

PADARTH

Newsletter



विद्या तत्त्व ज्योतिसमः

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Department of Physics and Materials Science and Engineering
Jaypee Institute of Information Technology, Noida, U.P., India

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Message from Editorial Team

As we all associated with this Department, \in Physics, we regularly encounter with dynamics, be it relativistic or non-relativistic. Dynamics (or equivalently, change) is part of our life. In fact, since the publication of the first issue of our newsletter “Padarth”, the Earth has already made almost half a rotation around the Sun. In this period, many changes have happened in the Department. Some of those changes are exciting, like a set of JRFs and a Postdoc have received NASI Swarnjayanti Award, best poster award in international conference, some coin cells are made in the lab, coherent one-way protocol for quantum key distribution is realized in the lab. Two SERB projects have been received by the faculty members. We have started Women in Science Lecture Series and Journal Club. Some changes are routine in nature, like we have published a good number of papers in reputed journals, Prof. Anirban Pathak and Dr. Vikash Malik have taken charges of HoD and Coordinator 128, respectively. This issue of Padarth will aim to give you glimpses of all the events that have happened in our dynamic department in the last few months.

When we study dynamics of a system or look at a spectrum, our primary focus remains on the sudden changes- be it a spectroscopic peak or sudden death of entanglement. Such a sudden change is recently observed in the campus when it became fully offline. Campus is now extremely living- so many young and bright minds are all around us. We are getting induced by their energy, and we hope Padarth will also add an avenue to capture their energies in positive manner.

Let's enjoy Physics and Physicist's skill's in other domains, let's enjoy Padarth.

Editorial Team

Prof. Anirban Pathak

Prof. Papia Chowdhury

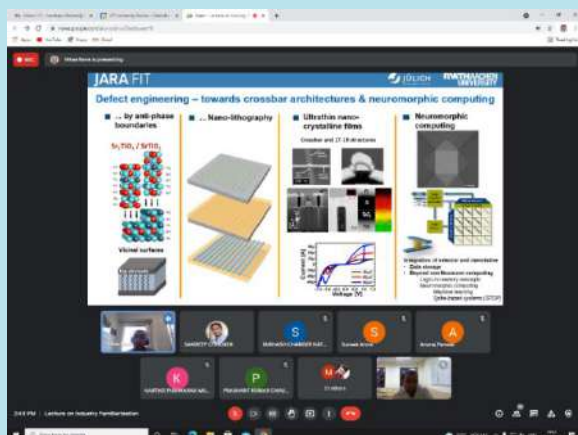
Dr. B. C. Joshi

Dr. Anuraj Panwar

Events Organized

One day webinar on familiarization to industrial life

The Department of Physics and Materials Science and Engineering, Jaypee Institute of Information Technology, organized lectures for industry familiarization. Specifically, it organized a webinar on "Role of Science in Industry and Economic Development" on 10th Sep 2021. The key objective of the lectures organized as part of this one-day webinar was to familiarize faculty and students with industry requirements in some of the highlighted areas and also to bridge the gaps of communication and guidance to concerned by providing opportunities to listen and interact with experts from the industry and academia (industry related). Keeping in view the current pandemic situation the workshop was held online mode. Event had three invited speakers, Dr. Vikas Rana- RRAM Integration Technology Expert, Jülich, North Rhine-Westphalia, Germany, Mr. Akhilesh Kumar- Head, Innovation Strategy & Execution/Corporate Technology Management, BHEL India and Dr. Suneet Arora- PV systems- SB Energy (Soft Bank Group). It was attended and appreciated by a large number of students and faculty members.



International Conference on Energy and Advanced materials

Department of Physics and Materials Science and Engineering, Jaypee Institute of Information Technology, Noida, has successfully organized an International Conference entitled Energy and Advanced Materials-2021 (ICEAM-2021) from October 21-23, 2021 in online mode. ICEAM-2021 was focused on cutting edge research that addressed recent scientific and industrial advancements in the field of energy and material science research. The conference covered the unique spectrum related to the hydrogen energy, energy storage and advanced functional materials.

The conference witnessed 24 jam-packed and interactive sessions related to energy and advanced

The Department is thankful to Editor-in-chief International Journal of Hydrogen Energy (Elsevier), Energy Storage (Willey) and International Journal of Materials Research (De-Gruyter) for their kind consent to publish (after rigorous peer review) the special issue of ICEAM-2021 in their journals, the process for which has already been started.

