DEPARTMENT OF PHYSICS · IIT (ISM) D... VOL. III NO. 4 — APRIL 2026

# PHYSICS PULSE

ISSUE 4

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## THEORY OR EXPERIMENT?

BY SOURADEEP

### PHYSICS-TECHNE SYMPOSIUM 2026 SU

The Physics-Techne Symposium 2026 has been successfully inaugurated at the Department of Physics, IIT (ISM) D

### MUON MYSTERY RESOLVED:...

### THEORY OR EXPERIMENT?

In the field of physics, is it theoretical or experimental science that leads the subject?

IN THIS ISSUE



FROM THE EDITORS

*Welcome to this edition of Physics Pulse. Inside you will find highlights from our recent events, research achievements, and the latest news from the department. We hope you enjoy reading.*

# EVENTS ORGANISED

## Physics-Techne Symposium 2026 Successfully Inaugurated

March 14–15, 2026

The **Physics-Techne Symposium 2026** has been successfully inaugurated at the Department of Physics, IIT (ISM) Dhanbad, marking the beginning of an exciting two-day celebration of science, innovation, and technology. The symposium brings together students and enthusiasts to explore how theoretical physics drives modern technological advancements through three major tracks — **Quantum Computing, Electronics, and Machine Learning**. With a prize pool worth **₹21,000**, the event promises engaging competitions, innovative ideas, and interdisciplinary learning. The symposium is being held on March 14–15 at the Central Library, 4th Floor, IIT (ISM) Dhanbad.


## Omnipresent, Omnipotent and Omniscient: Based on Fourier Transform

March 16, 2026

The Department of Physics successfully organized a Popular Talk and Panel Discussion on 16 March 2026 at Raman Hall, bringing together students, research scholars, and faculty members for an engaging academic interaction. **Prof. Dr. O.S.K.S. Sastri** from the Department of Physics & Astronomical Science, Central University of Himachal Pradesh delivered a thought-provoking popular talk titled *"God is Omnipresent, Omnipotent and Omniscient: Based on Fourier Transform."* The session explored fascinating connections between physics, mathematics, and philosophical ideas, generating lively discussions among the audience. This was followed by an interactive panel discussion on *"Voices of Research Scholars: Challenges, Choices, Change,"* where research scholars shared their experiences, perspectives, and insights on academic life and research culture. The event provided a vibrant platform for intellectual exchange and meaningful dialogue within the department.

## Research Scholars' Conclave

March 17, 2026

The Department of Physics, IIT (ISM) Dhanbad successfully organized the Research Scholars' Conclave 2026 on 17 March 2026 at Raman Hall as part of the month-long National Science Day celebrations. The one-day event brought together research scholars, young scientists, faculty members, and students for a vibrant exchange of scientific ideas and interdisciplinary discussions across diverse areas of physics and emerging technologies. The conclave featured engaging scientific interactions, invited discussions, and research presentations, providing participants with an excellent platform to share their work, explore collaborative opportunities, and discuss contemporary challenges in research. A special panel discussion titled *"Voices of Research Scholars: Challenges, Choices, Change"* was also organized, where scholars shared valuable insights into academic journeys, research experiences, and future aspirations. The event fostered an atmosphere of learning, collaboration, and meaningful scientific dialogue within the research community.

# PHYSICS NEWS

NEWS

## Muon Mystery Resolved: Standard Model Stands Strong

A long-standing puzzle in particle physics may have just been resolved. The research, carried out by an international team including scientists from Pennsylvania State University, provides the most precise calculation yet of a key property of the muon, a fundamental subatomic particle. For years, measurements of the muon's magnetic moment appeared to disagree with predictions from the Standard Model. This mismatch had led many physicists to suspect the existence of *new physics*, possibly even a fifth fundamental force.

However, the new study, published in the journal **Nature**, uses an advanced hybrid approach that combines high-precision simulations with experimental data. The researchers found that the theoretical prediction now closely matches experimental results. The findings suggest that the earlier discrepancy was not evidence of new physics, but rather due to limitations in earlier calculations. As a result, one of the strongest hints of physics beyond the Standard Model has weakened.

