DEPARTMENT OF PHYSICS

Physics Pulse

IIT (ISM) DHANBAD

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Spintronics: An Emerging Technology

By SUNITA YADAV, M.SC. FINAL YEAR

What is the spin of an electron?

Spin is an inherent property of an electron that describes the angular momentum and not an actual spinning. This intrinsic property of an electron gives rise to the spin quantum number (a fourth quantum number). (image 1)

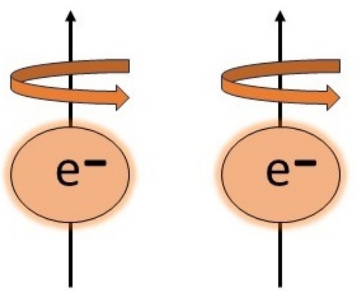

Image 1

How a spin can be used in electronics?
As electronic devices are becoming increasingly smaller in size, intense heat is becoming a major problem. Electron spin can be used to store and process the data. In electronic gadgets, the information is being transferred by the movement of an electron. Whereas in spintronics, we are manipulating the system in such a way that the information is being transferred by the spin of an electron and not by the actual movement of an electron. This leads no heat loss. Also spintronic devices offer the possibility of enhanced functionality with no power failure issues, faster transfer, lower power consumption, more compact, and increased storage capacity compared to conventional electronic gadgets. (image 2)

GIAN Courses

Prof. Bobby Antony has been awarded a grant of Rs. 6,64,000 for conducting a course on "**Astronomical Spectroscopy**" under the GIAN (Global Initiative of Academic Networks) program. The course will feature **Prof. Jonathan Tennyson**, FRS, Massey Professor of Physics, University College London, as the foreign faculty expert.

A one-week GIAN course on "**Statistical Mechanics of Active Matter: Principles, Models, and Applications**" will be held from October 6–11, 2025.
Course Coordinator: **Prof. Pankaj Mishra**, and Course Instructor: **Prof. Zhiwei Peng**, University of Alberta

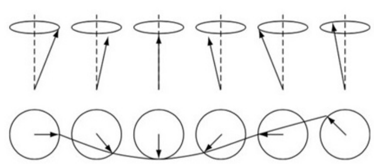

Image 2

A Conversation with Prof. Binata Panda

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Spintronics application

1. **MRAM: Magnetoresistive Random Access Memory** MRAM uses spin polarized electron to store the data and it is more durable and faster than conventional RAM. Also it retains data even when power is off.
2. **Spin valve and GMR effects:** Spin valve and giant magnetoresistance effect is used in hard drives to increase data storage density. And the discovery of GMR leads noble prize in Physics 2007 (image3)
3. **Quantum computing (Qubits)**
4. **Spin LEDs and spin laser, etc.**

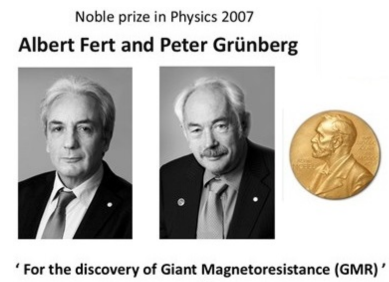


Image 3

Spintronics Market Analysis and Forecast 2025-2032

The major factor driving growth of the Spintronics market is growing adoption of IoT-based devices. For instance, according to the statistics published by Global System Mobile Association (GSMA), the number of industrial IoT connections is expected to increase from 3 billion to 14 billion from 2017 to 2025. This is attributed to rising adoption of solution for smart buildings (for heating, air conditioning, building security, lighting, office equipment, and automation), manufacturing (inventory tracking, monitoring and diagnostics, and warehouse management) and utilities (energy, water & gas smart metering, and smart grid solutions). Increasing demand for technologies such as Advanced Driver Assistance System (ADAS), self-driving technology, fleet management, smart homes, and connected vehicles among others is propelling demand for sensors which is integral part of these

*Send your feedback to: physicspulse@iitism.ac.in technology. Thus, increasing adoption of sensors in these technology is further driving the Spintronics market growth, as it one of the major application of Spintronics.

On the basis of geography, the global Spintronics market is segmented into North America, Europe, Asia Pacific, Latin America, Middle East, and Africa. Moreover, Magnetic RAM (MRAM) is expected to hold major market share among memory storage devices in near future. Furthermore, vehicle sales in China reached over 29 million in 2017, growth rate of 3.2% as compared to 2016. Furthermore, China register the highest sales of electric vehicles and had 2.2 % share of electric vehicle in 2017, followed by North America, which witnessed 1.2% share of electric vehicle in the same year. Thus, significant growth in sales of vehicles in China is driving growth of sensors and storage device as it is the integral part of vehicles. Hence, with the growing application of spintronics in vehicles is fueling the Spintronics market growth. (reference: www.coherentmarketinsights.com)

Science Fest

The Department of Physics successfully organized Science Fest 2025, a grand celebration of scientific spirit, innovation, and intellectual exchange, to commemorate the Raman Effect, from 5th February to 28th March 2025. The event featured three key activities — Debate Competition, Quiz Competition, and Research Scholars' Conclave — along with expert talks. The fest brought together students, researchers, and faculty members for an enriching and inspiring experience. The events were organized by **Prof. Pankaj Mishra** as the Convenor and **Prof. Ritwik Mondal and Prof. Rajendra Giri** as the Co-convenors.

