18,O11,O14,O15,O26,O5,O27,O1
11.00-11:15	Tea		
11:15 – 12.15	Poster Session II		9 posters
12:15-13:30	Oral Session -IV	5 presentations	O3,O6,O10,O13,O23
13:30-14:30	Lunch		
14:30-15:30	Invited Talk	Prof. Kirti Ranjan	Applications of Silicon detectors in high energy physics experiments
15:30-15:45	TEA		
15.45– 17.00	Oral Session- V	5 presentations	O25,O8,O12,O21,O24
17.00 -19.00	Poster Session III		10 posters

12 November 2017, Sunday

Time	Activity	Speaker	Title
9.00 -10.00	Oral Session- VI	4 presentations	O2,O9,O16,O19
10.00 – 11.00	Invited Talk	Prof. Arvind	TBA
11.15-11.30	Tea		
11.30 – 12.00	TBA		
12:00-13:00	Invited Talk	Prof. Sandeep Sahijpal	Planetary Sciences and Exploration
13:00-13:30	Valedictory Function		Certificate Distribution
13:30 -	Lunch		T.A. Disbursal

Two poster presentations from each session shall be rewarded with First and Second Prizes.

Poster Session –I: P1, P2, P4, P5, P9, P10, P15, P16, P17, P26, P29, P30, P32, P33;

Poster Session –II: P3, P7, P11, P12, P13, P19, P21, P22, P31;

Poster Session –III: P6, P14, P18, P20, P23, P25, P27, P28, P29,P34;

INVITED SPEAKERS

Prof. Yeshwant R. Waghmare
Title of Talk: `World: A Reality or an Illusion!'
Abstract: We all observe Nature and Natural phenomena. It is the purpose of science to understand its underlying principles. Such development took place in two phases (i) The classical science of Newton and Maxwell (ii) The Modern Science driven by Quantum Theory and Theory of relativity. While In the first phase attention was paid to the study of phenomena concerning macroscopic objects, and the related technology, in the second phase the revelation of dual nature of matter took the centre stage; the technology based upon this phase has been highly successful and developed with leaps and bounds. How the flip-flop of particles into waves and vice versa occurs is still a mystery. There is no term in any quantum mechanical equations which can do this automatically. Reality in the first phase concerned with personal experiences which are deterministic. Einstein termed them as `Principle of Independence' and `Principle of Realism'. Quantum theory flouts both these. According to quantum theory `Reality is Observer created'. Einstein and Bohr had strong arguments on these aspects, leading to what became known as `Match of the Century' (which Bohr won!). According to John von Neumann (and also Einstein) a new theory needs to be developed which will incorporate both the experimental apparatus as well as the experimenter as integral components of the theory. As of now such a theory does not exist.

Prof. J. S. Bagla
Title: Detection of gravitational waves
Abstract: I will give a brief overview of gravitational waves, and then describe the history of the efforts to detect these. The original work was started using bar detectors, however these gave out many false alarms that could not be verified independently. An independent approach was then suggested and led to construction of huge interferometers for the purpose. I will describe the journey spanning more than four decades from inception to detection. I will discuss the role of the three Nobel prize winners. I will also describe the role of Indian scientists in this journey.

LIST OF ORAL PRESENTATIONS

Sr. No.	Name	College/Institute	Title
O1	Karan Aggarwal	D.A.V. College, Abohar	A Brief History of Quantum Mechanics- An Act of Desperation
O2	Rishabh Gupta	Invertis University, Bareilly	Engineering light absorption in semiconductor nanowire devices
O3	Gaurav Joshi	Invertis University, Bareilly	Review Paper On Simultaneous Enhancement of Open-Circuit Voltage, Short-Circuit Current Density, and Fill Factor in Polymer Solar Cells
O4	Shivam Shukla	Invertis University, Bareilly	Hybrid Rocket Motor Techniques and Applications
O5	Ankit Kargeit	Invertis University, Bareilly	Organic photonics for communications
O6	Kuldeep Kargeti	Doon University, Dehradoon	Synthesis of Ni-Fe-Al alloys and study of their microstructure and FSMA nature
O7	Sarvesh Bansal	IIT Delhi	Determination of cross section for top quark pair production at LHC and study of jets from top quark decays
O8	Salil Batabyal	Delhi University, Delhi	Optimization Of Ion Beam Currents For Accelerator Mass Spectrometry
O9	Sanghvi Harshal Amit	Gujrat University, Ahmedabad	Automatic Rationing System
O10	Kuldeep Dineshbhai Dave, Chintan Mukeshbhai	Gujrat University, Ahmedabad	Band structure of solids using Kronig -Penney model
O11	Prasoon Kumar	Gurukula Kangri University, Haridwar	A Description on Gravitational Lensing
O12	Aparna Tomar	Miranda House, Delhi	Positron Annihilation Spectroscopic Studies Of Sr-Substituted Lanthanum Ferrite(La1-xSrxFeO3)
O13	Kajal	Guru Nanak College for Girls, Muktsar Sahib	Electrowetting and its Applications
O14	Loveleen Wadhwa	Guru Nanak College for Girls, Muktsar Sahib	Gravitational Waves

O15	Palvi	Guru Nanak College for Girls, Muktsar Sahib	Higgs Bosons: The Standard Model Of Electroweak Interactions
O16	Harishchand. S. Nishad	Mumbai University	Solar Air Purifier And Domestic Appliances
O17	Karan Dixit, Lav Kumar Jha	St. Xavier College, Pune	Piezo-Electric Energy Harvesters: The Present Scenario & Challenges
O18	Saurav Kumar	Ranchi University	Fourier Series And Multipole Expansion Due To An Arbitrary Charge Distribution: A Comparative Study
O19	Jyotsana Kala	Pt. L.M.S.Govt. College, Rishikesh	On Development Of Hydrogen Storage Material For Vehicular Application
O20	Aditya Upreti	Panjab University	EPR Paradox-Quantum Entanglement and Quantum Computing
O21	Sumit Bansal	Panjab University	Remote Switching Of Electric Appliances Using RF Module
O22	Ashish Kumar Rajayan	U.I.E.T., Panjab University	Light Sensing Light: An Innovation In Technology
O23	Ashish Chaudhary	Panjab University	Shape Memory Alloys with Applications: An Analysis
O24	Nikhil	Guru Jambheshwar University, Hisar	
O25	Navneet	Guru Jambheshwar University, Hisar	Thickness of plate using Michelson Interferometer
O26	Ramesh Kumar	Guru Jambheshwar University, Hisar	Concurrence measurement of entangled two qubit pure state of Photon and quantum dot
O27	Priyanka Rani	Pt. Neki Ram Sharma Govt. College, Rohtak	Scientific Philosophical Ideas Leading Towards Reality
O28	Tanya Bahl	Panjab University	Dark Matter and Current Status of Detection Experiments
O29	Ravikant Shrivastava	Invertis University, Bareilly	Quantum entanglement Teleportation

LIST OF POSTER PRESENTATIONS

Sr. No.	Name	College/Institute	Title
P1	Divanshu	D.A.V. College, Abohar	Gravitational waves
P2	Bhavna Bansal, Manpreet Kumar, Aman Garg	D.A.V. College, Abohar	Neutrino: - a chameleons's of Particle Physics
P3	Ritesh Kakkar	G.N.D.U., Amritsar	Hexadeca fluorinated copper pthalocynine anchored on reduced graphene oxide for gas sensing application
P4	Vikramdeep Singh	G.N.D.U., Amritsar	The cosmological lithium problem and its probable solution
P5	Sahil Sharma, Rabia, Shruti Sharma	GGDSD College, Chandigarh	Gravitational waves
P6	Samarkant Gaur	Vardhman College	Over-damped motion
P7	Rajat Sardana	Dept. Of Physics D.U.	Optimization of Ion Beam Currents For Accelerator Mass Spectrometry
P8	Sunil Luhar	KSV University	Frustrated Total internal reflection
P9	Sachin Singh	Gurkul Kangri University	MANGALYAAN : Mars Orbiter Mission
P10	Titiksha Dua	P.A.U, Ludhiana	Prospects At Superkekb And Present Status Of Ckm Angles
P11	Manpreet Kaur	P.A.U, Ludhiana	Cold Plasma Technology For Food Processing
P12	Himani Baweja	P.A.U, Ludhiana	Quantum Dots Through Chemical Cutting
P13	Sarabjeet Kaur	P.A.U, Ludhiana	Design, Construction And System Performance Coefficient (SPC) Of Ohmic Heater
P14	Jyoti Bala	Guru Nanak College For Girls, Ludhiana	How to generate electricity using static friction
P15	Arijit Gupta	Fergusson College, Pune	Probing the Interstellar Medium in the Line of Sight of PSR B1846-06