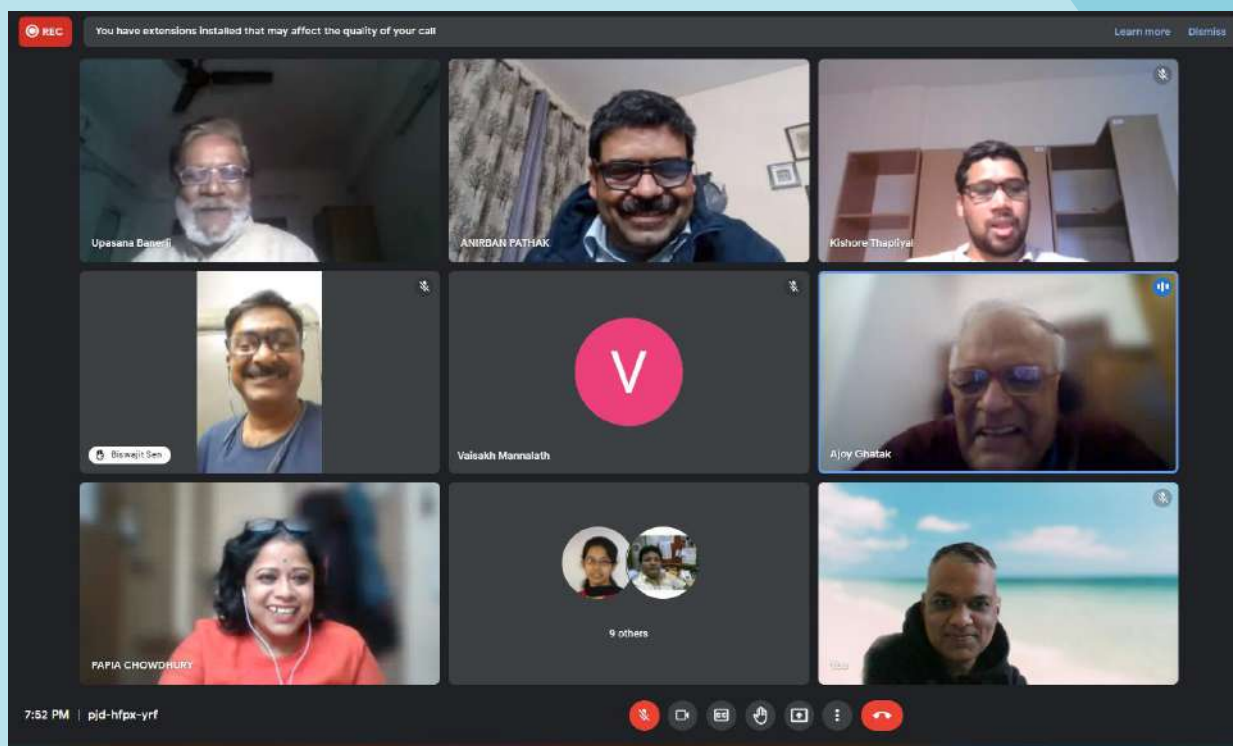
materials. This conference not only attracted the participants from every corner of India but there were number of participants form USA, Germany, South Korea, Turkey, Australia, Portugal and Malaysia etc. We received a total of 285 abstracts, out of which 162 abstracts were selected for presentation in the conference. The participants from various reputed institutions contributed to this event with full enthusiasm. 4 best oral presentations and 4 best poster presentations were selected after a rigorous review and were awarded. The expert lectures were delivered by the eminent speakers in their areas of expertise, which were very well received by the participants and audience. There were 3 plenary lectures, 17 keynote lectures, 8 special invited lectures and 8 invited lectures by eminent speakers. The list of distinguished speakers included Prof. J.K. Johnson (Associate Director, Centre for Computing Research, University of Pittsburgh, USA), Prof. Michael Federoff (Group Leader, Max Planck Institute for kohlenforschung, Germany), Prof. Cenk Celik (Director, Centre of Vocational School, Kocaeli University, Turkey), Prof. A. K. Sood (Padamshri Awardee, IISc Bangalore), Prof. T.N. R Rao (Director, ARCI Hyderabad), Prof. Ashok Ganguli (Founding Director, INST-Mohali and Chair Professor, IIT Delhi), Prof. Rangan Banerjee (Chair Professor, IIT Bombay), Prof. Y.R. Sood (Vice-Chancellor, JIIT-Noida).



Celebration of Birthday of S. N. Bose

Continuing with the Jaypee Institute of Information Technology's endeavor to celebrate the life and science of the Indian scientists on their birthdays, PMSE celebrated the birth anniversary of legendary Indian Physicist Prof. Satyendra Nath Bose on 1st January, 2022. Prof. Bose was born on 1st January 1894. It's well known that in collaboration with Albert Einstein he developed Bose Einstein Statistics, which paved the way for Bose Einstein Condensates. Further, in the universe there are only two kind of particles: fermions and bosons. Bosons are named after Bose. So, in some sense, half of the Universe (if not more) belongs to Bose. To make the students familiar about the life and science of Bose a webinar was organized on 1st January 2022 at 6 PM, which was primarily consisted of following three presentations:

- (i) "My memories of Prof. S. N. Bose" by Prof. Ajoy Ghatak, President, National Academy of Sciences, India.
- (ii) "My interaction with Prof. S. N. Bose" by Prof. Jagannath Banerji, Physical Research Laboratory, Ahmedabad.
- (iii) "My interaction with bosons" by Dr. Kishore Thapliyal, Palacký University, Czech Republic.



Women in Science Lecture Series

On the Eve of the 75 years of Independence, the National Academy of Sciences, India (NASI) is celebrating *Azadi Ka Amrit Mahotsav* through different science and society initiatives. As part of NASI's science and society initiative, Delhi Chapter of the NASI and the PMSE Department, Jaypee Institute of Information Technology (JIIT, Noida) jointly organized a series of lectures entitled, "Women in Science Lecture Series". All the lectures of this series are being delivered by the eminent Women Scientists. The lectures were aimed to motivate young female students involved in UG, PG and PhD programs to continue science. All the talks had two parts. In one part, the speaker usually talked lucidly about her research works and the other part remains focused topics that inculcated confidence among the young students that even they can do top-class science and thus contribute to the society. Some practical problems that a growing scientist faces and how to circumvent those were discussed during the interaction sessions at the end. Details of lectures are as follows

Women in Science Lecture 1



Dr. Manju Sharma delivered the inaugural talk of the series on 19th February, 2022. Her talk was entitled "Science and Technology for Rapid Progress of Women". She is currently Distinguished Women Scientist Chair of NASI (The National Academy of Sciences, India). She is also a well-known biologist and science administrator who has played critical role in the development of biotechnology and related areas in India. She has been a Past president of NASI and served as the Secretary, DBT (GoI). For her outstanding contributions to science, she has received the Padma Bhushan award.

In her talk, Dr. Sharma described role of women in Indian Science. Very lucidly she described the progress of science in India and showed that the progress in science and technology has been deeply connected with the active involvement of the woman researchers throughout post-Independence period. Dr. Sharma also discussed about different available research fellowships, project grants, startup grants which are regularly offered by GOI for the women researchers only by various funding agencies like: DST, DBT, UGC, CSIR etc.