Debate Competition

As part of Science Fest 2025, an institute-wide debate competition was organized by the B.Tech. Engg. Physics students on the topic "***Technology Contributes to Social Isolation***". There were about 20 participants from various departments of the institute; half supported the theme, while the other half spoke against it. The competition was highly engaging, with participants posing counter questions to the speakers.

Quiz Competition

The institute-wide quiz competition, The Spectral Showdown, tested participants' knowledge across various domains of science, with a special emphasis on physics. The competition consisted of two rounds. In the screening round, more than 20 groups participated, with each group comprising up to three members. The top 8 groups advanced to the final round. The event witnessed a high level of enthusiasm and excitement among the participants.

Research Scholars' Conclave

The Research Scholars' Conclave (RSC) was a one-day program held on 1st March 2025, where UG, PG, and research scholars from both within and outside the institute presented their research work.

The conclave began with a Director's address by **Prof. Sukumar Mishra** (Director, IIT Dhanbad) and address by **Prof. Bobby K Antony** (Head, Department of Physics).

There were 15 oral presentations and 10 poster presentations. The presentations were evaluated by the respected faculty members.

The special guest, Prof. Partha Ghose (a Ph.D. student of Prof. Satyendra Nath Bose), delivered a thought-provoking lecture on S.N. Bose's contributions, particularly the quantum mechanical derivation of black body radiation, starting from classical principles.

The RSC was a tremendous success, fostering academic networking, delivering insightful lectures, and inspiring students toward innovative research. The Department sincerely thanks the organizing team, led by **Mr. Prashant Singh Lohiya**, a Research Scholar in the department.

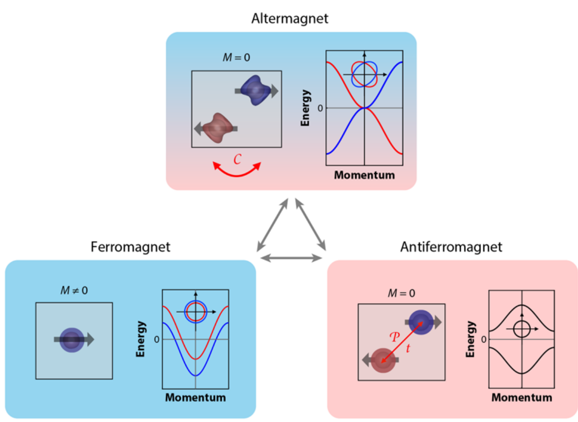
Valedictory Function

The valedictory function was organized on 28 March 2025, where the prizes and certificates were distributed to the winners. Mementos were given to the session judges at RSC. A small token of appreciation was given to all the organizers. This event witnessed cultural performances such as singing, dancing and playing instruments by the students of the Physics Department. The valedictory function ended with a vote of thanks by the convenor of the Science-Fest: **Prof. Pankaj Mishra** with the promise that next year the ScienceFest will grow bigger and better only, in addition to including participants from other institutes.

Altermagnets: Breaking the Boundaries of Magnetism

By RITWIK MONDAL

Magnetism is everywhere and we use it on a regular basis. It's in your fridge door, guiding your compass needle, mobile phone, computer, pen drive, hard drive, SSD, and even in your wallet in the form of a debit/credit card. Typically, there are two types of magnetism that occur in nature: (1) ferromagnets, like the magnets on your fridge, which have a uniform magnetic field due to the parallel alignment of their atomic spins, and (2) antiferromagnets, where neighboring atomic spins cancel each other out, creating no net magnetization despite being magnetic at an atomic level. While the ferromagnets produce a net "***stray field***" due to the parallel spin arrangement, the net stray field in an antiferromagnet is zero. This unqiue property puts antiferromagnets ahead in terms of technology as the density of spins are much larger in antiferromagnets compared to ferromagnets. Equivalently, the magnetic domain size becomes smaller in antiferromagnets which sets a drawback on the antiferromagnets. Recently, scientists have discovered a new and "***third***" kind of magnet that is breaking the rules we thought magnets always followed. It's called an altermagnet, and it could potentially lead to revolutionary advancements in technology.