P16	Shreya Shah, Kaushik Kapadiya, Mansi sonaiya, Abhishek Davda	Christ College, Rajkot	Vacuum Polarization, Self-Energy And Its Effects On The Lamb Shift Of H-Atom
P17	Rohan Anil Kinger	Christ College, Rajkot	Gravitational Waves
P18	Suraj Sharma	Pt.L.M.S.Govt. College, Rishikesh	Electricity Production Through Moving Train
P19	Peeyush Gupta	SLIET Longowal	Application of plasma as medicine and its different mechanism
P20	Rahul	SLIET Longowal	Side Effects of X-Rays
P21	Ashish Soni	SLIET Longowal	Carbon Nanotube
P22	V Vineetha, V Chandrashekar	Azim Premji University	Employing Microfluidics for the Study of Soft Matter
P23	Kritika Jain	Maitreyi College, Delhi	A Comparative Study of Water from Different Sources and their Analysis
P24	Shweta Bisla	Panjab University	Shape Memory Alloys with Applications: An Analysis
P25	Deepika	Guru Jambheshwar University	Raman Stimulated Emission
P26	Pooja	Guru Jambheshwar University	The Nobel Work: Mass Energy Equivalence
P27	Suman	Guru Jambheshwar University	Electronic Circuit representation by Using Quantum Logics
P28	Sunil Kumar	Guru Jambheshwar University	Kerr Electro -Optic Effect
P29	Hassanpreet Kaur, Komal Singh, Ikchit Singh Sangha	Panjab University	Development of Modern Physics- A Philosophical
P30	Jaspreet kaur, Mansi	Panjab University	Everyday Entanglemen: Physicists take quantum weirdness out of laboratory
P32	Jasdeeep Sharma	GGDSD College, Chandigarh	Photoelectric vs Compton
P33	Shagun Sharma	GGDSD College, Chandigarh	Wormholes
P34	Lovish Gulati, Diksha, Kamaldeep Dalal, Yashika, Irina Cheema	Panjab University	Change In Resistance Of Tungsten Filament In Bulb

Abstracts for Oral Presentation

A Brief History of Quantum Mechanics-An Act of Desperation

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The journey of quantum mechanics from a mere idea to a full-fledged branch of physics explained for a layman. Classical laws of physics which can be used to travel between vast distances i.e. from Earth to moon seem to fail when applied to mere subatomic particles. The main purpose of this paper is to introduce all to the core concepts that underlie quantum physics. . The concepts explained include Particle like Properties of Light, Wave like Properties of Light, Blackbody Radiation, Photoelectric Effect, nuclear model of atom, De-Broglie waves, Heisenberg Uncertainty Principle. The paper is based on key milestones established in quantum physics by scientists and researchers.

Engineering light absorption in semiconductor nanowire devices

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Review paper on the use of quantum and photon confinement has enabled a true revolution in the development of high-performance semiconductor materials and devices1–3. Harnessing these powerful physical effects relies on an ability to design and fashion structures at length scales comparable to the wavelength of electrons (_1 nm) or photons (_1 micro _m). Unfortunately, many practical optoelectronic devices exhibit intermediate sizes where resonant enhancement effects seem to be insignificant. Here, we show that leaky-mode resonances, which can gently confine light within subwavelength, high-refractive-index semiconductor nanostructures, are ideally suited to enhance and spectrally engineer light absorption in this important size regime. This is illustrated with a series of individual germanium nanowire photodetectors. This notion, together with the ever-increasing control over nanostructure synthesis opens up tremendous opportunities for the realization of a wide range of high-performance, nanowire-based optoelectronic devices, including solar cells, photodetectors, optical modulators and light sources.

Review Paper On Simultaneous Enhancement of Open-Circuit Voltage, Short-Circuit Current Density, and Fill Factor in Polymer Solar Cells

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The growing interests in polymer solar cells (PSCs) are related to their unique advantages such as low-cost manufacturing and easy processability over large-area size via printing and roll-to-roll coating technologies, and compatibility with flexible substrates and

materials availability, which enable them for potential applications in low-cost photovoltaic systems. Although the power conversion efficiency (PCE) of state-of-the art PSCs has already exceeded 7% in scientific literature, further improvements are needed for mass production and practical applications, especially simultaneous enhancement of short-circuit current density (J SC), open-circuit voltage (V OC), and fill factor (FF) are in urgent need. Among all of the approaches to improve the PCE, the most common and successful strategy is developing new low band gap donor materials to maintain a broad overlap with the solar spectrum ensure effective harvesting of solar photons, which leads to higher J SC . However, since there is a trade-off between light harvesting (J SC) and open-circuit voltage (V OC), a gain in PCE can be expected only if a decrease of V OC can be avoided. Apart from this, other approaches based on device physics have also been studied and proved to be effective, but these methods normally can only improve one or two key parameters of PSCs substantially at a time. This is the review paper which has been presented by "Zhicai He" et.al.[1]

Hybrid Rocket Motor Techniques and Applications

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In this review paper, I will discuss about a hybrid rocket which combines components from both solid fuel and liquid fuel rocket motors. The fuel itself is a solid grain, (known as HTPB) while the oxidizing agent is liquid (hydrogen peroxide or liquid oxygen). These components are combined in the fuel chamber which doubles as the combustion chamber for the hybrid motor. This review looks at the advances in techniques that have taken place in the development of these motors since 1995.
Methods of testing the thrust from rocket motors and of measuring the Rocket plume spectroscopic ally for combustion reaction products have been developed. These assessments allow researchers to more completely understand the effects of additives and physical changes in design, in terms of regression rates and thrust developed. Hybrid rocket motors have been used or tested in many areas of rocketry, including tactical rockets and large launch vehicles. The most recent discoveries have come from research into nano-particle additives. The nano-particles have been shown to provide enhancements to many parameters of hybrid rocket function and research into specific areas continues in the sub-field of nano-additives for fuel grains.
Keywords: Rocket, Engine, Motor Techniques
References:
1. Durocher's, M.F., Olsen, G.W. and Hudson, M.K. (2001) A Ground Test Rocket Thrust Measurement System. Journal of Pyrotechnics, No. 14, 50-55.
2. Chiaverini, M.J., Kuo, K.K. and Lu, F.K. (2007) Fundamental of Hybrid Rocket Combustion and Propulsion. Progress in Astronautics and Aeronautics. Volume 218, American Institute of Aeronautics and Astronautics, Reston.
3. Hudson, M.K., Wright, A.M., Luchini, C., Wynne, P.C. and Rooke, s. (2004) Guanidinium Azo - Tetrazolate (GAT) as a High

Organic photonics for communications

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Photons are very much useful for the passing of information through bandwidth in the field of information technology as well as communication technology whereas there are other fields also where we can use photons as the information carriers. Organic photonics includes those semiconducting materials where carbon related doping is done to increase the lasing function. Basically it's the hybrid system of inorganic pumping and organic lasing. Organic photonics includes all optical modulation in polymer crystals and this has been very affordable in the terms of pricing that is low cost as well as it is very light weighted systems. This is the review paper which has been presented by the Jenny Clark et.al. [1]

Synthesis of Ni-Fe-Al alloys and study of their microstructure and FSMA nature

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Ferromagnetic shape memory alloys have intervening Austenite – Martensite transformations which are diffusionless structural transformation, from high temperature cubic phase to a lower temperature lower symmetry phase, like orthorhombic, monoclinic etc. These structural transformations are generally studied through resistivity, magnetization etc. In this report we have synthesized a Ni based FSMA alloy having composition Ni60Fe19Al21 in order to find the shape memory effect closer to the room temperature. This could be very useful substitute for the other present systems in the category of smart materials. However, in addition to the conventional methods, we also observed the microstructure, AC resistivity as well as magnetic properties. Samples were annealed at 1000oC to improve it's physical properties. For cooling the sample has Ms at 264K and MF at 243K. For heating As is 170K and AF is 267K.

Determination of cross section for top quark pair production at LHC and study of jets from top quark decays

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Currently high energy physicists are trying to _nd particles beyond standard model.These new energetic will have top quark as there major background. So to understand these new particles we need to understand kinematics of top quark in better way. In this project we

have estimated the production cross section of top quark pair in LHC proton-proton collision at centre of mass energy of 7 TeV using processed data made available in open platform by CMS collaboration at LHC, CERN. Also in this project we have studied the situation of boosted top quarks when LHC machine will collide protons at an energy of 14 TeV. We have studied the jets from these boosted top quark by generating samples using Pythia monte carlo event generator .We used N- subjettiness parameter to _nd some characteristics of these jets in order to distinguish top signal from mainly QCD multijets events.

Optimization Of Ion Beam Currents For Accelerator Mass Spectrometry

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Accelerator mass spectrometry (AMS) is an ultra-sensitive technique for isotopic analysis of long-lived radionuclide. The precision of AMS depends upon the counting statistic which in turn depends upon the ion currents. To obtain better precision in less measurement time, high ion beam currents are necessary. It has been found that mixing the sample with some metal matrices improves the beam currents from the ion source. In AMS measurement of 14 C, graphite is loaded into ion source with iron powder. Here iron powder serves two purposes, it acts as a catalyst during graphitization reaction and it also optimizes the carbon currents from ion source during AMS measurement. In the present project, we have investigated the effect of iron powder amount on the carbon current from the ion source. For this purpose, we have graphitized some standard samples using Automated Graphitization Equipment (AGE) with different amount of iron powders. Carbon current measurement of these samples performed using Inter University Accelerator Centre (IUAC) XCAMS system.

