



MARCH | 2025

## Physics Research Advancements by Thoughtful Humankind and their Achievements Miscellany

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## **Quarterly Newsletter**



Department of Physics School of Physical and Biological Sciences Faculty of Science, Technology and Architecture

1 https://jaipur.manipal.edu/fosta/department-of-physics.php







## In Focus

## **Leadership Transition**

- Dr. Ashima Bagaria has been appointed as the Associate Dean of the School of Physical and Biological Sciences from January 2025.
- Dr. Kamakhya Prakash Misra has formally assumed the position of Head, Department of Physics from January 2025.

## **Researcher of the Month**



Dr. Ashok Kumar Mondal Assistant Professor | February 2025 |

Dr. Ashok Kumar Mondal has taken a fresh look at the important nuclear reaction involving silicon and phosphorus - crucial in stellar environments. By using updated shell model techniques and advanced computational tools, he recalculated key reaction rates and resolved inconsistencies from past studies. His work sheds new light on how certain energy states behave and helps improve our understanding of nuclear processes in stars, especially at very low across a wide energies and range of temperatures.



Dr. Ashima Bagaria Associate Dean & Professor | March 2025 |

Dr. Ashima Bagaria recently got breakthroughs in catalyst engineering by unlocking new ways to recycle carbon dioxide into useful fuels. From NiO-TiO<sub>2</sub> nanoparticles enhanced with oxygen vacancyrich Fe<sub>3</sub>O<sub>4</sub> clusters - boosting methane yield by 83% - to PdSn electrocatalysts that outperform platinum in oxygen reduction, she reimagined surface chemistry for maximum impact. Notably, new catalysts demonstrate high CO selectivity for sustainable reverse water–gas shift reactions. These innovations showcase the power of atomic-scale design in creating efficient, durable, and ecofriendly catalytic systems.







## **Out & About**



## Prof. Ashutosh Sharma, was invited for an interactive session on "Driving Innovation Through Interdisciplinary Research: Insights and Strategies"

Through this session, he gave insights as to how interdisciplinary research would benefit masses and gave the ideas of strategies that a good research is the one that affects masses in the right direction. The interactive-ness of the session was a great success as many ideas and thoughts were exchanged and discussed.







**Prof. Bijay K. Agarwal,** was invited for a talk on "Demystifying Quantum Computing"

He broke down the concepts and illustrations on working of Quantum Computers for the understanding of the same at basic level. The concepts were de-mystified which made it easy for everyone to get the gist on its working including the need of it.



#### "The Graduate Meet",

B.Sc. (Hons.) Physics VI Sem students celebrated their journey through engaging talks on career opportunities and personal growth. Dr. Kamakhya Prakash Misra, Dr. Ashima Bagaria and Dr. Sushil Kumar Jain inspired students with their insights and real-world experiences. The event fostered open dialogue and a close-knit community spirit, setting the stage for the students' next exciting chapter.







## **Captured Memories**































## **Faculty Endeavours**



Dr. Ashima Bagaria Associate Dean & Professor



Dr. Manoj Kumar Saini Assistant Professor



## Dr. Ashima Bagaria and Dr. Manoj Kumar Saini Secure ₹1 Crore AICTE IDEA Lab Project Grant in Collaboration with AIML Department.

They have successfully secured a prestigious project grant of ₹1 crore under the AICTE IDEA Lab initiative. This achievement is the result of a collaborative effort with the Department of Artificial Intelligence and Machine Learning. The grant will support innovative interdisciplinary research and development in emerging technologies, fostering a culture of experiential learning and innovation on campus.



**Dr. Ashima Bagaria** has been selected for the prestigious **INSA-NCGG** Leadership in Science and Technology (LEADS) program, April 2025, held at Indian National Science Academy (INSA), New Delhi.





## Scholar's Endeavours



## **Presentation Title:**

Ion acoustic shock wave solution induced by charged debris in space plasma with Super-thermal electrons.

**Conference:** 

Redefining Possibilities: Cross Multi-disciplinary approaches to Global Challenges.

**Aashima Sharma Research Scholar** 

## **Paper Title:**

**Conference:** 

**Poster Title:** 

Analytical Approach for Degradation of Pollutants via Photocatalytic Response of Graphite Intercalated SnO2 Nanophotocatalysts **Journal Name:** Electrocatalysis(IF= 2.7, Q2)

Study of DYE removal yield on SnO2 / MWCNTs nanocomposites.

4th International Conference on Recent Trends in Environment and



**Ashish Kumar Research Scholar** 

Deepika Maan **Research Scholar** 

## **Poster Title:**

Sustainable Development.