While the possibility of new physics is not completely ruled out, the study reinforces confidence in the Standard Model and highlights the power of improved computational methods. Researchers say future experiments will continue to test these results, but for now, the particle once thought to challenge physics appears to follow the rules after all.

NEWS

## Superradiant Lasers — A 1990s Idea, Reborn for Atomic Clocks

In a major leap for precision timekeeping, physicists have successfully revived and refined a laser concept which was first proposed in the 1990s. The breakthrough centers on **superradiant** lasers, which could make the next generation of atomic clocks more accurate than any in history. Unlike conventional lasers, which rely on bouncing photons between mirrors, these superradiant devices synchronize atoms to emit light collectively. While the idea is decades old, researchers had long struggled with overheating and stability since the 90s.

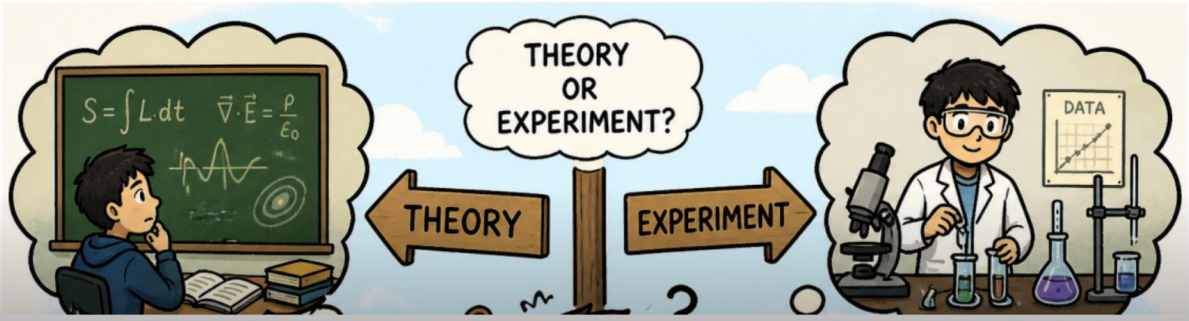
However, by adding a third energy level to the traditional atomic model, the team managed to maintain synchronization while drastically reducing heat. The result is a beam of light with unprecedented stability. This laser could theoretically be the narrowest laser ever — its coherence length (the length over which light remains in constant phase) could extend roughly 2.7 billion kilometers, or about 18 Astronomical Units (AU).

Beyond just building a better clock, it also has further uses. This ultra-stable light could enhance gravitational-wave detectors, allowing scientists to sense the tiniest ripples in spacetime with far less interference. It also paves the way for *active nuclear clocks*, which could measure time using the nucleus of an atom rather than its electrons, redefining the limits of measurement.

PHYSICS EXPLAINED

# THEORY OR EXPERIMENT?

*Souradeep Bhattacharya*




In the field of physics, is it theoretical or experimental science that leads the subject? Which of them requires more intelligence to pursue? And the question that triggers most coffee table feuds in university canteens: Which is superior? The answer to these age-old questions remains a matter of ongoing debate, and there are indeed scientists in one sector who completely dismiss the other. As I work in an experimental field, one might think the rest of this article will be completely biased toward experimentalists, but in all honesty, I assure you I will try to be as brutally unbiased as possible. The root of science was to understand the mechanism behind all phenomena that occur in nature, be it as common as the rising and the setting sun, or as fantastical as the northern (or southern) lights or aurora borealis (or australis). It is undeniable that one needs a starting point for the advancement of science, and that is almost always provided by a phenomenon, which is either natural or artificial, i.e., an experiment. However, without the existence of theory, one would have had to resort to the mystical realm of supernatural and paranormal studies to explain these phenomena. Even though the root of almost all physics topics can be traced back to some ancestral experimental (or natural) observations, the one that leads in contemporary times is almost always field-specific. Take two very well-known fields, for example, Condensed Matter and High Energy Physics. In condensed matter physics, generally designing an experiment is much more convenient than the latter in terms of time and resources. For instance, one can compare the complications involved in developing a setup to measure the magnetic response of a sample at varying temperatures which is subjected to different wavelengths for recording photomagnetic response of a material, with the development of an accelerator like the Large Hadron Collider (LHC),