Automatic Rationing System

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We have made Automatic Rationing System in which we proposed an experiment to create a transparency between government and customers, the ration they provide to the common people. Due to illegal smuggling of goods more than 50% of the grains were black marketed or else the quality of the grains were changed. So to create a transparency between government and customers this machine was designed using GSM technology so that after taking the required amount of ration from the machine one of the message would be delivered to government employee and one message to customer about the type of the grains and the amount which they demanded, so that when next time the customer comes to collect the ration materials they can they get the next figure of their left ration materials deducting the previous one. For security purpose we use RFID technology and we also included password security options. The machine works in the same way as ATM Machine works, the difference is that ATM machine gives us the required amount of money and this machine provides us with required amount of ration materials.

Purpose of this project is to create a transparency between government and customers and to reduce the corruption and black marketing which is taking benefit of inaccurate measurements which are done at ration shops. Now we have RFID cards that will ensure security and transparency about the same. This project was done under the course curriculum of BSc.Programme at St.Xavier's College.

Band Structure Of Solids Using Kronig-Penney Model

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In the present work, computational exercise is developed to compute the possible energy possessed by free electron in one dimensional arbitrary array (1-D crystal). We have used Bloch theorem and Bloch wave function of free electron using Kronig–Penney Square well periodic potential, which is quantum mechanical system consists of an infinite array of rectangular potential barriers. In the present work we have computed band structure of solids.

A Description on Gravitational Lensing

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In this presentation I concerned about the brief description of an application of Einstein's General Theory of Relativity which is known as Gravitational lensing. I will discuss this phenomenon and it's cosmological impacts which helps us to understand universe beyond current horizons. How this phenomenon is related to several other disciplines such as cosmography, astrophysics & astronomy is also discussed. In addition to it, I will also give a concise description on present research institutes and observatories working in this field in order to understand universe through Gravitational lensing.

Ositron Annihilation Spectroscopic Studies Of Sr-Substituted Lanthanum Ferrite ($La_{1-x}Sr_xFeO_3$)

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Lanthanum Ferrite is a pervoskite structured ferromagnetic insulator having wide areas of applications as electrode material in solid oxide fuel cells, gas sensors and in high temperature atmosphere. The properties of $LaFeO_3$ can be favourably modified by substituting La by alkali earth cations. However, achieving cent percent success of substitution is always a difficult challenge. Incomplete substitution can always result into a high concentration of structural defects like vacancies, whose role on the physical and other properties is to be widely investigated many of the experimental probes which are

popularly used did not yield satisfactory result. Positron annihilation spectroscopy (PAS) is a well established defect spectroscopic probe. Its success in the investigation of defects and defects-related processes in a variety of solids has always enriched the subject of solid state physics. Over the years, it has been recognized as the most sensitive and reliable among analytical probes giving information on defects. In the present work this technique has been used to extract information on the effects of substitution by Sr ions in $LaFeO_3$. The results are discussed in details.

Electrowetting and its Applications

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A drop of water lying on a surface, pulled into a ball by surface tension. With electricity it is possible to change the shape of the drop and cause it to flatten out. This is electrowetting, a physical phenomenon which has aroused great interest in recent years as it has found new applications alongwith number of advantages. Electrowetting has a number of interesting applications which have recently been developed. They are all based on the fact that it is possible using an external electric field, with no mechanical parts, to control movement or quick change (hundredths of a second) between a number of states of the system. It is important that systems can be miniaturized to scales of less than a millimetre and still be controlled with great precision using a minuscule amount of energy for a long period of time. Applications from recent years include transport of liquids for purposes of changing the characteristics of optical conductors and creating optical switches, cooling of electronic circuits by transport of cold drops across them etc. Other applications includes the electronic paper, colored pixels ,variable lenses etc.

Gravitational Waves

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On September 2015, the two detectors of the laser interferometer Gravitational wave observatory simultaneous observe the transient gravitational signal. The signal sweeps upward from 35 to 250 Hz with a peak gravitational wave strain of $1.0 \text{ X } 10^{-21}$. It matches the wave form predicted by general relativity for the inspiral and merger of a pair of black holes and the ringdown of the resulting single black hole. The signal was observed with a matched filter signal-to-noise ratio of 24. These observations demonstrate the existence of binary stellar mass-black-hole systems. This theory was already predicted by Einstein near 100 years ago. The indirect proof of existence of Gravitational waves was demonstrated by Joseph Taylor and Hulse. They discovered that binary system compose of pulsar in orbit around neutron star, the orbit of pulsar is slowly shrinking over time because of the release of the energy in the form of Gravitational waves. Gravitational waves are the ripples in the curvature of space-time. These ripples travel with the speed of light. When these waves travel through space, stretching and compression of space occurs.

Higgs Bosons: The Standard Model Of Electroweak Interactions

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The development of science over the recent years shows us that practical applications of theoretical concepts have greatly accelerated the development of new technologies. One of the newest confirmations in the standard atomic model is that of the Higgs Boson. A basic introduction to the physics of the Standard Model Higgs boson is given. We will also discuss Higgs boson production in $e+e-$ and hadronic collisions.

Solar Air Purifier And Domastic Appliances

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This work based on solar energy, wherein application on solar energy in air purifier and domestic appliances has been discussed. In comparison to market available air purifier this is solar energy based purifier is green or it works on the principal of solar energy. This purifier can also is used in industry to remove impurities such as Carbon-dioxide from air. This model also comprised, Mosquito Repellent, Gas and smoke sensor, earthquake alarm, ionizer circuit along with Mobile charging facility and also automatic street light switching circuit. This is first report wherein I reported solar energy based approach for air purifier which is economic and green.
Keywords: Photonics, organic, optoelectronic device

Piezo-Electric Energy Harvesters: The Present Scenario & Challenges

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The past few years has witnessed a noticeable development in the field of piezo-electric materials because of its inherent property to generate electricity in lieu of pressure applied on it. The dramatic growth in the Wireless Sensor Networks (WSNs) and its increased applicability, nowadays, seems to have been eclipsed due to short life-span of the batteries used for supplying energy to the wireless sensor nodes [1]. WSNs require power to be operated for longer duration- even for several years or decades; but the batteries used for this purpose can't meet the requirement because of very small size of node. The cantilever beam which is the most used structure in the piezoelectric harvesting system could not meet the complicated external environment and the situation with wide exciting vibration band and thus limits the application of piezoelectric harvesting system to a certain degree. To have increased output energy, the output power requires to be modulated by the energy harvesting circuits which eventually meets with relatively large

energy loss due to the switch control circuit and thus affect the efficiency of the energy harvesting systems. In order to obtain better performance, improved efficiency as well as practicability of piezoelectric energy harvester, new piezoelectric materials with large piezoelectric constant strain, high electromechanical coupling coefficient and low loss, improvement in the structure of piezoelectric energy harvester are needed. In the present article we are presenting an account of the basic and applied aspects of piezo-electric materials in the realm of acoustic harvesting system.

Key Words: Wireless Sensor Network, Energy harvesters, Piezo-electric materials

Fourier Series And Multipole Expansion Due To An Arbitrary Charge Distribution: A Comparative Study

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Nature is always trying to maintain the symmetry and there is no dearth of examples where natural symmetries can be explored. A comparative study between Fourier series and the multipole expansion due to an arbitrary charge distribution reveals several inherent natural similarities. On one hand where Fourier series helps to express a complex waveform into a number of simple harmonic waves, the potential due to an arbitrary charge distribution can be written as a collection of potential terms due to monopole, dipole and higher order multipoles. In this paper we have attempted to find a correlation between these two. Comparative study between the two leads to the similarity to hyperfine structure of hydrogen atom in which beyond the Pfund series there are several more energy levels but their energy difference is very small so they appear to be continuum and analogous to that of water flowing in a river in which the uppermost layer appears very quite but inside there are several turbulent layers.

On Development Of Hyodrogen Storage Material For Vehicular Application

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Transportation is a major sector to consume energy. At present 24.6% of total energy is consumed in transportation sector around the globe. In India, the percentage of total energy consumed in transportation is 15%. At present, the major fuel for transportation is fossil fuel, which produces a lot of pollution in the environment. Green house effect, Acid Rains is other harmful effect of it. Hence the society must move towards the use of electric vehicles or towards adopting a clean fuel for vehicle. Hydrogen storage materials can be utilized in electric vehicles directly or in form of negative electrode material of nickel metal hydride (Ni-MH) battery. In both the version of vehicular application, the important parameters of hydrogen storage materials are heat of formation of hydride, plateau pressure and hydrogen storage capacity. Till now, the search of appropriate material properties is based on trial and error method by substituting other elements in basic alloy. In present investigation, a semi- empirical formula has been proposed to calculate the heat of formation of AB_5 - type multi-component hydrogen storage alloy.