Women in Science Lecture 2



Dr. Shohini Ghose, talked about “Seeing the Invisible: A Quantum Journey” on 25th February 6:00 pm 2022. TED Senior Fellow and NSERC Chair for Women in Science & Engineering is well-known for her outstanding works on quantum information and related areas. She is a Professor of Physics and Computer Science at Wilfrid Laurier University. She is also the President of the Canadian Association of Physicists, the Co-Editor in Chief of the Canadian Journal of Physics, and the Director of the Laurier Centre for Women in Science.

In 2017 she was elected to the Royal Society of Canada's College of New Scholars, Artists and Scientists. Her talk included a guided tour of the strange quantum world, a stopover to explore quantum computers and the quantum internet, and a glimpse of the quantum future. The itinerary also included surprising lessons about science and about being a scientist.

Women in Science Lecture 3



Third lecture of the series was entitled “Reflections on my Journey with Light waves” and it was delivered by Prof. Enakshi Khular Sharma on 24th March, 2022. Prof. Sharma has recently retired from the position of Professor in the Department of Electronic Sciences, Delhi University and is well known for her outstanding contribution in the area of photonics. Her research interests are analytical and computational techniques for design and analysis of wave propagation in Optical Fibers and Integrated Optical Wave guides. In these areas, she has published more than 100 research papers in many reputed international journals of high repute.

During her talk, she covered many cutting-edge areas of Photonics with interesting analytical results which are highly useful in the domain of Optical Communication. Total number of participant was about 40.

Faculty Corner

भारत



भारत का इतिहास बताता है, बलिदानों की अमर कथाएं!

मानस का ज्ञान सिखाता है, आदर्शों की अनुपम प्रतिभाएं!

भारत की भूमि बताती है, माँ का आंचल क्या होता है!

माँ के समान मातृत्व दिखाती, उसकी गोद में फसलें हैं !

हिमगिरि का शिखर सिखाता है, त्याग, तपस्या, बलिदान!

चरण धो रहा भारत माँ के, विशाल सागर है महान!

उस महान माता के चरणों में, हम शत-शत वंदन करते हैं!

(डॉ० सुनीत कुमार अवस्थी)
सह-आचार्य

मियाँ तुम भी पीएचडी किये लगते हो

न सर पे बचे बाल न चेहरे पे नूर,,, करियर का पता नहीं,,, नौकरी है बहुत दूर
मियाँ तुम भी पीएचडी किये लगते हो,,

रातों को जागा करते हो,, खुद से ही बातें करते हो,,
पेपर पे आये कमेंट का जबाब नहीं,, एनालिसिस में अपनी ही उलझे हो,,
मियां तुम भी किसी रिव्यूअर के सताये लगते हो,,

लैब में अकेले हूँ ही सालों साल गुजारे,, दीन दुनिया का पता नहीं,,
आँखें हैं खोई खोई सी,, और चेहरे पे छाई उदासी है
एक हाथ में सुलगता सुट्टा और दूजे हाथ में चाय का प्याला,,
खयालो में अपने यूँ ही गुम अकेले बैठे हो,
मियाँ तुम भी सुपर वाइज़र से डॉट खाये लगते हो,,

साल दर साल यूँ ही जाते रहे और तुम बस पेपर छापने में ही लगे रहे,,
अपने भी सारे बेगाने हुए,,, "क्या करोगे आगे" ये पूछ पूछ के माँ बाप भी अब हार गए,,
स्कूल में चाहा था जिसे कभी,, वो अब दो बच्चों की मम्मी है,,
मन चाहे कुछ उदास हो इससे या दिल का कोई कोना टूटा हो,,
मियां तुम अब भी रिसर्च में ही सर खपाये बैठे हो,,

पीएचडी/पोस्ट डॉक में ऐसे फंसे,,, निकलने का रास्ता नहीं,,
करोगे भी तो अब क्या,,, रिसर्च के अलावा कुछ और भी तो तुम्हें आता नहीं,,
करियर का पता नहीं,,, नौकरी है बहुत दूर
न सर पे बचे बाल न चेहरे पे नूर,,,
मियाँ तुम भी पीएचडी किये लगते हो,,

द्वारा

डॉ प्रशांत चौहान



The Marvel of Eddington



If Waterloo was not enough, Ypres gas testing (*tear as well as poison gas*) in 1914 and 1915 respectively by German allied forces was more of a quoted scientific advancement (*as per Germans eventually some experiments done by Fritz Haber*) rather than their effort to win World War 1. Fritz's promotion of this anti-mankind weapon prompted the suicide of his wife, Anne Haber, who was herself a Polish chemist, and many others condemned him for his wartime role. There was great resistance when he was awarded the Nobel Prize in Chemistry for 1918 for the synthesis of ammonia and eventually many decided to not to share the ceremony with him (*this section of story will be covered in forthcoming issues of this newsletter*).

Germans didn't win the war of course but that was the time when there was another running war between Germans and English. *It was more on science* and with Albert Einstein in an exiled home at that time, Germans were desperate to bring him back to Berlin, even though WWI was at a surge and had started to sweep across most of Europe. Max Planck did well to bring Einstein back to University of Berlin and that was the exactly the right time for Germans to prove to the world that they're scientifically/technically more advanced than English (*Austria-Hungary-Belgium didn't stand a chance anywhere*) although industrial revolution was seen all over Europe.