Altermagnets have been discovered during 2019 - 2024 and hence they are entirely new. Unlike other physics discovery, the altermagnets have been predicted theoretically first and then they were found in the experiments. They belong to neither group of ferromagnets and antiferromagnets, but borrow characteristics from both. Like ferromagnets, altermagnet breaks time-reversal symmetry and like antiferromagnetism, it has, by symmetry, no net magnetization. Unlike ferromagnets, they don't produce a uniform magnetic field. But unlike antiferromagnets, they can influence the spins of electrons, which makes them potentially useful in spintronics. This cutting-edge field of altermagnetism could transform electronics by using electron spins instead of electric charges. Magnets usually follow a principle called time-reversal symmetry. In simple terms, if you "rewind" the motion of electrons in a typical magnet, you'll get the same pattern of magnetism in reverse. But altermagnets behave differently. In their case, if you flip the direction of time, the electrons' magnetic patterns change dramatically. This unusual behavior is tied to how their atomic spins are arranged. In an altermagnet, electron spins point in opposite directions, like in antiferromagnets. But here's the twist: instead of simply canceling each other out, their arrangement creates alternating regions with different spin properties. This leads to a special kind of magnetic behavior that scientists think could be a key to building faster, more efficient electronic devices.

About the abundance, the antiferromagnets are much more abundant than the ferromagnets in the nature. Typical ferromagnets include Fe, Co, Ni (3d electrons), Gd, Tb (4f electrons) and many more. Typical antiferromagnets include Cr, NiO, CoO, FeMn, hematites (α-Fe_2O_3) and so on. The first experimental signatures of altermagnet were discovered in RuO_2. The recently discovered altermagnets include many materials e.g., MnTe, CrSb, CuF_2, Co_2 and many more.

While the discovery of altermagnets is still in its early stages, scientists are excited by their potential. Researchers are working on understanding the physics behind these materials and figuring out how to harness their unique properties. If they succeed, altermagnets could change the way we think about magnetism and open the door to a new era of technological innovation.

References:

1. "*Altermagnetism Then and Now*" in Physics News and Views by Igor Mazin, Physics and Astronomy Department, George Mason University, Fairfax, Virginia (2024).

2. Libor Šmejkal, Jairo Sinova, and Tomas Jungwirth, *Beyond Conventional Ferromagnetism and Antiferromagnetism: A Phase with Nonrelativistic Spin and Crystal Rotation Symmetry*, Phys. Rev. X 12, 031042 (2022).

Physics News

Italian scientists managed to freeze light, demonstrating that it can behave as a supersolid - a rare state of matter that exhibits both a solid-like structure and frictionless flow. Until now, supersolidity had only been observed in Bose-Einstein condensates. However, a team led by Antonio Gianfate and Davide Nigro has now shown that light itself can exhibit this behavior. Using a gallium arsenide structure embedded with microscopic ridges, they fired a laser to produce hybrid light-matter particles known as polaritons. As the photon count increased, the researchers observed the formation of satellite condensates, a pattern indicative of supersolidity. This discovery marks a significant milestone in quantum physics and could revolutionize quantum computing and optical technologies.

Conversation with Prof. Binata Panda

By NEWSLETTER TEAM

Prof. Binata Panda has been one of the most esteemed faculty members of the Physics Department at IIT (ISM), Dhanbad, since 2013. A pioneer in her field, she was the first to introduce String Theory to our department.

Her academic contributions have significantly enriched our curriculum with the introduction of courses such as Astrophysics and Cosmology, High Energy Physics, and more. She is currently pursuing research in areas at the frontier of theoretical physics — Supergravity, Black Hole Thermodynamics, and Quantum Chromodynamics. Prof. Panda completed her PhD from the Institute of Physics, Bhubaneswar, and was a Marie-Curie Fellow and visiting PhD scholar at CERN, Switzerland. She later continued her postdoctoral research at the Harish-Chandra Research Institute, India, under the mentorship of the renowned physicist Prof. Ashoke Sen. Currently, she leads a vibrant research group comprising five research scholars and one postdoctoral fellow, nurturing the next generation of physicists. It is truly an honour to be taught and mentored by her. We are proud to have her as part of our department, and we hope you enjoy the conversation with her below.

Q. *So Ma'am, can you tell us how you joined IIT (ISM) and what is your experience till now?*

A: Okay, so I joined the Department of Physics, IIT (ISM) in July 2013, and it has already been more than 11 years. When I joined the department, it was not IIT; it was ISM, and there were few faculties and I was the only female faculty member working in the department. Then to now, during this short time span, the department has grown like anything, so we have changed to IIT, and the number of faculty members has, of course, increased. I joined ISM, my first job after my post-doctoral studies, and I'm continuing it. I always looked forward to stay here, enjoy doing things, and happy being a part of the department. After my joining, I started thinking, "What can I contribute to the development of the department?" Back then, there were no courses on astrophysics/astronomy/cosmology/high energy physics in our curriculum. Hence, I designed new courses so our students can have basic knowledge on these subjects and have an idea about current research along these directions. If you compare the status of our department now, the situation has completely changed. There are many new faculties actively involved in research in every direction. Now, when I visit different places to give talks/attending a conference, I find people know where IIT (ISM) is. The scenario with respect to the visibility of the department has changed, maybe the IIT brand worked.