The formula has been applied to calculate heat of formation of binary hydrides, ternary hydrides and multi-component hydrides. An excellent matching has been observed in calculated and experimental value of heat of formation of AB_5-type hydrogen storage alloy. The thermodynamic parameter heat of formation has been further correlated with plateau pressure. This model will help in predicting the important parameters of novel hydrogen storage material with reference to specific application.

EPR Paradox – Quantum Entanglement & Quantum Computing

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Einstein had strong reservations against Quantum view of the world, i.e. he didn't believe in the uncertain nature of the observables and held the view that if one knew of all the variables, affecting a system, to infinite accuracy, one should be able to predict the outcomes of observations to any accuracy desired. It is, therefore an irony that an idea like the EPR Paradox (a thought experiment to negate the probabilistic view of nature) would lead to "Quantum Entanglement" or what is classically known as the "Instantaneous Action at a Distance". This idea of Quantum Entanglement along with the Superposition principle of Quantum Mechanics forms the basis of one of the most exciting frontiers of the modern day Science & Technology, i.e the Quantum Computers and Quantum Cryptography. These new frontiers are apt in revolutionizing the information technology as well as scientific computing with far-reaching consequences into Big Data Analytics, Blockchain Technology, IT Security, and simulating complex chemical reactions at atomic and molecular level - at the scale never imagined before, just to give a few examples. This presentation will give an overview of what is unequivocally the cusp of the second industrial revolution.

Remote Switching Of Electric Appliances Using Rf Module

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In the present technology based world, machines/appliances play an important role in human life (both in industrial and domestic area). With the advancement of appliances, it becomes necessary to have a precise human control of the automated system. This can be achieved by both wired and wireless channel. There are several modes in remote control area. In embedded system, it is often required to communicate with another device in wireless manner. I have made use of radio waves for the wireless communication. In this project, RF transmitter and receiver communicate with each other by serial transmission of digital signal at the frequency of 433MHz and this have been utilized to control domestic appliances (incandescent bulb, fan etc.).

Light Sensing Light: An Innovation In Technology

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Science and technology are the backbones of a developing society. Light based scientific innovationis emerging as one of the responsible factors to bring out breakthroughs for humankind. Current decades have shown several great products towards saving energy beyond the old processes of switching off light and operational appliances. Here we discuss about the sensing and controlling the light using the sensor controllers called light dependent resistor (LDR). These sensors make us well sure about the amount of switching on the light at the time of requirement, based on the intensity of light or occupancy of space available in the vicinity. With the intensity of external light, say, sunlight entering the room decreases,the intensity of glow of tube light sensor increases accordingly. Such technological outcomes are going to play a major role towards consumption of electrical energy and reducing human power at all levels, thus changing our lives using photonics based smart technologies.

Shape Memory Alloys With Applications: An Analysis

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Shape memory alloys (SMAs) are metals that "remember" their original shapes. Recently a growing interest has beeninclined towards investigating the development of polymers with shape memory characteristic with wider potential to applicate in the fields of textile and clothing such as fiber,woven fabrics/garments along with fascinating properties as temperature sensitive, higher fabric breaking & tearing strength and better performance etc.Here we are planning to bring out the application enriched products using shape memory alloys/polymers like tracking systems for solar panels. By coiling shape memory alloys into springs which get stretch when cool, the sun-trapping system allows the solar panel to move back and forth, tracking the sun in the sky. The idea has the potential to make solar energy more affordable to cost-sensitive customers by increasing the panel's energy output. The efforts have been further extended to include the details towards the usefulness of these alloys/polymers in production of electrical energy by combining them with various piezo crystals and with other technological energy products of mechanical energy used in aeroplanes etc. so as to bring out the outcomes for welfare of society.

Thickness of plate using Michelson Interferometer

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The aims of this experiment is use the Michelson interferometer, to measure the thickness of glass/mica . Michelson used this interferometer to establish the first absolute measurement of length. When the standard meter was compared with the wavelength of the spectral line from cadmium.The Michaelson Morley experiment using the interferometer was also crucial importance in the development of the subject of relativity by demonstrating the absence of the so-called 'aether drift' .First of all, we directly measure the fringe width of Michelson interferometer. Then we put the glass plate in between the one of the light beam and due to that the path difference between the two wave changes. This path difference will create a shift in the fringes which we measure using the screw gauge scale. We can calculate the thickness of plate using formula:

$$t = \frac{\delta d}{\mu_g - \mu_a}$$

Where
δd is effective change in optical path length
μ_g Refractive index of glass plate
μ_a is refractive index of air

Concurrence measurement of entangled two qubit pure state of Photon and quantum dot

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We have a quantum dot array with a applied Hamiltonian with time dependent exchange interaction using dynamic modulation. Here quantum dots are simply trapped electron array so we need a global phase control using applied magnetic field. Here our system consists of two entangled quantum dot in pure state. Measurement of EOF is based on calculable quantity i.e. Concurrence for a pure state in two qubit system. For an easy approach towards experimental study, we also consider the measurement of arbitrary pure momentum photon state. Hyperentanglment allow us for entanglement in multiple degrees of freedom (DOF). Of a quantum system with polarisation. Hyperentanglment can be used to carry information in quantum information processing. . Here in this work an optical implementation technique of a controlled NOT gate has been designed, realised and simulated. Interaction between two qubit required for realisation of CNOT operation and we achieved this by converting the qubits form polarisation encoding to spatial encoding with the help of a polarising beam splitter (PBS) and half wave plates (HWP). Concurrence provides us a very effective approach to quantify entanglement. Entangled systems are basic and important need for quantum information processing application. We represent CNOT operation using basic single qubit operation and equivalent optical circuit using wave plates and beam splitter. A possible implementation for the storage of information in quantum dot is discussed. With the focus on the

application of the spin of the electron confined in the quantum dot and polarisation of photon to store the information and implement universal set of one and two qubit gates for quantum computation using the spin state of coupled single electron quantum dots and pair of polarised photons. Measurement of spin state of quantum dot incorporating decoherence caused by a prototypical magnetic environment.

1. D. Loss and D. P. Divincenzo, "Quantum computation with quantum dots," "Phys. Rev. A.", vol. 57, pp. 120-126, Jan 1998. A. Ekert and A. Kay, "Requirements for a Quantum Computer", pp. 315-348. Wiley-VCH Verlag GmbH, 2008.
2. Lan Zhou and Yu-Bo Sheng; " Concurrence Measurement for the Two-Qubit Optical and Atomic States" Entropy 2015, 17, 4293-4322

Scintific Philosophical Ideas Leading Towards Reality

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Philosophy is the fundamental foundation for the development of science and technology. All the progresses in sciences are nurtured by philosophical ideas. We always look for the correct scientific explanation of a phenomenon. In the process, we keep challenging our assumptions so as to arrive at reality of an event. In this work, I intend to point out the ideas, which seem to be necessary towards building our scientific thinking across all disciplines of experimental and theoretical sciences in a correct way. These analyses have the capabilities to lead us towards the real comprehension of a scientific natural process.

Dark Matter and Current Status of Detection Experiments.

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We have been studying matter for a couple of hundred of years and have an (almost) fine understanding of the visible matter. But, our universe is only 5% of this visible matter, the Baryonic matter, rest 27% is dark matter and 68% is dark energy. Much like ordinary matter, dark matter might consist of elementary particles. As we have seen, it is not made up of quarks and electrons, the ingredients of regular matter. Yet, it forms gravitationally bound clumps, and it does so rather quickly i.e. within the first billion years after the Big Bang. Numerical simulations show that the rapid formation of complex structures of matter out of the very smooth universe that we witness through the CMB at an age of 380,000 years. This requires Dark Matter to be non-relativistic. This has lead to the idea of neutral, massive particles that possibly interact only via weak interactions. These weakly interacting massive particles (WIMPs) have not been discovered yet, but many experiments around the globe are trying to find the WIMP either directly (like the XENON experiment), or indirectly by searching for rare WIMP annihilation processes in the galaxy (Fermi/GLAST). During the past decade, the sensitivity of experiments trying to directly detect WIMPs has improved by three to four orders of magnitude, but solid evidence for their existence is yet to come. This paper overviews the recent progress in direct dark matter detection experiments and the scope for future researches.Several experiments including XENON10,LUX, DarkSide-50 experiment XENON100,The

Super-CDMS experiment, DEAP-3600 at SNOLAB in Sudbury are going on. But, to date, no solid WIMP signal has been observed in a direct detection experiment. However, these placed tight constraints on various theoretical models. In the next decade or so, future experiments are planning to push the search sensitivity in spin-independent WIMP-nucleon interaction to the irreducible neutrino background in almost the entire WIMP range.