## THEORY OR EXPERIMENT? (CONT.)

Given the feasibility of experiments in the mentioned fields, it is obvious that experiments lead in the field of condensed matter, and theory leads in the field of high-energy physics. In the case of very costly experiments, computer simulations often provide a middle ground that makes thought experiments visually realizable and, many times, significantly reduces the number of failed experimental attempts. Where I think experimentalists probably have the upper hand in this debate is the absolute nature of a data point: it can never be wrong. It can arise due to some exotic new physics or some instrumental artefact; the explanation may vary. However, a theory is only valid until a better one comes along and replaces it, and is able to explain all the existing phenomena and a certain novel phenomenon, which has created the demand for the new theory. Despite this, it is not uncommon for experimentalists to get away with an ad hoc explanation for their results, which sometimes strays far from the actual underlying physics. So, playing the role of an advocate of physics rather than the devil, I have observed that a holistic understanding and, hence, advancement of science often occur when an experimentalist collaborates with a theorist to validate their results, and vice versa. A prime example is the LIGO experiment, which confirmed the existence of gravitational waves. Theorists may argue that the time gap between Einstein’s prediction and the experimental confirmation put theorists ahead of their counterparts, but none can deny the brains and ingenuity behind the formulation of the experiment, as at every intricate level, experimentalists and theorists had to work hand in hand to perform something that put all physicists in awe, irrespective of the field and sector they belonged to. In recent years, collaboration between experimentalists and theorists has increased significantly. This markedly increases the robustness of the research work, making it suitable for submission to much higherimpact journals than before. Given the increasing competition in academia, people who expand their collaborations for experimental or theoretical validation of their results gain an edge, as this process increases the robustness of their results and strengthens networking within the field's research fraternity. So rather than remaining confined to debates in university canteens, collaboration between these two camps provides a more comprehensive understanding of the subject, one that is difficult to achieve in isolation, and thereby drives scientific progress. About the writer: Souradeep Bhattacharya is a third-year PhD student in our department, working in the research group of Prof. Tushar Kanti Dey.

# ACADEMIC VISITS AND AWARDS

## Academic Visits & Awards

Ph.D. student **Ashutosh Kumar** received the *Best Poster Award* at the **International Conference on Recent Advances in Multifunctional Materials and Devices (ICRAMMD 2026)**, held at Banaras Hindu University, Varanasi during 9–11 March 2026. His work, titled "A Compact Meta-Absorber for SATCOM and Stealth Applications in the C, X, and Ku Bands", focused on the design, numerical simulation, and performance analysis of a compact metamaterial-based absorber for radar cross-section reduction and stealth applications. The proposed absorber demonstrated excellent absorption characteristics, wide-angle stability, and polarization insensitivity across the C, X, and Ku microwave bands.


*Ashutosh Kumar receiving the Best Poster Award at ICRAMMD 2026.*

**Prof. Umakanta Tripathy** delivered an invited talk at the Department of Mathematics and Computing, IIT (ISM) Dhanbad, on the topic *"Parkinson's Disease: Possible Impact and Solutions"*. The visit was an official engagement involving a conference / workshop format with extended discussion among participants on the role of biophysics and nonlinear optics in early disease detection.

*Prof. Umakanta Tripathy delivering the invited talk.*

**Sudhanshu Arya** attended the *Golden Jubilee Meeting of the Indian Society of Atomic & Molecular Physics (ISAMP)* at the Indian Institute of Technology Delhi on 6 and 7 March 2026, marking fifty years of atomic and molecular physics research in India.

*ISAMP Golden Jubilee — IIT Delhi, July 2026.*

**Dr. Samapika mallik** has been honored with the Women Researcher Award at the **3rd International Conference and Award Ceremony for Women Researchers (IACWR, 2026)** , held on March 7–8, 2026. She presented her research titled "Ion-based Neuromorphic Devices for AI Hardware Systems" highlighting advancements in next-generation computing inspired by brain-like architectures. Her work focuses on ion-driven devices for efficient and intelligent hardware systems, contributing to the development of neuromorphic AI technologies. The conference brought together researchers, students, and industry professionals to share developments in science, engineering, and technology, providing a valuable platform for knowledge exchange and collaboration.