Q. *Can you explain how you decided to be a part of String Theory and what led you to it?*

A: When I was a MSc student in the Department of Physics at Utkal University, we didn't have many choices for elective subjects. We had only two directions: either particle physics or condensed matter physics. I chose to study particle physics. It was a year-long elaborative course on particle physics. The teacher who taught us particle physics fascinated me with her knowledge. I decided then to work in theoretical high energy physics – not exactly in string theory, but I wanted to be in particle physics and related areas. This direction searches for answers to fundamental questions like: What are we made of? How does everything around us work? What is the origin and the fate of the universe? These questions have bothered mankind, and we are still searching for the answers. I joined the Institute of Physics (IOP) as a PhD scholar in 2004, and got a chance to learn about String theory. Again, at IOP, there were very few faculties working in theoretical high energy physics (phenomenology, cosmology, string theory) that time. The string theory group was more vibrant. I was also fascinated by the works of Professor Ashoke Sen, one of the leading theoretical physicists in the World. So I joined the String Group in IOP. My MSc and PhD teachers greatly influenced me to take up this research.

Q. *As you have worked with Professor Ashoke Sen, how much did he influence your work, and what was the feeling of working with him, considering he is a grand person in India?*

A: Yeah, of course. I worked with Professor Ashoke Sen as a postdoctoral student at HRI. He is one of the finest and kindest human beings I have come across. I am fortunate to get a chance to work with him. When I was about to complete my PhD, my PhD supervisor, Prof. Alok Kumar, passed away in a sudden cardiac arrest. It was a difficult period for me– I hadn't even written my thesis. I was applying for postdoctoral positions at various places. I got an offer from HRI and joined the string group at HRI. I started working with Professor Ashoke

Sen. It was like I started my second PhD under his guidance. I have learnt a lot not only about physics but also about life in general from him. I worked with him for about one and a half years before joining here as a faculty.

Q. *It must have been a very difficult time for you, with your guide passing away, yet you managed to do such great things.*

A: Actually, there were many people who supported me at that tough time. For instance, after my guide passed away, Prof. Sudipta Mukherji, supervised my PhD work at the Institute of Physics. During my PhD period, although I was officially a student at IOP, I mostly worked at the theory division, CERN, Switzerland. In 2007, I received the "Marie - Curie Early Career fellowship" and got a chance to work with Prof. Ignatios Antoniadis at the CERN theory division. In 2009, I was again awarded a Visiting PhD student fellowship (ERC MassTeV grant) and continued my work at CERN. Prof. Alok Kumar guided me during these periods. When Prof. Alok Kumar passed away, Prof. Antoniadis supported me like his own PhD student. He helped me complete my thesis and even came to India to be present during my PhD defense viva-voce. Many people; faculty members at IOP, faculties working in string theory at other institutes in India, my lab-mates, and, of course, my family members supported me and helped me to survive that difficult phase.

Q. *Since you have been here for many years, can you tell us how many PhD scholars graduated under your supervision since 2013?*

A: I joined the institute in 2013. But I didn't take any PhD students immediately because in 2014 I went on maternity leave and started a family. Two students joined me in 2015. These two students, Dr. Sudip Karan and Dr. Gaurav Banerjee, graduated in 2021 (their graduation was delayed due to Corona). After that, I had two or three more students, but they discontinued due to various reasons. Currently, I have five PhD students working in my group – a total of seven. Mr. Anwar joined me in 2019 and will be graduating soon. In addition, currently there is one research associate (RA) working in my group with the financial assistance received from a CSIR project.

Q. *You mentioned you have five scholars – are they all working on string theory, or are some working on other topics in your group?*

A: They work in different areas, but all related to string theory. For instance, Anwar mostly worked on QCD matter, studying some properties of hot QCD matter from a string theory perspective. One student is working on string cosmology, and two others are working on Black hole Physics. So, they are working on different fronts within string theory.