Abstracts for Poster Presentation

Gravitational Waves

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Gravitational Waves are ripples in the curvature of space-time that are generated in certain gravitational interactions and propagate as waves outward from their source at speed of light. They are extremely weak so are very difficult to detect. These are caused by some of the most violent and energetic processes in the Universe. Albert Einstein predicted the existence of gravitational waves in 1916 in his general theory of relativity. Gravitational waves carry information about their dramatic origins and about the nature of gravity that cannot be obtained from elsewhere. Gravitational waveform binary black hole merger are detected 100 years after Einstein‘s prediction. These were detected on Sept. 14, 2015 by both of the twin Laser Interferometer Gravitational-wave Observatory (LIGO) detectors, located in Livingston, Louisiana, and Hanford, Washington by measuring the tiny disturbances the waves make to space and time as they pass through the earth. Several other gravitational–wave detectors are planned or under construction. The concept is useful in testing Einstein's general relativity and turning the universe into our own laboratory. In 2017, Nobel Prize in Physics was awarded to Rainer Weiss, Barry C.Barish and KipS Thorne for their contribution to LIGO detector and for observation of gravitational waves.

Neutrino: A Chameleons’s Of Particle Physics

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A Neutrino is an electrically neutral spin-1/2 fermion with left-handed helicity that interacts with matter principally through the weak nuclear force and was considered to be mass-less but neutrino oscillations confirm their massive character by calculating the square mass difference. Double beta decay is an exotic process in which double beta decay occurs in such a way that it violates the standard model of particle physics which is our point of concern i.e. Neutrino less Double Beta Decay (NDBD).NDBD ($0\upsilon\beta\beta$) is a process with long and curious history and important applications in the cosmology and in particle physics, but its observations are still deceptive. It represents our best hope for determining the absolute Neutrino mass scale of the level of few tens of eV. Firstly it will signal the violation of the standard model as lepton number will not be conserved. Secondly, it will indicate Majorana or Dirac nature of neutrinos. To achieve these goals however certain hurdles have to be overcome involving particle, nuclear and experimental physics and many experiments are going on in the search of no neutrinos. But till now we are not able to detect the neutrino less double beta decay.

Hexadeca Fluorinated Copper Phthalocyanine Anchored On Reduced Graphene Oxide For Gas Sensing Application

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We have grown hexadeca fluorinated copper Phthalocyanine ($F_{16}CuPc$) molecules onto surface of reduced graphene oxide (rGO) for gas sensing applications. Synthesized hybrid has been characterized for structural, compositional and optical properties by different experimental techniques. The results indicate that $F_{16}CuPc$ with nanoflower morphology provide more specific interaction sites along with the conducting network produced by high surface area rGO sheets.

The Cosmological Lithium Problem And Its Probable Solutions

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The primordial abundances of light nuclides (H, ^{3}He, ^{4}He, ^{7}Li) produced during Big Bang Nucleosynthesis (BBN) are sensitive to the universal density of baryons (η), number of neutrino flavors (N_ν), and mean lifetime of neutron against β decay (τ_n). In standard BBN, number of neutrino flavors is fixed to be three and the neutron mean lifetime is calculated experimentally. Some 3,80,000 years after BBN, when the temperature was low enough for formation of neutral atoms, "recombination epoch", the Cosmic Microwave Background (CMB) radiations were scattered for the last time from the scattering surface of the ionized plasma of protons and electrons, the spectrum of temperature fluctuations imprinted on the CMB also depended on the baryon and radiation densities. The predictions of Baryon density parameter ($\Omega_b h^2$) from CMB anisotropies is done former by WMAP and later by Planck. BBN has only one free parameter left i.e. baryon to photon ratio (η), which is related to critical baryonic density Ω_b as,

$$\Omega_b = \frac{\rho_b}{\rho_{crit}} \approx \eta_{10} \frac{h^{-2}}{274}$$

Where, ρ_b mean density, ρ_{crit} critical density, h is present Hubble parameter in units of $\frac{1}{100}$ Kms^{-1} Mpc^{-1}.

The temperature fluctuations imprinted on the CMB at small angular scales by acoustic oscillations of the coupled photon-baryon fluid during recombination enable an independent determination of the baryon density from CMB sky maps. The light element abundances predicted from BBN theory by using CMB predictedη, are in good agreement with the observational abundances except for ^{7}Li. Abundance of ^{7}Li shows a discrepancy of the order of $2^{\sim 4}$, leading to cosmological ^{7}Li problem. The value deduced from WMAP+BBN for ^{7}Li/H$= (4.15^{+0.49}_{-0.45}) \times 10^{-10}$, while the most recent observation in halo stars give ^{7}Li/H$= (1.68^{+0.68}_{-0.32}) \times 10^{-10}$. Hence, this observed ^{7}Li is 3.4 times lower than the WMAP+BBN predictions. Probable solutions of ^{7}Li problem are,

(1) Astrophysical solutions revising the systematic uncertainties in the observation of ^{7}Li abundance from metal poor Halo stars.
(2) Nuclear physics solutions revising the reaction rates of reactions responsible for destruction of ^{7}Be, which is source of ^{7}Li at BBNη.
(3) Solutions beyond the Standard model physics.

Gravitational Waves: A New Era Of Astrophysics

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Gravitational waves are basically the ripples in the fabric of the space time. These are one of the greatest discoveries in the field of astrophysics for which Rainer Weiss, Barry C Barish and Kip S Thorne has been awarded by the Nobel prize in 2017.
We will briefly explain the four categories of these waves : Continuous Gravitational Waves, Compact Gravitational Waves , Stochastic Gravitational Waves , Burst Gravitational Waves Which can be sensed by LIGO interferometer we will briefly give over view of Einstein prediction of theory of general relativity 1916 concept of precession, description of working of LIGO interferometer

Over - Damped Motion

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Damping is the presence of a drag which is nonconservative; it gradually removes mechanical energy from the system by doing negative work. As a result, the sinusoidal oscillation does not go on forever. Mathematically, the presence of the damping term in the differential equation for x (t) changes the form of the solution so that it is no longer a simple sinusoidal.

Optimization Of Ion Beam Currents For Accelerator Mass Spectrometry

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Accelerator mass spectrometry (AMS) is an ultra-sensitive technique for isotopic analysis of long-lived radionuclide. The precision of AMS depends upon the counting statistic which in turn depends upon the ion currents. To obtain better precision in less measurement time, high ion beam currents are necessary. It has been found that mixing the sample with some metal matrices improves the beam currents from the ion source. In AMS measurement of 14 C, graphite is loaded into ion source with iron powder. Here iron powder serves two purposes, it acts as a catalyst during graphitization reaction and it also optimizes the carbon currents from ion source during AMS measurement. In the

present project, we have investigated the effect of iron powder amount on the carbon current from the ion source. For this purpose, we have graphitized some standard samples using Automated Graphitization Equipment (AGE) with different amount of iron powders. Carbon current measurement of these samples performed using Inter University Accelerator Centre (IUAC) XCAMS system.

MANGALYAAN : Mars Orbiter Mission

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The Indian Mission to Mars, Mars Orbiter Mission, got off to a flying start on 5th of November 2013 from the Satish Dhawan Space Centre at Sriharikota at 2.38 pm. The launch vehicle - PSLV-C25 successfully injected the Spacecraft into an Elliptical Parking Orbit around earth. It was a near perfect launch for the Mangalyan spacecraft, the 25th successful mission carried out by the PSLV rocket, the trusted workhorse of ISRO. The spacecraft first going into orbit around the earth signalled the start of its 300-day voyage to the Red Planet. If everything goes well during this complex and challenging journey through deep space, it will be put into the Mars orbit on September 24, 2014. The orbiter weighs about 1,350 kg and will carry five instruments to conduct a battery of remote-sensing experiments on the availability of methane on the Red Planet, its upper atmosphere, its surface features, mineralogy and so on. One of the main objectives of the first Indian mission to Mars is to develop the technologies required for design, planning, management and operations of an interplanetary mission. From technological viewpoint, ISRO is looking at the mission that would help in design and realisation of a Mars orbiter with a capability to survive and perform Earth bound manoeuvres, cruise phase of 300 days, Mars orbit insertion / capture, and on-orbit phase around Mars. It will also explore possibilities of deep space communication, navigation, mission planning and management and incorporate autonomous features to handle contingency situations. The scientific objectives which ISRO intends to achieve is the exploration of Mars surface features, morphology, mineralogy and Martian atmosphere.

Prospects At Superkekb And Present Status Of Ckm Angles

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The *B*-factories KEKB at KEK, Japan and PEP II at SLAC, USA have the most important goal of establishing *CP* violation in $B0$ meson decays. Both experiments achieved this goal after two years of operation through time dependent analyses of $b \to c\bar{c}s$ transitions. Overview of the present status on *CP* violation in *B* mesons is given by means of the unitarity triangle. Several methods have been employed to measure angles $\phi 1$, $\phi 2$ and $\phi 3$ of the unitarity triangle. The latest measurements of $\sin 2\phi 1$is 0.687 ± 0.028(stat) ± 0.012(syst) and 0.667 ± 0.023(stat) ± 0.012(syst) by BaBar and Belle respectively. Decay modes used for $\phi 2$ measurements are of type $b \to u$ transition, for example $B0 \to \rho+\pi-$, $B0 \to \pi+\pi-$ with current measured value $\phi 2$=(88±2.3)0. The

$\phi 1$ and $\phi 2$ angles are measured to a good level of precision but $\phi 3 \equiv \arg[-VudVubVcdVcb/]$ is still ambiguous because branching ratios of the processes used for its determination are small and there is limited statistics from the previous runs of *B*-factories. The combined *B*-factory $\phi 3$ average is (67±11)0 but the most precise measurement reported recently by LHCb is (62−14+15)0. The future Belle II at SuperKEKB will have a peak luminosity 40 times higher than its predecessor and accumulate 50 ab-1 in about 5 years. . The expected precision with this is 0.012 for $\sin\phi 1$, ~10 for $\phi 2$ and 1.50 for $\phi 3$.