# JOB OPPORTUNITIES

### Application for Integrated M.Tech / Ph.D. (Tech.)
ARIES — Aryabhatta Research Institute of Observational Sciences

LAST DATE: 17 MAY 2026

https://aries.res.in/opportunities/imp

### Research Assistant — Experimental Condensed Matter Physics (electron, spin, exciton, and orbital dynamics in 2D magnetic materials)
TU Berlin

LAST DATE: 15 MAY 2026

https://www.jobs.tu-berlin.de/en/job-postings/203368

### Trainee Scientific Assistant
Physical Research Laboratory, Ahmedabad

https://www.prl.res.in/~notices/websitedocs/2026/04/25/Advt_no._03-2026-25-04-2026-09-51-39.pdf

### Science Communicators (Master's Degree graduates)
Shrikrishna Science Centre

LAST DATE: 25 MAY 2026

www.sksciencecentre.org

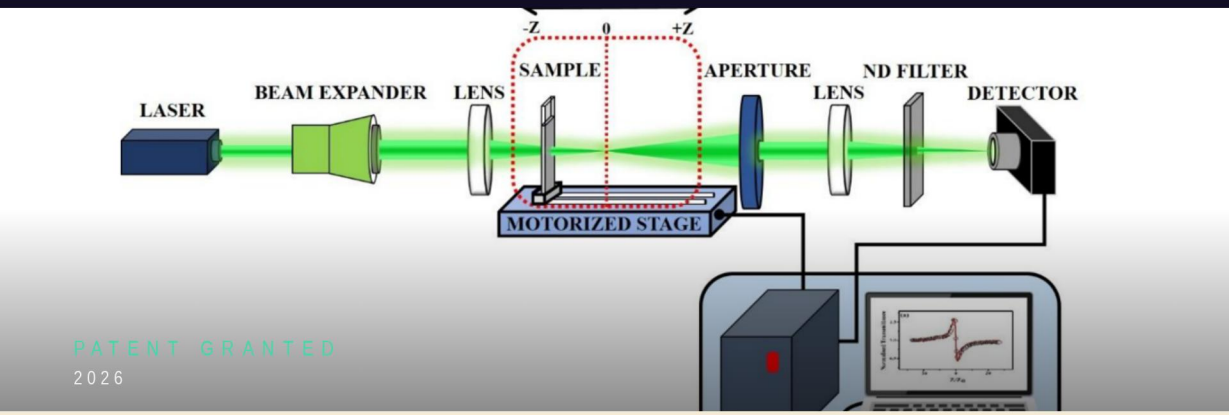




# RESEARCH PUBLICATIONS

1. N. Meghana , V. Zimba , and J. Nayak
*Enhanced room temperature acetic acid gas sensing properties of graphitic carbon nitride having two dimensional lamellar structures*
Journal of Materials Science: Materials in Electronics, doi.org/10.1007/s10854-026-16898-6

2. Ashutosh Yadav and Bobby Antony
*Investigation of positron scattering from atomic fluorine and fluorine-containing molecules*
https://pubs.rsc.org/en/content/articlelanding/2026/ra/d6ra01378c