Albert Einstein had already made great scientific impact by 1915, with his theories on Photoelectric effect (http://astro1.panet.utoledo.edu/~ljc/PE_eng.pdf) and special theory of relativity; STR (https://www.f.waseda.jp/sidoli/Einstein_Relativity.pdf), but failure of Newton's ideas of gravity was something to which he was after. It simply contradicted with his second postulate of STR about cosmic speed limit and until then gravity as a force was accounted instantaneous. Although Germans were not too interested in his work on General Theory of

Relativity (GTR), he was convinced by Max Planck to work for his country rather than anything. Einstein of course didn't believe in any scientific boundaries just like countries (no wonder he had 5 nationalities). To his belief or disbelief, it was always impossible for him to prove his idea of space-time and GTR experimentally, but thankfully, for all astrophysics admiring people, there was one man who could prove this new idea of the universe by his experiments.

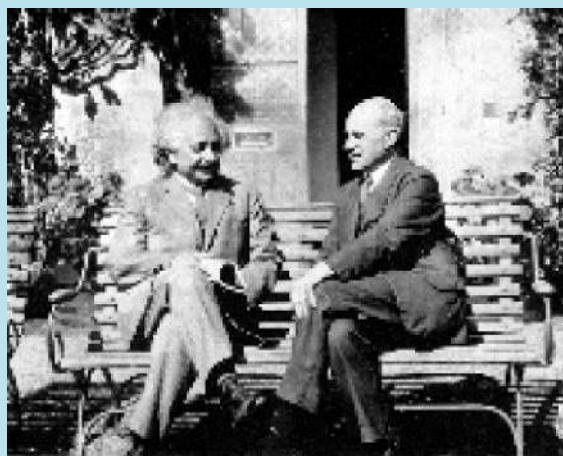
He was Sir Arthur Eddington (*who was PhD Co-supervisor of S. Chandrasekhar; R. Fowler being Chandra's main supervisor (Nobel Prize in 1983) and this section will also be covered in future newsletter for the controversies between Chandra and Eddington, especially over Black-holes and degeneracy of stars*) who was a contemporary of Einstein and was working on Mercury's peculiarity in its orbit prediction at Cambridge University aided by Royal Astronomical Society (RAS, <https://ras.ac.uk/about-the-ras>). He was regarded as the best measuring man in the whole of England during the second and third decade of 1900's. After several postal exchanges, Eddington made very clear to Einstein that there is only one way the whole idea of GTR can be proved experimentally and that if, solar eclipse of May 1919 can be imaged for positions of stars in the sky and compared with the actual position of same stars in the sky without eclipse. That way, they could prove if sunlight is bent due to the effect of gravity. There were few other conclusions from these experiments besides proving space-time existence

Einstein and Eddington in the Cambridge Observatory garden in 1930 (photo by Winifred Eddington, courtesy Institute of Astronomy, Cambridge).

(<https://arxiv.org/ftp/quant-ph/papers/0603/0603146.pdf>). RAS was obviously not too keen to prove Einstein right by spending money on this expedition, but Sir Eddington smartly convinced RAS that, this way RAS can prove Einstein wrong and make mockery of German science (*more importantly*). But, deep down Eddington also knew that Einstein was right. Eclipse recording showed gaps in positions of stars and perhaps, this was the start of proximity between two great scientists of the 1920's and 1930's. Einstein and Eddington became more accomplished in the mid 30's, which further changed the perspective of humans to look at the universe and solve certain mysteries like star luminosity, radiative transfer phenomenon, size and matter of universe which led to the foundation

of modern physics as well as Astrophysics. Eddington's work was also carried forward by scientists such as Paul Dirac, Finkelstein and others.

Sir Arthur Eddington after his 1919 solar eclipse also wrote a parody popularly read as;



Oh leave the Wise our measures to collate
One thing at least is certain, LIGHT has WEIGHT,
One thing is certain, and the rest debate
Light-rays, when near the Sun, DO NOT GO STRAIGHT.

Dr. Sandeep Chhoker



Prof. Navendu Goswami received SERB research grant of worth 19.89 Lakhs.



Dr. Anuraj Panwar received SERB research grant of worth 32.55 Lakhs in collaboration with IIT Guwahati.

Recently Added Experimental Facilities

Coherent One Way (Cow)- QKD

Coherent One Way (COW) scheme for Quantum Key Distribution (QKD) is installed in the newly created Quantum Cryptography Lab of the PMSE department in February 2022.



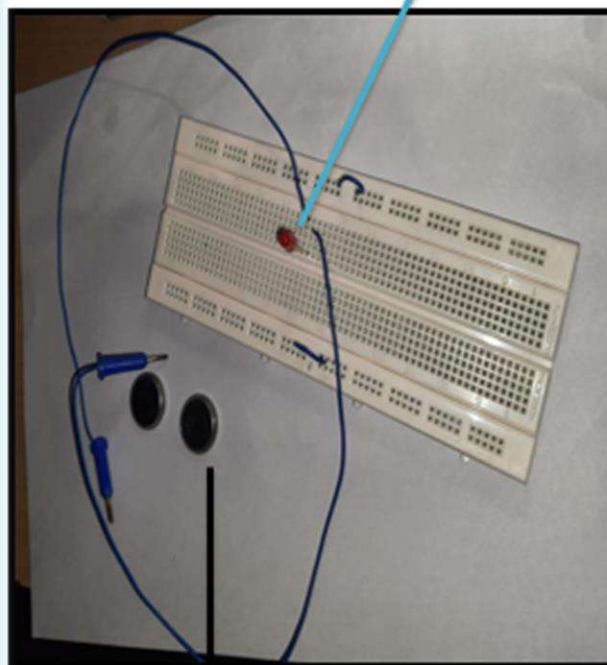
The set up can be used by two remote users Alice and Bob to generate unconditionally secure key, which can then be used for secure communication between them. In our setup, Alice and Bob are connected to each other via telecom grade optical fiber spool of 40 km in length and this set up can be used to generate keys in the of range 1-2 kbps with QBER < 5%. This set up will be used for the experimental investigation of existing as well as new hacking strategies and optimization of the parameters for commercial applications.