Cold Plasma Technology For Food Processing

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These days, cold plasma technology has become an emerging, green process offering many potential applications for food processing. As plasma is a quasi-neutral gas of ionized particles and electrons. In cold plasma, the temperature of the electrons (Te) is much higher than that of the heavy particles (Ti) and also the gas temperature (Tg) i.e. Te>> Ti >Tg>. The electron can reach temperatures of 104 -105 K (1-10 eV) whereas the gas temperature Tg, can be as low as room temperature. In such plasma, most of the energy is stored in free electrons due to which the overall temperature is quite low. Applications of cold plasma are widespread and put to use in variety of fields such as microbial inactivation and also the elimination of toxic chemical residues and pesticides in food such as vegetables and fruits without any change in nutritional contents. The concentration of pesticides can be decreased up to 45-71% by cold plasma treatment. Several research investigations showed a reduced growth of microorganism via different mode of actions by etching phenomenon, cell disruption by electrophoration etc. This new technology may prove to be the most-effective means of microbial intervention in food while also being a money and time-saving phenomenon.

Synthesis Of Graphene Oxide Derived Graphene Quantum Dots Through Chemical Cutting

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Graphene quantum dot is usually used to describe the miniscue fragments, limited in size or domains of single layer to tens of layer of graphene. Having low cytotoxicity, excellent solubility, stable photoluminescence, good biocompatibility, high specific surface area, high mobility and tunable band gap the graphene quantum dots become promising for biosensing, photovoltaic devices and imaging. In this study, two different approaches were employed to synthesis graphene quantum dots from graphene oxide. Graphene oxide was chemically prepared using graphite powder. In current study, graphene

quantum dots had been synthesized by $KMnO_4/H_2SO_4$ in oxidized shearing method through chemical cutting from graphene oxide. (Fan et al 2015). The defects on GO sheets can be created by the oxygen containing functional group that serve as chemically reactive sites to allow GO to be cleaved into smaller sheets. One kind of graphene quantum dot was synthesized with a shorter reaction time and marked as GQD-1 and other with longer reaction time and marked as GQD-2. The results were characterized on the basis of Transmission electron microscopy (TEM). The outcome of TEM results shows that the size, shape and yield of GQD-1 synthesized from approach 1 were better than the TEM results for GQD-2 synthesized from approach 2.

REFERENCE**:-** Fan T, Zeng W, Tang W, Yuan C, Tong S, Cai K, Liu Y, Hyang W, Min Y and Epstien A J (2015) Controllable size-selective method to prepare graphene quantum dots from graphene oxide. Nanoscale Res Lett **:** 1-8

Design, Construction And System Performance Coefficient (Spc) Of Ohmic Heater

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Food preservation is one of the most critical aspects in the industrial food processing. Heating plays a significant role in food processing and preservation. Ohmic heating is a novel food processing technology which operates due to the flow of alternating electric current through the food material. It is also called as Joule heating, electrical resistance heating, electro-heating or electro-conductive heating. The electrical resistance of food product leads to an increase in temperature. Electrical energy is dissipated into heat, which results in rapid and uniform heating. The overall objective of this study is to design and build a laboratory scale ohmic heating system, concluded by evaluating the electrical conductivity and ohmic heating rate of amla juice. The ohmic cell employed was constructed from Polyvinyl Tetrachloride (PVC) cylinder having diameter 3.47cm and length of 10.5cm and two stainless steel electrodes with thickness of 0.2 cm. The distance between two electrodes was 10.5 cm resulting in a total sample volume of 125ml. Two holes with diameter 0.5cm each was created at a distance 2cm from each other to observe bubble formation and measure temperature. System performance coefficient of an ohmic heater is the ratio of energy gained by the sample to the energy supplied to the sample. System performance coefficient (SPC) of ohmic heater was calculated for four concentrations (100, 90, 80 and 60%) of amla juice and five voltage gradients (16, 14, 12, 10 and 8V/cm) over a temperature range 30 to 70˚C.

How To Generate Electricity Using Static Friction

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The developing country India is deficient in electricity and energy as compared to developed countries. So we should find non conventional alternatives. Then we are going to generate electricity by using “rubber flap”. A cemented pit of 3×3 feet is formed and battery and wiring connections are placed in it. The outer facing material is rubber flap

which produces friction and this friction is responsible for charging of battery and this is further used in form of DC voltage for LEDs and street lights etc. In a dance bar all the lights can be flashed by using flap phenomenon without any another expense and bill of electricity. This method can also used in institutes and at roads also.

Probing The Interstellar Medium In The Line Of Sight Of Psr B1846-06

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Pulsars are highly magnetized, rotating neutron stars which emit focused beam of electromagnetic radiation. The beam is only visible if you happen to be in its path. Since they rotate with a fairly constant period, the pulsars from which we do receive signals, we receive them as pulses at regular intervals. As the emission has to pass through the intervening space before reaching us, one way to determine characteristics of the Interstellar Medium (ISM) is to monitor signals from a pulsar. On an average, pulse signals emitted by the pulsar are always the same. As they travel through the ISM they become slowed and scattered by the gas. This helps us to calculate the dispersion delay of the pulse. The ISM affects the travelling signal and measuring the variations in these effects with time allows one to understand the properties of the intervening material. The pulse strength, which is a proxy for the flux of the receivedpulse; pulse shape, which tells us about the scattering timescale of the pulse and arrival times tell us about the scintillation, scattering and electron density properties of the ISM. We have tried to estimate the average time delay and the dispersion measure of the pulsar using a rough estimate of the period of the pulsar. The dispersion measure itself was then used to get a better estimate of the period of the pulsar. The pulse broadening of the pulsar due to interstellar scattering has also been quantified. Furthermore, an attempt has been made to get a rough estimate of the electron density turbulence in the line of sight of the pulsar and the fluctuation of the density. The Pulsar source used for our purpose was the PSR 1846-06 and live observations were taken from Ooty Radio Telescope. This pulsar was a relatively weak source with a lot of electron density in its line of sight and therefore, high dispersion measure. Its period is about 1.4514 seconds. The calculated results of my experiment were then tallied with the above data published in the research papers which characterized this particular pulsar among many others. Agreement between the two was found up to a large extent and the observed discrepancy was accounted for. GNUPLOT and SigProc 4.3 were used for data analysis. This was done as a part of the activities at Pulsar Observatory School (POS), 2016 held during July and December at Radio Astronomy Centre (RAC), Ooty.

Vacuum Polarization, Self-Energy And Its Effects On The Lamb Shift Of H-Atom

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The term “vacuum polarization” is the descriptive of the effect responsible for conclusively reducing the charge on a particle, and the reduction being dependent on the distance of observation from state, hence from the energy level. The polarized vacuum effect involves pairs of “virtual particles,” one with a positive charge and one with a

negative charge. As stated in quantum electrodynamics, all electromagnetic interactions in the atom are accomplished via the photons. When a photon propagates, the vacuum affects the photon to fluctuate into virtual electrons and positrons, these particles again interact with the background EM field by exchanging another photon, thus creating more virtual particles. The standard electric charge on the nucleus is screened by this phenomenon, and the effective charge decreases. The interaction of electron with the virtual photons and constant emission of absorption of them, creates a fuzzy cloud around the electron, and hence a divergent term which is proportional to the interaction of electrons with the surrounding, which is called "self-energy". As predicted by Dirac in his relativistic equations for spin ½ particles, the energy levels with same principal quantum number have identical energies. It was later experimentally realized that the energy levels $2s_{1/2}$ and $2P_{1/2}$ of hydrogen atom have trivial difference in their energies, popularly known as the "Lamb Shift". The QED vacuum is subject to minimal non-zero ground state fluctuations called "zero-point fluctuations", and the interaction between vacuum energy fluctuations and electrons is the cause of this "Lamb shift". Hence, these virtual particles, which are merely ripples in the EM field, are constantly appearing and disappearing in the vacuum, and the vacuum is full of such virtual pairs which leave their trace behind and hence cause such perturbations in the energy levels of atoms.