Q. *Since the string theory community is small and close-knit, do you have collaborations outside this institute?*

A: Over the years, the size of the string theory community in India has increased significantly. There are now hundreds of faculties, 40 to 50 postdoctoral scholars, and many students working in this area at various IITs, IISERs, research institutes like TIFR, ICTS, IISc, HRI, and different Universities. I work in close collaboration with members at various institutions. For example, one of my collaborators, Prof. Sayantani Bhattacharyya (earlier working at NISER) is now at the University of Edinburgh. Currently, I am working with Prof. Nilay Kundu (IIT Kanpur) and Prof. Sadhana Dash (IIT Bombay). Furthermore, we are working in collaboration with Prof. Imtak Jeon, who works at Huzhou University, China. So, I have both national and international collaborations.

Q. *Can you shed some light on what strings are, in layman's terms? Are they the fundamental building blocks, or are they the fundamental degrees of freedom?*

A: String Theory is one of the theories explaining physics beyond the standard model. The standard model, a successful quantum field theory, tells us that everything is built up of tiny particles which we can observe. It is a successful and experimentally tested theory but is incomplete. It has many drawbacks, and people are looking for theories beyond the standard model that provide a more elementary understanding of everything. String theory is based on the idea that the elementary building blocks of everything are just tiny strings whose different vibrational modes represent the different particles. The typical size of the String is much smaller than the length scale that can be probed by any present day experiment. The string can be closed, like a loop, or open, with two end points. A string undergoing a particular mode of vibration corresponds to a particle with definite properties such as mass and charge, the particles that we observe: quarks, leptons, and gauge bosons.

Q. *What are your views on unified theory, and what current research is going on?*

A: Talking about a unified theory: we already have a unified theory that unifies three of the four fundamental forces. There are four forces—gravitational, strong, weak, and electromagnetic, governing all interactions in nature. The standard model unifies strong, electromagnetic, and weak interactions in a quantum framework. However, the gravitational interaction is described by the general theory of relativity, which is a classical theory. And we don't yet have a quantum theory of gravity. Alternatively, we are searching for a unified quantum theory that includes gravity. String theory is one such theory. The string spectrum includes a graviton (the quanta of gravitational force) along with other elementary particles of Standard Model. Superstring Theory is currently considered as one of the most promising candidates for a unified theory of nature.

Q. *Are there any other open-ended questions in your field that intrigue you apart from quantum gravity?*

A: Yes, there are many open-ended questions that I want to understand and explore. Even though we have quantized gravity within string theory, we still need to correlate its predictions with the observed world. For example, supersymmetry is a key ingredient in string theory, and for it to be correct, we should observe supersymmetric partners of known particles. Understanding the evolution of the universe, dynamics of the black holes etc.

Q. *Shifting a bit from the subject, what are your hobbies outside physics? What do you like to do in your leisure time to free your mind from stress?*

A: I used to study novels and popular physics books. One of my all time favourite is "Surely You're Joking, Mr. Feynman!".

I read lots of novels in Odia, English, and Hindi. However, these days, while managing teaching and research, along with family responsibilities (I have a school going kid), I am left with very little leisure time. Now I read with my kid, who is fascinated by space physics books, Sudha Murthy's novels. The other thing I enjoy most is travelling to new places. I always try to take time out of my busy schedule and travel.

Q. *If hypothetically you weren't a physicist, what other career would you have chosen?*

A: I really don't know. I mean, it was never pre-decided that I will be a physicist. I studied in a small school in a village in Odisha, where the typical option was to go to the nearby college after you finish school. Starting from there, to this place today, I went with the flow and tried to make best out of each situation that came along. After completing higher secondary, I did my intermediate to graduation in Ravenshaw College, one of the prestigious college in Odisha. I became the best graduate of Ravenshaw in 2002. I moved to Utkal University for my master's study. I was awarded Gold medal for being the topper in MSc, Physics at Utkal University in 2004. I struggled a lot throughout, but I managed. I owe to enormous people who helped me in this journey, specially my teachers at different stages of my life. Coming back to your original question; if I were not a physicist, I would still have been a teacher because I love teaching and interacting with students.

Q. *Since you love teaching and imparting knowledge to your students, before selecting any scholar (during interviews or after), do you look for any specific qualities in them? What special qualities do you seek so that they can work well with you?*

A: Whoever (Phd / MSc students) comes to meet me or wants to do research in string theory, I have only two requisites. First, you must really be interested in doing research—whether it's experimental or theoretical. If you're interested, you will enjoy the work; if not, it will seem like a burden, and you might end up blaming everything around you. So, only if you are truly interested you should proceed to work with me. Secondly, you must be ready to work hard. Hard work and dedication to your work is the single key to success. There is no substitute for hard work.

Q. *Do you think the current academic scenario provides enough external support for scholars to do wonders in their research, or are there still gaps?*

A: Do you want to ask this question, at the level of our institute or on a national level? See, if I talk about the string community, even at the national level, they are helpful. If my students are missing certain courses and want to go to another institute, most of the times they come forward to help. However, academic rules sometimes do not allow taking extra leaves. But one thing is, the current scenario is not as difficult as it was before. Now, most things are available online. Many good researchers give online lectures, with an option to ask questions directly. In our time, online resources were very limited, but now the situation has drastically changed. However, I still think that academic rules should be modified to encourage/ help more students to get a foreign exposure like academic visits, attending conferences.