PATENT GRANTED
2026

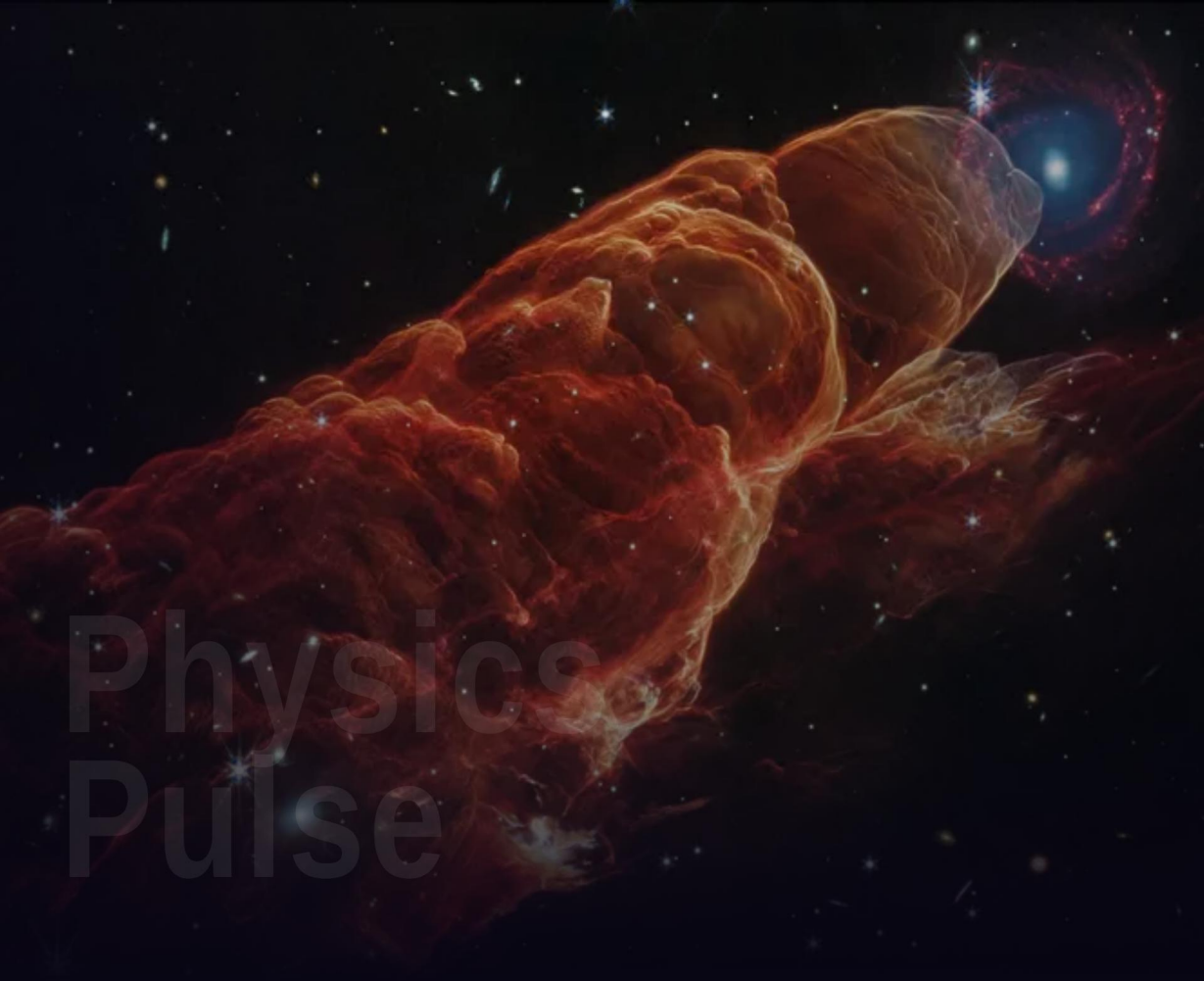
# *A Method Based on Self-Focusing and Self-Defocusing Effects to Study Protein Aggregation in Real-Time*

MANIKA DANDAPAT · PRIYADARSHI SAHOO · UMAKANTA TRIPATHY

The present invention relates to a method based on concepts of nonlinear optics — *self-focusing* and *self-defocusing* effects under third-order nonlinearity — to study protein aggregation in real time. For nonlinearity monitoring, a laser beam is used as the excitation source for the sample. The beam passing through the sample is detected by a photodiode detector at the far field, and a processing unit handles data acquisition and analysis.

For unfolded monomeric states of a protein, the sign of the nonlinear refractive index ($n_2$) is consistently *negative*, whereas at the onset of aggregation — corresponding to the formation of early-stage oligomers — a critical transition occurs in which $n_2$ changes sign from negative to positive. The proposed method is applicable throughout the entire aggregation time window to determine the exact protein conformation in real time via a unique magnitude of $n_2$. It also identifies the toxic species by a sign shift in $n_2$.

The method is **completely chemical-free**, making it safer and environmentally friendly. Its simplicity and sensitivity allow precise identification of disease markers without complex equipment or extensive sample preparation.



# Physics Pulse



## GET INVOLVED

ARTICLE SUBMISSION

https://people.iitism.ac.in/~phy/pages/newsletter/submit/

PREVIOUS ISSUES

https://www.iitism.ac.in/physics-newsletter

SUGGESTIONS

*physicspulse@iitism.ac.in*