Gravitational Waves

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When a mass is kept on a very largely stretched piece of fabric, it bends the fabric around it causing a depression. It generates ripples when this mass is accelerated on the fabric. In terms of our universe, these ripples are known as gravitational waves which are generated on the fabric of space-time. The masses resemble planets, solar systems, stars, galaxies etc. The mass of these objects generates a curvature in the fabric of space-time. These waves can let us observe the merger of black holes and other exotic objects in the distant universe. LIGO in collaboration with Virgo detected the first gravitational wave on February 11, 2016 which had originated from the pair of merging black holes. The gravitational waves can become a navigation system which will map all the baryonic entities in the space which were unknown till date. Though the gravitational waves can exist at any frequency theoretically, we are unable to detect very low frequencies and no credible methods have been developed to detect very high frequencies. Thus, the optimum range for frequencies as suggested by Sir Stephen Hawking and Werner Israel range from 10-7Hz to 1011Hz. With the faster technological advancement, we will be able to map the space around us better which will make our space travel easier. We will be able to make our satellites avoid the path of black holes and will be able to reach to the untrodden paths of space.

Electricity Production Through Moving Train

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Fast developing human society needs more amount of energy to fulfill the existing requirements of energy and also to progress further. Hence energy harvesting has always been an attractive idea in human society. In present study an innovation for energy harvesting through moving train has been proposed. The electricity production through wind energy by wind turbine is already in practice. The basic requirement to install the wind turbine is availability of wind. For this reason wind energy harvesting is done in border area and coastal area (Rajasthan, Gujarat). On- shore and Off- shore both places offer good surrounding with respect to availability of air for installing wind turbines. In present study a model has been proposed to establish small wind turbines at roof of the train. With the speed of train wind also flows at some speed, which can be utilized for moving the rotor of wind turbine and to produce electricity with it. This electricity can be consumed for running electrical and electronic parts of train itself. Any wind turbine specifies three speeds of wind; cut-in-speed (~5m/s), rated speed (~10m/s) and cut-out-speed (~25m/s). Here cut-in-speed is minimum wind speed and cut-out-speed is the maximum wind speed to produce electricity. Since the train moves at different speed during its journey, a regulation mechanism is provided to check the rotor speed through pitch or stall regulation mechanism. The electricity produced in this way can be stored in a battery and can be made available whenever needed to run the electrical and electronic parts of train. By this method electricity may be produced during day and night both.

Living With Plasma

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Existence of plasma in the universe as a whole and on the earth in particular has always been a subject of research interest. Here we are discussing the plasma and its expanding applications in everyday life in the field of health science and technology called **Plasma medicine**. Providing health care at tolerable cost is one of the greatest challenges facing the world in this century. Technologies that may offer enhanced quality of care at reduced cost, such as plasma technology, will be of immense societal and commercial value. Plasma medicine can be subdivided into three main fields:

- Plasma modification of biomedical surfaces
- ·Plasma based Decontamination/Sterilization
- ·Direct therapeutic plasma application

Cold plasmas selectively kill cancer cells without damaging normal cells; and significantly reduces tumor size. Plasma sterilization is a nontoxic, fast procedure without the severe drawbacks suffered by other traditional techniques. Direct therapeutic plasma applications as the central element of plasma medicine will bring physical plasmas

directly on or in the human (or animal) body. A bright future for Plasma medicine is emerging worldwide and some promising applications are on the horizon.

Side Effects Of X-Rays

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My topic for poster presentation is side effects of X-RAYS. Now a days science is widely used in medical field. Where X rays plays a major role. Although X rays are used in detection of fractures and in various scanning process of the body parts. They also help in identifying bone cancer. X-rays help in locating alien objects inside the bones or around them. But it has some harmful effects also as x-rays makes our blood cells to have higher level of hydrogen peroxide which could cause cell damage. A higher risk of getting cancer from X-rays. The X-rays are able to change the base of the DNA causing a mutation. From this poster presentation I want to aware the people to use X rays as least as possible and try to show some alternative of x rays.

Carbon Nanotube

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Now a day the technology requires very fast and smart materials. With the time going, more and more enhancement in its structure to comfort our lives. Our approach to use of the nonmaterial in mobiles, computers, tabs etc but at the cheapest cost. Within the few past decades none has held a central a role as the computer and communication technology. The progress in these is directly connected to the Nano material used in electronic devices. Research related to Nano technology give impetus to further growth from the advent of Very Large Scale Integration (VLSI). Through this poster presentation I want to show some applications of carbon nanotubes in our future technology. I want to pursue the research work in my future studies. I took very much interest in practical and always try to gain more and more in depth of my subjects.

Employing Microfluidics For The Study Of Soft Matter

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The microfluidic method is the science and technology of manipulating and controlling fluids of the size varying from micrometers to picometers in a micro-sized channel. The advantages of using this methods are it decreases sample and reagent consumptions, shortens time of experiments, and reduces the overall costs of applications. The project will be mostly working on preparing emulsions using the method of digital microfluidics, there designing microfluidic channel (T-junction) using glass slides. The digital microfludics is the subcategory of microfluidic, it involves the generation and

manipulation of discrete droplets inside micro-devices like T-junction. It allows for independent control over each droplet and also creates mono-disperse droplets. Most of the liquids that we encounter in our daily life from toothpaste to the body fluids like mucus, blood etc are a form of emulsions. The micro-emulsions are largely used in drug delivery, is to protect the water soluble drug molecules and in the micro-reactors.

A Comparative Study Of Water From Different Sources And Their Analysis

Ms Kritika Jain, Dr Poonam Juneja and Dr Prajwalit Shikha

In the 21st Century, Water Crisis has been an issue of utmost importance. From the availability of water to the quality of water that is accessible to the people, it becomes important for one to know that if the water that we are consuming contains an appropriate amount of minerals or not. Is the best quality of water that we are been provided with or can efforts be made to get even a better quality of water? In order to bring a conclusion out of the mentioned questions, a few samples of the water obtained from different filtration systems and a sample of the rainwater were collected and studied so as to study the mineral content present in them and analyses as to which system provided the best quality of water. Moreover, the impact on water when it is kept in containers made up of materials like plastic, soil, brass etc. were also analyzed. The samples have been tested on various parameters like salt, mineral and bacterial content. More specifically for the amount of minerals provided by each were analyzed. On the basis of the results obtained, a conclusion was drawn along with the suggestions on how to enhance the quality of water used for day to day purposes and move a step forward towards tackling the problem of water crisis at personal level.

Shape Memory Alloys With Applications: An Analysis

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Shape memory alloys (SMAs) are metals that "remember" their original shapes. Recently a growing interest has been inclined towards investigating the development of polymers with shape memory characteristic with wider potential to applicate in the fields of textile and clothing such as fiber, woven fabrics/garments along with fascinating properties as temperature sensitive, higher fabric breaking & tearing strength and better performance etc. Here we are planning to bring out the application enriched products using shape memory alloys/polymers like tracking systems for solar panels. By coiling shape memory alloys into springs which get stretch when cool, the sun-trapping system allows the solar panel to move back and forth, tracking the sun in the sky. The idea has the potential to make solar energy more affordable to cost-sensitive customers by increasing the panel's energy output. The efforts have been further extended to include the details towards the usefulness of these alloys/polymers in production of electrical energy by combining them with various piezo crystals and with other technological energy products of mechanical energy used in aero planes etc. so as to bring out the outcomes for welfare of society.

Raman Stimulated Emission

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Raman stimulated emission is an application part of Raman scattering. Raman lines are independent of the wavelength of the incident light but depends on the nature on the scattering. The displacements of THE RAMAN LINES from the incident lines are the characteristics of the scattering substance. Quantum theory says that there three cases are possible molecule will back to the ground vibrational state and will emit the same frequency named as Rayleigh scattering. Molecule can absorb or loss their energy then lines from with varying frequency from incident will be anti-stokes or stokes line. When the intense light is sufficiently large the large then induced oscillation of the dipole moment become non-linear.

$$p = \mu_0 + \alpha E + \beta E E + \gamma E E E$$

Where the p is dipole moment of given sample.
α is polarizability, β is hyper polarizability and γ is second hyper polarizability.
Many stokes photon cause by a particular intense laser pumping beam . these stokes photon will stimulate other stokes transition from the virtual level to the excited level this will cause an increase in the excited level population which will the increase the antistoke radiation which will itself become stimulated . This is stimulated Raman scattering (SRS).

The Nobel Work: Mass Energy Equivalence

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When a body move in an inertial frame with speed comparable to speed of light, law of electromagnetic theory fails and a new physical view of system came into picture presented by Sir Albert Einstein in his Noble Paper "Does the Inertia of a Body Depend Upon its Energy Content". A body moving in Inertial frame of reference does not have mass equal to its constituent contains but it has also a part of energy that it contains in the form of its internal energy or the energy due to motion of the system. The motion of the body increases its mass depending upon its speed. This will be happened according to the equation,

$$m = \frac{E}{C^2}$$

Where m $\rightarrow$ mass of the system
E $\rightarrow$ energy contain by a system
It means that mass of the body also contains a part of the energy that may be in the form of potential energy, kinetic energy and thermal energy.
Let a body simultaneously emit plane wave of light of energy L/2 (measured relative to(x, y, z)) in the direction forming an angle α with the x-axis and an equal amount of light in opposite direction. We can understand it with the help of physical explanation

that two co-ordinate systems in relative motion with each other with energy before emission E_0 and E_1, and H_0 and H_1 be the energy after the emission of light.

$$(H_0 - E_0) - (H_1 - E_1) = L\left\{\frac{1}{\sqrt{1 - \left[\frac{v}{V}\right]^2}} - 1\right\}$$

In one frame the system is at rest and in other it is moving with speed v so this difference clearly inform about the kinetic energy of the system. This energy includes in the mass of the body in moving frame of reference.