Q. *Also, since you have been teaching for so many years at ISM and have taught many subjects from Electrodynamics to Computational Physics, do you have a personal favorite subject to teach?*

A: As I mentioned earlier, I love teaching and designed new courses for the curriculum. Over the years, I have taught various subjects like Electrodynamics, Mathematical Physics, Computational Physics, Astrophysics and Cosmology, High Energy Physics etc to students of different levels (MSc, B. Tech, PhD). All these subjects are very close to my heart. Assigned a subject, I always try to give my best in terms of teaching. I learned many new things each year while teaching different batches.

Q. *String theory is one of the most highly mathematical subjects. How do you approach it and what advice would you give to upcoming generations so that they can ease into it?*

A: All physics subjects, not just string theory, are based on mathematical tools. Even experimental analysis requires mathematics and computational methods. Of course, String Theory includes intricate mathematical computations. In many foreign universities, string theory is part of the mathematics department. However, it attempts to address a number of deep questions of fundamental physics. If you try to understand the underlying physics at each stage of mathematics, you will start enjoying it. So, focus on understanding the physics behind the mathematics, and the math will not seem as difficult.

Q. *You mentioned many collaborations with people from around the globe. What role does India play in the global landscape of theoretical research?*

A: Indian physicists have made noteworthy contributions to the current research in theoretical physics particularly in the field of String Theory. Over the years, for their remarkable contribution, Indian theoretical physicists are being honored with globally prestigious awards like Breakthrough Prize in Fundamental Physics, Physics Frontiers Prize, ICTP prize Dirac medal etc. Every year many Indian string theorists get invited to participate in STRINGS, the annual conference which brings together eminent researchers from around the world.

Q. *Also, you mentioned that we have not yet reached an experimental stage to conclusively prove string theory. Do you think that in the upcoming years there will be some experimental verification?*

A: No, I do not think we can achieve that in the upcoming years. For instance, although the Higgs boson was predicted 50 years ago, it was only recently detected experimentally. Our present experimental facilities can probe down to about 10^{-18} cm, but to observe the strings, we need to probe around 10^{-33} cm. So, even in the next 50 years, we are unlikely to have direct experimental signatures. Instead, we rely on indirect evidence where predictions from string theory match observations.

Q. *Reflecting on your journey from a small village to where you are now, is there any advice you wish someone had given you in your early days?*

A: Yes, definitely. I wish I could get advice on different career options during my school and intermediate days. It would have been certainly more helpful. I am very much indebted to all my teachers, who helped me realize my potential. However, as I mentioned I enjoyed my journey and feel blessed for what I have achieved.

Q. *As one of the most prominent female professors in our department – not just in the department, but in IIT(ISM) since 2013 – what advice would you give to young female scientists?*

A: There is a popular quote "Science has no gender" and I rigorously believe that. It is equally difficult for both genders to be a good scientist. You must be very good at physics to be a great physicist irrespective of your gender. However, female scientists face many additional challenges related to work-life balance. But if you are good at something, you must stay focused and most importantly build your support system – both physically and mentally. Stay motivated, and things will eventually work out.

Q. *Lastly, what is the one life lesson you have learned through physics or your career that we could take away?*

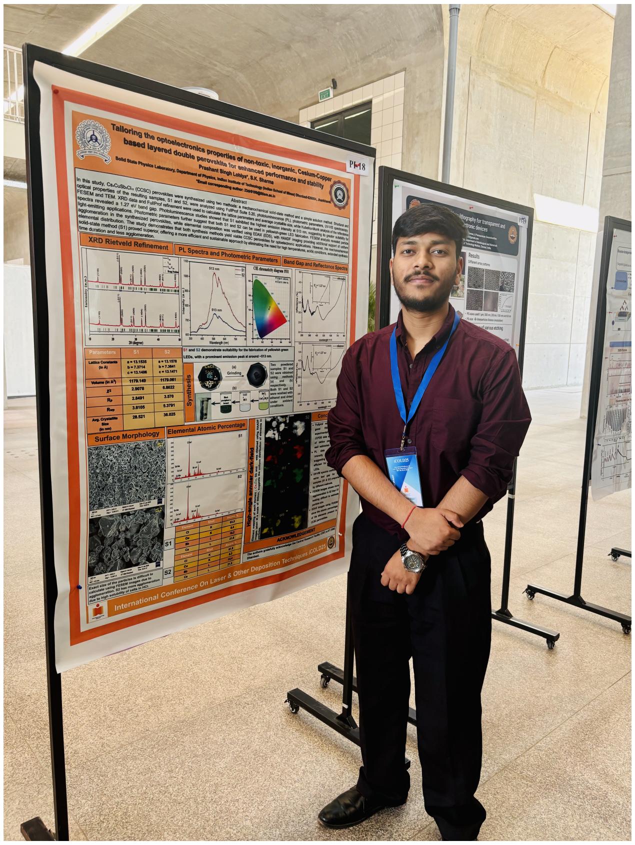
A: Ohh, I don't know what to say exactly, but I've learned that working hard, staying honest towards your work/ duties and a positive attitude towards every situation helps you achieve your goals in life. Friends are important in life, so make good friends. In research, focus on your work and stay motivated.