In-house Fabrication of Coin Cells

Coin cells shown below are fabricated in-house.

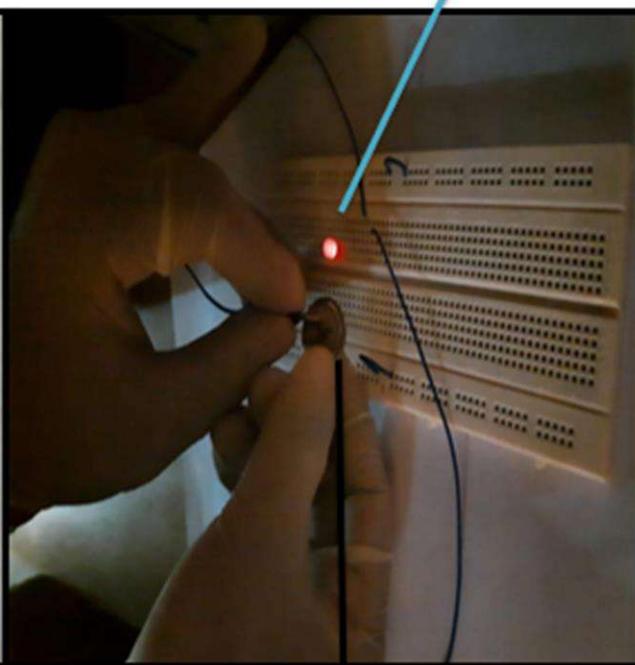
Working coin Cell with Hydride as Anode

LED not glowing

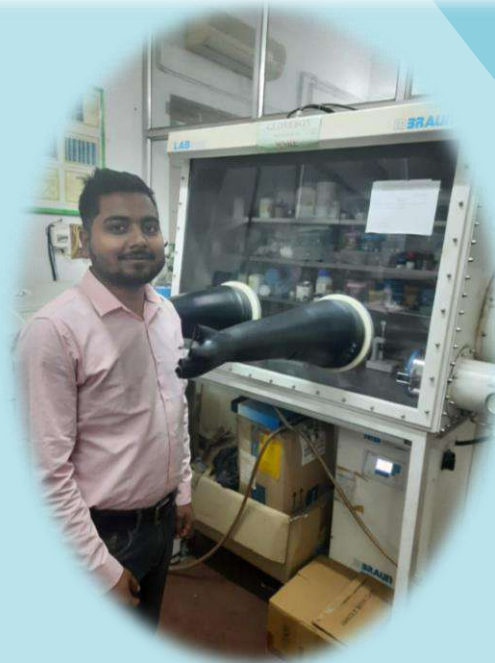


Coin Cell with hydride as anode
without external connection

LED glowing



Working Coin Cell (having external
connections) with hydride as anode



PMSE Activities Recognized Externally

Excellence in Research

Jaypee Institute of Information Technology, Noida obtained 31st rank in India and 907th rank in world for Engineering and Technology developed by Research.com, one of the prominent platforms for computer science research known for maintaining reliable data on scientific contributions. The ranking of universities is based on the h-index and bibliometric indicators compiled by December 6th, 2021. The ranking process involved a detailed examination of 166,880 researchers' profiles from Google Scholar and Microsoft Academic Graph. For the discipline of Engineering and Technology, over 10,875 profiles were examined. Scientists from more than 1,545 institutions and affiliations were analyzed. The total sum for the h-index values for top scientists in Jaypee Institute of Information Technology is 64 with a mean value for the h-index of 64.00. The total sum of publications for top scientists in Jaypee Institute of Information Technology is 131 with the mean value for publications per scientist of 131.00. Interestingly, this ranking of JIIT become possible because of the contribution of the PMSE Department only as the entire score came from the contribution of the faculty members of the Department.

Source: <https://research.com/university-rankings/engineering-and-technology/in>



THE QUANTUM REVOLUTION IN INDIA: BETTING BIG ON QUANTUM SUPREMACY

Recently, The National Association of Software and Service Companies (NASSCOM) conducted a survey through AVASANT, a Los Angeles based leading international firm dedicated to management consulting and delivery services. The survey has led to a report published on February 2022 with the title. “The Quantum Revolution in India: Betting Big on Quantum Supremacy”. This report showcases the current state of the market with respect to quantum technology and resource development, the collaboration ecosystem, and investment scenarios, along with specific opportunities for India to take the lead. It listed main players on the field and the quantum information related activities of IIIT have been mentioned in many places in the report (cf. snaps from the report). This all become possible because PMSE Department is playing an active role in the India’s quantum technology revolution.

Source: <https://community.nasscom.in/communities/it-services/quantum-revolution-india-betting-big-quantum-supremacy>

India’s quantum computing ecosystem is expanding and is expected to continue to do so at an accelerated pace over the next 10 years



Note: Indicative list of examples. Numbers in parenthesis indicate the number of entities currently active in the Indian quantum ecosystem.