References:

1. A. Einstein " Does the Inertia of a Body Depend Upon its Energy Content", Annalen der Physik 18(1905):639-641.

Electronic Circuit Representation By Using Quantum Logics

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Biggest drawback of the classical electronic gates and circuits is irreversibility of the logics. Quantum mechanics allow us to reverse the logics using the matrix formulation which we called as quantum logics. CNOT (controlled-Not) gate is the universal one bit quantum gate. Using CNOT gate we tried to built some electronic circuit operation in Quantum form. Quantum gates are the basic building blocks of Quantum computing and quantum mechanical bit data storage. These system allows us the quantum data processing. Here we have quantum circuits representation of some classical operations.

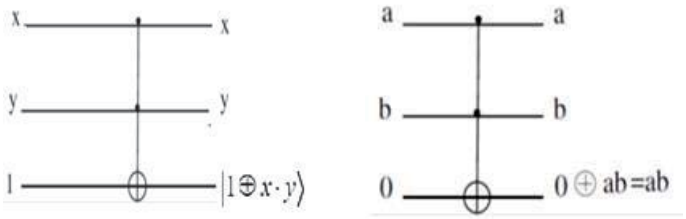

Fig: (i) XOR Gate (ii) NAND Gate (iii) AND gate

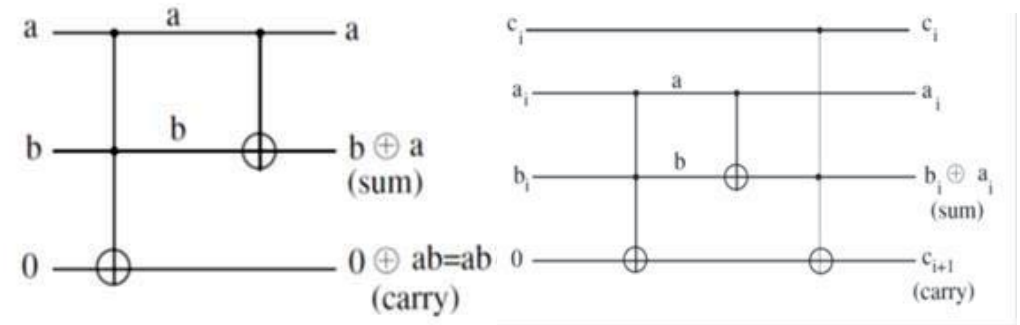

Fig: (iv) Half Adder (v) Full Adder

Kerr Electro -Optic Effect

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In Kerr electro optic effect experiment, a slowly varying electric field is applied and a voltage across the sample material. Then the sample become birefringent, with different indices refraction for light parallel and perpendicular to applied field. The difference of refractive index of refraction, δn is given as

$$\delta n = \lambda K E^2$$

λ is the wavelength of light, K is Kerr constant is electric field.
Optical Kerr effect is the case in which electric field is due to light itself. This cause a variation in index of refraction which is proportional to local irradiance of light. This effect only become very significant with very intense beam of light such as laser.
DC KERR EFFECT: Electric polarization field P will depend on the electric field E. In

dc Kerr effect, we can neglect all except the linear term and those in

$$\chi^{(3)} \mid E_0 \mid^2 E_w$$

$$P \cong (\chi^{(1)} + 3\chi^{(3)} \mid E_0 \mid^2) E_w \cos(wt)$$

AC KERR EFFECT: In AC Kerr Effect, an intense beam of light in a medium can itself providing the modulating of electric field without the need for an external field to applied.

In this case, we take only $\chi^{(3)} \mid E_0 \mid^2$.

$$P \cong \varepsilon_0 (\chi^{(1)} + \frac{3}{4}\chi^{(3)} \mid E_0 \mid^2) E_w \cos(wt)$$

Development Of Modern Physics- A Philosophical Approach

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Philosophy of physics deals with conceptual and interpretational issues in modern physics and often overlaps with research done by certain kinds of theoretical physicists.
The development of science post the advent of quantum concepts starting from the discovery of cathode rays by Michael Faraday (1838), Black-Body Radiations (1859-60), Photoelectric effect (1887), Planck's Quantum Theory, Wave-Particle duality, relations and material nature of time and space etc. lead to the metaphysical development of physics and philosophy and arose the most basic questions-
Can these results be interpreted in the most ultimate way possible to reflect properties common to all form of matter, living & non-living along with the measurement problem?
It further contributed in development of philosophy as through negation by some and affirmation by others of the cause- effect relations, mechanical determinism (esp. post newton) and the nature of objective reality.

The experiments most susceptible to these interpretations are Young's Double Slit Experiment, Copenhagen Interpretation, and Heisenberg's Uncertainty Interpretation etc.

Everyday Entanglement: Physicists Took Quantum Weirdness Out Of Laboratory

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Erwin Schrödinger introduced the term entanglement (a translation of the German Verschrän-) in a 1935 paper, inspired by a experiment proposed the same year by Albert Einstein and collaborates- Boris Podolsky and Nathan Rosen. The thought experiment demonstrated that when two objects interact in a particular way, quantum physics requires them to become connected, or entangled, so that measuring a property one instantly reveals the value of that property for the other, no matter how far away it is. . Quantum theory predicts that vast number of atoms can be entangled and intertwined by a very strong quantum relationship, even in a macroscopic structure. Until now, however, experimental evidence has been mostly lacking, although recent advances have shown the entanglement of atoms. Scientists at the University of Geneva (UNIGE), Switzerland, recently reengineered their data processing, demonstrating that 16 million atoms were entangled in a one-centimetre crystal. They have published their results in Nature Communications. Much of the new work is building a base for powerful technologies that operate in the real world, from manipulating information in futuristic quantum computers to sending secret messages with unbreakable security. Quantum computers based on entanglement can be developed. Like traditional computers, a quantum computer is made up of a network of logic gates that operate on information. Though current versions can perform only rudimentary operations, scientists hope future devices will be powerful alternatives for solving some types of problems.

Photoelectric Effect Vs Compton Effect

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There are three ways in which photons of light, X- rays, and gamma rays interact with matter - photoelectric effect, Compton Effect, pair production. In pair production, energy of photon is converted into matter that is photon gets converted into electron and positron. In photoelectric and Compton Effect, photon interact with electrons and give all its energy (in case of photoelectric effect) or a portion of its energy (in case of Compton Effect) to electrons, which in turn lose energy to atoms in absorbing material. In this poster, I am discussing the factors that determine, which effect is more likely to occur if X-ray beam is made incident on given material. It represents that how the probability of occurrence of photoelectric interactions or Compton interactions depend on photon energy and atomic number of given material.

Wormholes

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Wormholes are passage through space-time that could create shortcuts for very long distance journeys across the universe. These are imaginary and are predicted by GENERAL THEORY OF RELATIVITY. Wormholes may bring with them sudden collapse. Wormholes are supposed to connect the black hole with the white hole. They may also bring high radiation and dangerous contact with exotic matter. They are also called Einstein-Rosen Bridges. Wormholes contain two mouths and a throat, the mouths would most likely be spheroidal.

Plastic Solar Cell

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Nanotechnology is the nexus of sciences. Nanotechnology is the engineering of tiny machines - the projected ability to build things from the bottom up using techniques and tools being developed today to make complete, highly advanced products. It includes anything smaller than 100 nanometers with novel properties. As the pool of available resources is being exhausted, the demand for resources that are everlasting and eco-friendly is increasing day by day. One such form is the solar energy. The advent of solar energy just about solved all the problems. As such solar energy is very useful. But the conventional solar cells that are used to harness solar energy are less efficient and cannot function properly on a cloudy day. The use of nanotechnology in the solar cells created an opportunity to overcome this problem, thereby increasing the efficiency. This paper deals with an offshoot in the advancement of nanotechnology, its implementation in solar cells and its advantage over the conventional commercial solar cell. In order to the miniaturization of integrated circuits well into the present century, it is likely that present day, nano-scale or nano electronic device designs will be replaced with new designs for devices that take advantage of the quantum mechanical effects that dominate on the much smaller, nanometer scale. Nanotechnology is often referred to as general purpose technology. That is because in its mature form it will have significant impact on almost all industries and all areas of society. It offers better built, longer lasting, cleaner, safer and smarter products for the home, for ammunition, for medicine and for industries for ages. These properties of nanotechnology have been made use of in solar cells. Solar energy is really an abundant source that is renewable and pollution free. This form of energy has very wide applications ranging from small household items, calculators to larger things like two wheelers, cars etc. they make use of solar cell that coverts the energy from the sun into required form.