The interview is conducted by ***Aminul Hussain, Sanchari Biswas, Prashant Singh Lohiya***, Research Scholars, and ***Divya Bhengra***, M.Sc. 2nd Yr Student. Acknowledgement: Research Scholars of Prof. Binata Panda.

National Visits

Prof. Rajendra P Giri visited Ashoka University to deliver an invited talk at the conference titled "Recent Trends in Bio-Physics and Spintronics." The conference aimed to bring together experts, researchers, and students to explore and discuss the latest advancements in the fields of Bio-Physics and Spintronics.

Prashant Singh Lohiya attended the International Conference on Laser and other Deposition techniques (iCOLD25) held at IIT Hyderabad from 6th to 8th March 2025. The conference provided a platform for scientists, technologists, industry experts, and students to exchange insights on deposition processes such as PVD, CVD, ALD, and laser-based techniques. Key themes included material processing, device fabrication, and advancements in thin-film technologies using laser and plasma interactions.

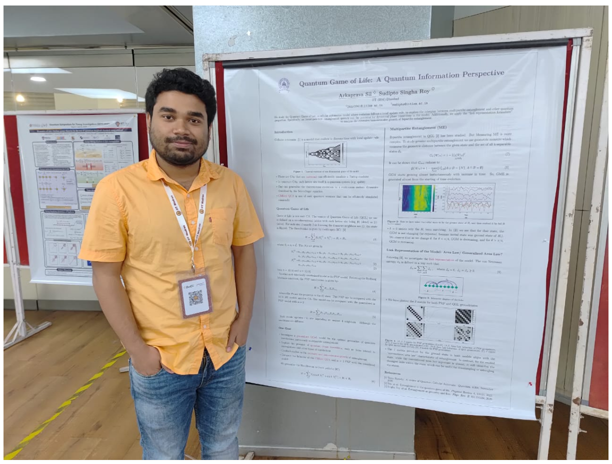


Prof. Manu Kurian visited IIT Gandhinagar to attend the workshop "IITGN Flavor Physics Week: Exploring Quark and Lepton Frontiers." The program focused on recent advances in high-energy particle physics, with in-depth discussions on quark and lepton flavour physics.

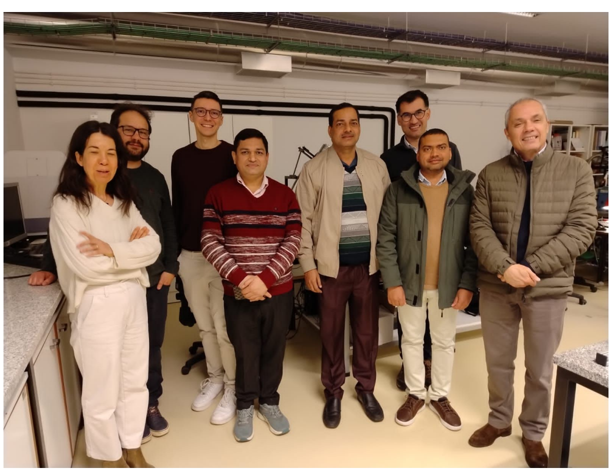
Prof. Soumya Bagchi visited TIFR, Mumbai during 9-12th March 2025 to participate in the conference "Frontiers in

Gamma Ray Spectroscopy (FIG2025)." In this event, he delivered an invited talk titled: "Isoscalar Giant Resonances in Deformed Rare-Earth Nuclei: Revealing a New Compression Mode in Quadrupole Resonance."

Prof. Sudipto Singha Roy, along with his Ph.D. student Mr. Arkaprava Sil, visited IIT Madras to participate in "The Quantum Symposium for Young Investigators (QSYI 2025)", held during 8-9 March 2025. The symposium aimed to provide a platform for early-career researchers across India to showcase their work and discuss future directions in quantum physics and quantum technologies. Prof. Singha Roy delivered an invited seminar titled: "Interplay of Classical Simulability and Entanglement in Quantum Many-Body Hamiltonians." Mr. Arkaprava Sil presented a research poster titled: "Quantum Game of Life: A Quantum Information Perspective."