Sources: Avasant Research
NASSCOM®

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AVASANT

Student Corner



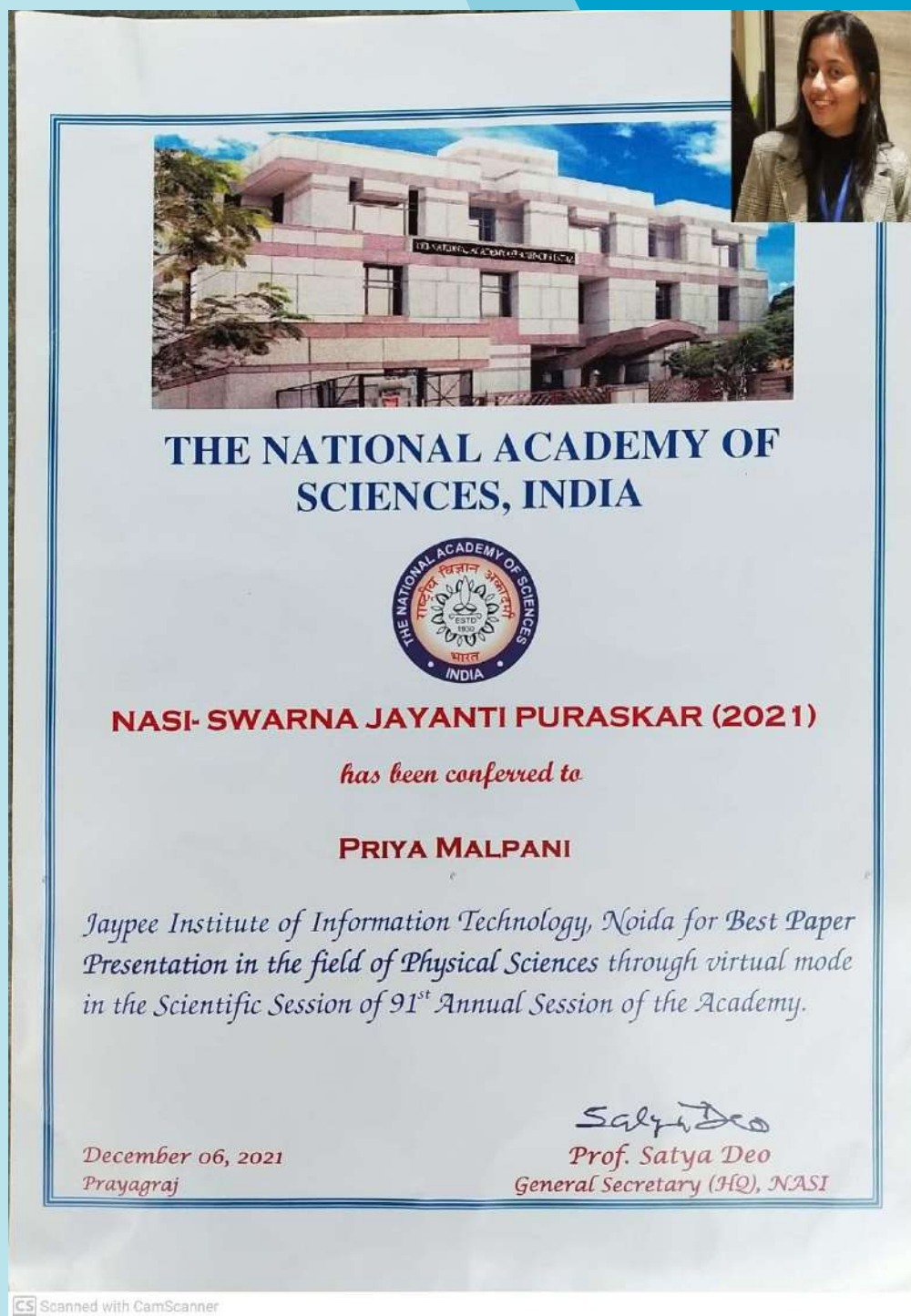
Mr. Rohit Kumar Srivastav, PhD student PMSE received Best Poster Award for his work entitled “Excitation of terahertz surface plasmon radiation over a graphene-free space interface” in International Conference on “Frontiers in Terahertz Technology and Applications (FTTA-2021)” held during 09-11 December 2021 at CSIR-National Physical Laboratory, New Delhi, India.



**Drawing
by
Kathakali Mandal, PhD student**

NASI-Swarna Jayanti Puraskar (2021)

Three scholars of the PMSE department have been awarded the prestigious "NASI-Swarna Jayanti Puraskar (2021)" in the field of Physical Sciences. Awards were given by The National Academy of Sciences, India, which is the oldest science academy of India.





THE NATIONAL ACADEMY OF SCIENCES, INDIA



NASI- SWARNA JAYANTI PURASKAR (2021)

has been conferred to

ARINDAM DUTTA

Junior Research Fellow, Department of Physics, Jaypee Institute of Information Technology, Noida for Best Paper Presentation in the field of Physical Sciences through virtual mode in the Scientific Session of 91st Annual Session of the Academy.

*December 06, 2021
Prayagraj*

Satya Deo
Prof. Satya Deo
General Secretary (HQ), NASI



THE NATIONAL ACADEMY OF SCIENCES, INDIA



NASI- SWARNA JAYANTI PURASKAR (2021)

has been conferred to

NIKHITHA NUNAVATH

Junior Research Fellow, Department of Physics, Jaypee Institute of Information Technology, Noida for Best Paper Presentation in the field of Physical Sciences through virtual mode in the Scientific Session of 91st Annual Session of the Academy.

*December 06, 2021
Prayagraj*

Satya Deo
Prof. Satya Deo
General Secretary (HQ), NASI



कमजोरियां ना गिन तू बन्दे अपनी,
देख कितनी खूबियां छिपी हैं तुझमें
तू राहों में ठोकरों की फ़िक्र ना कर,
हौंसलों से पा ले तू मंज़िल अपनी ।

सपने तेरे, ज़िन्दा हैं अब तक तुझमें,
ताबीर कर ले हर ख़्वाब की ख्वाइश तू अपनी
रोकती है जो तुझे तक्रदीर का मारा बताकर,
कर दे फ़ना उस खौफ़ को अब दिल से अपनी ।

हार का मलाल अब ना रख जारी,
जीत के गुलाल से रंग दे तू ज़िन्दगी अपनी,
खामोशियों के शोर से बाहर निकल,
लेकर मशाल हाथ में कर खोज अपनी ।

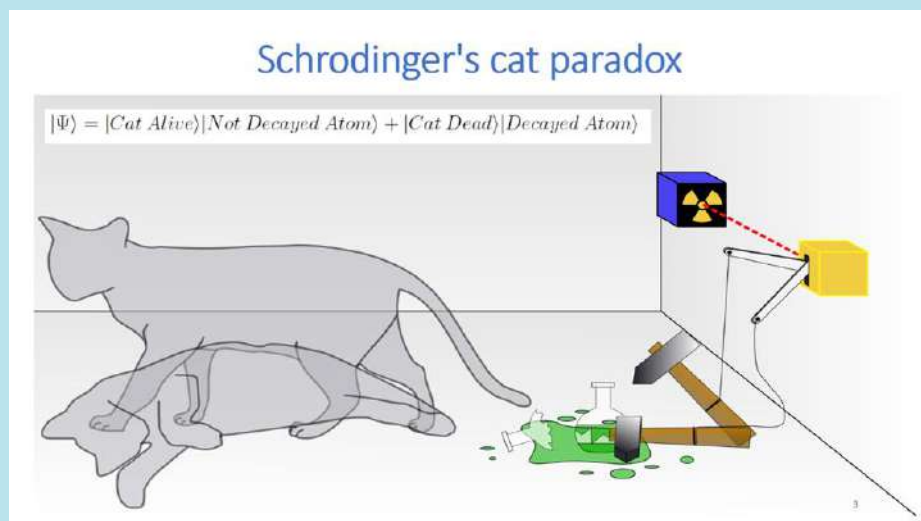
विकर्ष जैन

PMSE Journal Club

The department has started a new activity in the form of “PMSE Journal Club” where PhD students and Post-docs can share their excitements about some newly read papers or their own work(s). The motivation is to enhance the interaction among current research groups of the department and to create an environment for free exchange of ideas.



The inaugural lecture of the club was given by Dr. Sandeep Mishra at 3 PM on 20th December 2021. Dr. Sandeep Mishra is presently working as a Post-Doctoral Fellow in an Indo-US project of the PMSE Department. His research interest includes foundational issues in quantum mechanics, quantum information and quantum cryptography. His talk was focused on an interesting paradox of quantum mechanics namely “Wigner’s friend paradox” and it was delivered in a popular manner. The talk was very well received by the audience with around 20 research scholars and many faculty members attending it.



Alumni Corner

The PMSE Department has established a lecture series where only Alumni of the Department will be speaker. The aim is to keep a close connection with the alumni and to establish research links between present and past students. The series is extremely successful until now.

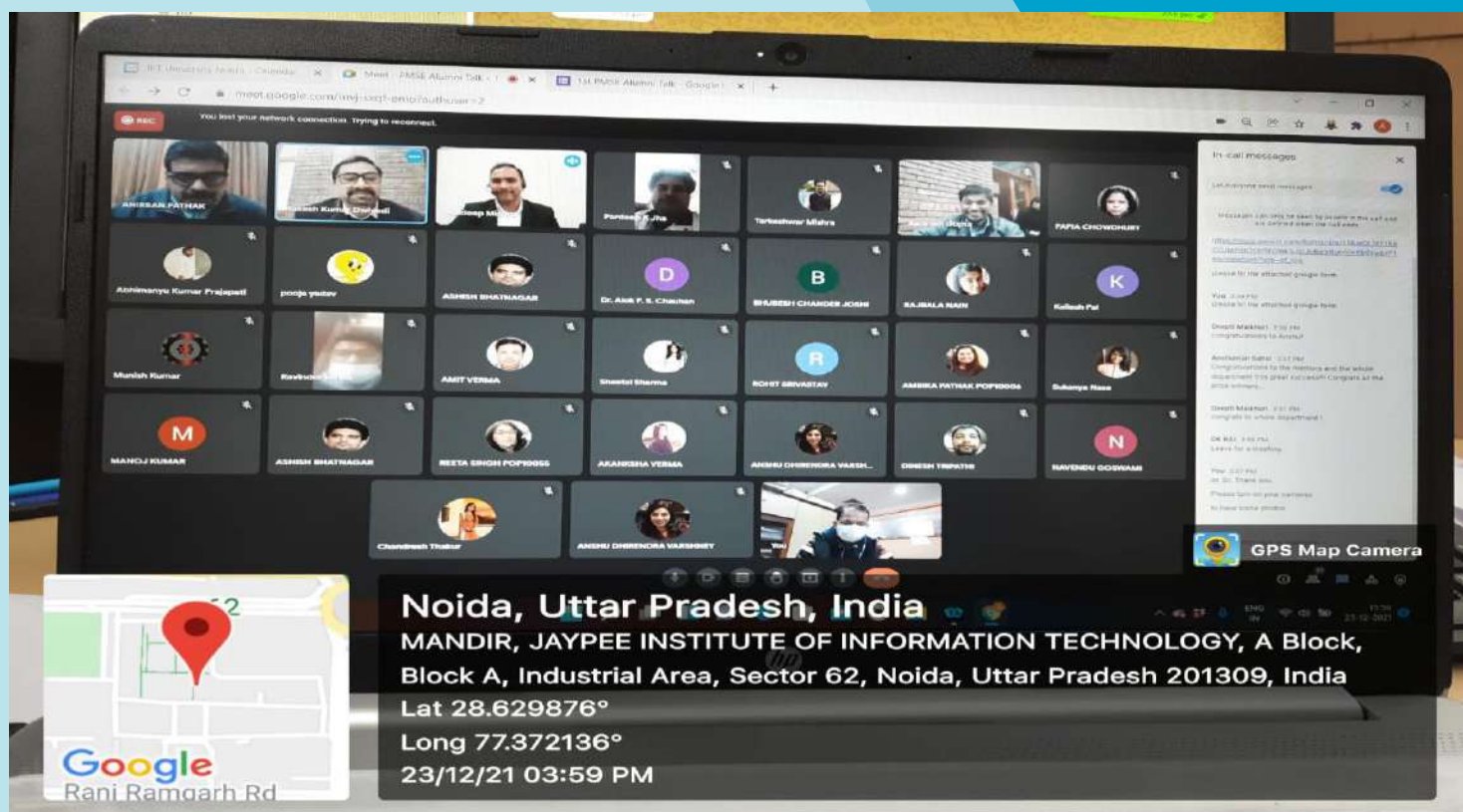
First IIIT PMSE Alumni Talk



First talk of this series was delivered by Dr. Kuldeep Mishra on 25th July 2021 from in online mode. Presently, Dr. Kuldeep Mishra is working as an Assistant Professor in Department of Physics and Materials Science, Jaypee University, Anoopshahr, Bulandshahr, UP India. Prior to that he did PhD from the PMSE Department under supervision of Prof. D K Rai.