International Visit



Prof. S K Sharma & Prof. Kaushal Kumar visited 3 top Universities of Portugal for productive research interactions during 1 - 9 March, 2025. They met with leading professors Prof. Rui Almeida (University of Lisbon), Prof. Luís Carlos (Universidade de Aveiro) and Prof. Joaquim C.G. Esteves da Silva (Universidade do Porto) - and explored potential collaborations in thermometry using upconversion phosphors, negative thermal expansion materials, and phosphor materials for dosimetry security. They also emphasized the achievements of IIT (ISM) Dhanbad, and the ongoing academic activities of the Department of Physics.

Physics in History

- On April 8, 1911, Dutch physicist Heike Kamerlingh Onnes discovered superconductivity at Leiden University. He observed that the electrical resistance of mercury dropped to zero when cooled to 4.2 K using liquid helium. This groundbreaking discovery laid the foundation for modern quantum physics and technologies like MRI.
- On April 12, 1961, Soviet cosmonaut Yuri Gagarin became the first human to orbit Earth aboard Vostok 1. The flight lasted approximately 108 minutes, marking a monumental moment in human spaceflight and physics related to space travel.
- On April 26, 1986, a catastrophic explosion at the Chernobyl Nuclear Power Plant in Ukraine released massive radioactive contamination. The disaster remains one of the most severe nuclear accidents in history.
- On April 26, 1933, Arno Allan Penzias was born in Munich, Germany. He co-discovered the cosmic microwave background radiation with Robert Wilson in 1964, providing significant evidence for the Big Bang theory.

Placement News

Congratulations to our B.Tech. Engineering Physics (EP) and M.Sc. Physics students for securing amazing campus placements and for landing internships.

M.Sc. Placements

- Ashish Kumar, Mrityunjay Singh Kamal, Gaurav, Vinay Kumar, and Mohd Ahsan Faraz - Associate Trainees at the Narayana Group.
- Sarup Khan, Manoj Yadav, and Ved Mani Tiwari - Physics Faculty at Infinity Learn. Ritik Gupta and Sunita Yadav - Physics Faculty at Axis IIT/NEET.
- Jatin Singh - Physics Faculty at Allen.
- Bhawna Kumari - Physics Faculty at Sri Chaitanya
- Himansu Sahoo - Physics Faculty at Physics Wallah

M.Sc. Internships

- Prasun Kumar Rajak - PRL Ahmedabad

- Anirbit Mulo, Aparna Bhunia, and Upasana Das - SNBNCBS, Kolkata
- Tanisha Shukla - Institute for Plasma Research (IPR)
- Ashish Prusty - IIT Dharwad

B.Tech. Placements

- Atish Shah – Analyst, Bank of New York
- Aryan Kshirsagar – Decision Analytics Associate, ZS Associates
- Deveshi Singh – Software Engineer, Arista Networks
- Gyanendra Parmaar – SDE, Myntra
- Jithendra Nadh Uddagiri – Data Engineer, Accordion
- Iliyan Noorani – Senior Associate, Meesho
- Jeet Rathod – Trainee Faculty, Bakliwal Tutorials

B.Tech. Internships

- Harshit Kumar – Software Development Engineer Intern, Texas Instruments
- Udit Singh Chauhan – Summer Analyst, Goldman Sachs

Research Publications

1. Sapna Mahla, and Bobby Antony, R-matrix calculations of photoionization cross-sections of sulfur-containing compounds, Monthly Notices of the Royal Astronomical Society, 538, 2693 (2025).

Book Chapter

Nitesh Kumar Pathak, Priyadarshi Sahoo, and Umakanta Tripathy,

authored the book chapter

Z-Scan as a Novel Tool for Disease Diagnosis,

which appears in the Springer book

Biochemical and Biophysical Methods in Molecular and Cellular Biology,

edited by Umakanta Tripathy

Physics Openings

1. **Researcher in experimental cloud physics**: PhD Researcher in Experimental Cloud Physics: Investigation of Aerosol-Cloud Interactions in Warm Clouds through Seeding Experiments, ETH Zurich, Switzerland.
2. **PhD position**: Modeling fracture in soft materials, ETH Zürich, Switzerland.
3. **Quantum Device Researcher**: QpiAI is looking for a skilled researcher to model quantum processors, focusing on superconducting qubit systems.

Awards and Honours

Smita Manjari Panda, a research scholar of the department, received the **Best Poster Award** at the 47th Indian Biophysical Society Meeting (IBS 2025) held at IIT Madras during 6–9 March, 2025. She presented a poster titled: "Unveiling a Novel Inhibitor of EGFR Tyrosine Kinase: An In-Silico Study."

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