His talk was aligned primarily on Micro/nano-size ceramic fillers dispersed polymer electrolyte systems for electrochemical applications. In last decade, polymer-based electrolyte systems have gained tremendous attention for battery applications. Various polymer electrolytes have been proposed for different battery chemistries based on lithium, sodium and magnesium. Due to high flexibility and shape versatility, these electrolytes appear promising in flexible and wearable electronics. Nevertheless, low ion conductivity, poor cation transport number, narrow electrochemical stability window and poor mechanical and thermal properties of polymer electrolyte are still the main challenges. In order to deal with these issues, the dispersion of micro/nano-size ceramic fillers in the polymer electrolyte is one of the most promising approach. Role of ceramic fillers in the enhancement of electrochemical properties of polymer electrolytes was presented.

He also discussed the strategies to prepare high performance composite polymer electrolytes using different types of ceramic fillers including active and passive ones. The performance of some recently reported proto-type batteries and supercapacitors utilizing these hybrid electrolyte systems by his research group was also discussed. Talk was delivered with gracious presence of honorable Dean Academic and Research Prof. D K Rai, IIIT Noida, all Professors and faculty members from PMSE. It was attended by more than 45 participants including a good number of PMSE alumni.



Second IIIT PMSE Alumni Talk



Second IIIT PMSE alumni talk was delivered by Dr. Prateek Varshney on 17th Jan 2022 in online mode. Presently, Dr. Prateek Varshney is working as post-doctoral fellow in Institute for Plasma Research, Gandhinagar, Gujrat. His talk was aligned primarily on his recent findings in terahertz radiation emission by laser-plasma interaction. THz radiation generation schemes, where plasma is utilized as a nonlinear broken medium with no limit on damage threshold. Out of various schemes based on laser plasma interaction, THz radiation generation by beating of two lasers of different frequencies and wave numbers in plasmas has shown tremendous potential in terms of amplitude, tunability, efficiency and directionality.

Out of various schemes based on laser plasma interaction, THz radiation generation by beating of two lasers of different frequencies and wave numbers in plasmas has shown tremendous potential in terms of amplitude, tunability, efficiency and directionality. Laser with plane, Gaussian, super-Gaussian, spatial triangular and cosh-Gaussian spatial profiles (envelopes) were utilized to generate efficient THz radiation. Plasma density ripples with different types of plasma (semiconductor, cluster plasma and nanoparticle plasma) were proposed to introduce extra momentum (in propagation direction) to achieve exact phase matching condition for maximum energy transfer between nonlinear ponderomotive force (at difference frequency) and nonlinear current which is responsible for the excitation of THz radiation. A transverse static magnetic field was introduced to improve the tunability and directionality of excited THz radiation. He had developed analytical models for efficient THz generation and tunability using the mechanism listed above where he demonstrated enhancement in THz amplitude and efficiency.



Dr. Prateek Varshney also received Emerging Scientist Award for his presentation entitled “Terahertz field generation by laser beating in semiconductor plasma” in Virtual National Conference on “Plasma Science and Applications (PSA-2021)” organized by Department of Physics Sardar Vallabhbhai National Institute of Technology Surat from 20 -21 December 2021.

Third IIIT PMSE Alumni Talk



On 11th Feb 2022, Dr. Abhishek Shukla (formerly Post-Doc at IIIT) delivered a talk cum interaction session on possible collaboration with European Industries and also talked about his own research related to quantum technologies. Currently, he is working as a postdoctoral researcher at Imec, University of Hasselt, Belgium.

Dr. Abhishek Shukla has experience and skilled in MATLAB, Mathematical Modeling, Spectroscopy, and Science. He has experimental expertise in handling NMR and NV center-based quantum information and computation. He did his PhD from IISER Pune. He has done multiple postdocs (including IIIT, University of Science and Technology of China, The Hebrew University of Jerusalem, imec). Dr. Shukla talked about his own research related to quantum technologies as well as various R&D activities.



Forth IIIT PMSE Alumni Talk

Forth IIIT PMSE alumni talk was delivered Dr. Deepti Maikhuri on 23rd Feb 2022 in online mode. Presently, Dr. Deepti Maikhuri is working as an Assistant Professor in Department of Physics, Manav Rachna University, Faridabad. She delivered a nice talk on her recent findings. Here talk was entitled, “Graphene sheet with periodic vacancy: A first principles study”.

A comprehensive first-principles study of the electronic structure of graphene sheet with periodic vacancy was presented. She discussed the structural, electronic, and magnetic properties of the graphene sheet with periodic vacancy that possess 48 C & 28 H atoms. Computational analysis based on density functional theory was shown to predict that the periodic vacancy can modulate the properties of graphene sheet. Results showed by her established that periodic vacancies lead to the manipulation of band gap & could be utilized to tailor the electronic properties of the sheet. She had also shown that, the graphene sheet with periodic vacancy is non-magnetic in nature. Presented results were exciting and led to many questions and the talk was ended with a exciting discussion involving many of the about 40 participants who were present in the talk.

MANAV RACHNA
|| vidyanatariksha ||

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