A study on photocatalytic response of MWCNTs modified Cu-BDC metal organic frameworks

## **Conference:**

4th International Conference on Recent Trends in Environment and Sustainable Development.

<sup>169</sup>Tm $(n,\gamma)$ <sup>170</sup>Tm using EMPIRE Nuclear Reaction Code.



**Conference:** International Conference on "Redefining Possibilities: Cross Multi -Disciplinary Approaches to Global Challenges"

Theoretical Calculation of Nuclear Reactions <sup>159</sup>Tb(n,y)<sup>160</sup>Tb and

Ekta **Research Scholar** 



Karishma Jain **Research Scholar** 

## **Paper Title:**

Quantitative Analysis of Sulphur/MWCNT Nanoparticles Using **RIETVELD** method and their photocatalytic activity. **Conference:** 4th International Conference on Recent Trends in Environment and Sustainable Development.

Awarded as the best presentation of the Conference (ICRTESD-2025)





Poster Title: Unraveling the structure and dynamics of 50.7 liquid crystal: A computational DFT Approach. Conference: 6th National Conference on Recent Advancement in Physical Sciences (NCRAPS-2025)



Kritika Garg Research Scholar



Mahesh Malpani Research Scholar

- **Poster title:** 
  - 1. Study of Structural and Morphological Behavior of Li and Eu Doped ZnO Nanoparticles.
  - 2. Reduction in crystallite size by Ca doping in ZnO nanoparticles.

## **Conference:**

- 1. International Conference on Innovation in Applied Science and Emerging Technologies 2025 (IASET 2025)
- 2. 6<sup>th</sup> National Conference on "Recent Advancement in Physical Sciences".(NCRAPS-2025)

Workshop: Nuclear Physics and Multidisciplinary Research, PPSU, Surat



Nihal Kumawat Research Scholar



**Poster Title:** 

Review of thermodynamic and optical properties of Schiff-based 5O.m (m = 12, 14, 16) liquid crystals: A DFT approach **Conference:** International conference On Innovations in Applied Science and Emerging Technologies 2025 (IASET 2025)

Ranjeet Vishwakarma Research Scholar

**Poster Title:** 

Study of nuclear deformation in Mass 160 region Conference: International Conference on "Redefining Possibilities: Cross Multi -Disciplinary Approaches to Global Challenges"



**Rohan Santosh Pandhre** Bachelor's of Science (5)







Symposium: 68th DAE Symposium on Nuclear Physics, SNP-2024 IIT Roorkee Workshop: Nuclear Physics and Multidisciplinary Research, PPSU, Surat

Sandeep Kumawat Research Scholar

Chapter Title: Harnessing in vitro assays for enhanced tissue engineering outcomes. Book Entitled: Fundamental of Translational Tissue Engineering



Shefali Pareek Research Scholar



Ugrasen Singh Research Scholar **Poster Title:** 

Thermal expansion effects on quasi-phase-matched optical parametric oscillators

## **Conference:**

International Conference on Emerging Trends in Complex Systems, Advanced Materials and Photonics.

#### **Poster Title:**

Sol-Gel Synthesis and Characterization of Copper-Doped Cerium Dioxide Nanoparticles: Structural, Morphological, and Vibrational Study Conference: International Conference on Innovations in Applied Science and Emerging



Vandana Choudhary Research Scholar



Vishakha Sharma Research Scholar

#### **Poster Title:**

Advanced Materials and Photonics.

Technologies 2025 (IASET 2025)

Thermal expansion effects on quasi-phase-matched optical parametric oscillators Conference: International Conference on Emerging Trends in Complex Systems,





## **Hidden Curiosities**



## Famous Physics Blunders

## 1. Einstein's "Biggest Blunder" – The Cosmological Constant ( $\Lambda$ ) What happened?

Albert Einstein introduced the cosmological constant ( $\Lambda$ ) into his equations of General Relativity to keep the universe static (neither expanding nor contracting).

## Why was it a blunder?

Later, Edwin Hubble discovered that the universe is actually expanding, making Einstein's modification unnecessary.

## 2. Lord Kelvin's Age of the Earth Miscalculation

## What happened?

Lord Kelvin calculated that the Earth was only 20-40 million years old, based on its cooling rate.

## Why was it a blunder?

He didn't know about radioactive decay, which generates heat inside the Earth. Modern geology estimates Earth's age to be 4.5 billion years.

## 3. The Cold Fusion Controversy (1989)

## What happened?

Martin Fleischmann and Stanley Pons claimed to have achieved cold fusion, meaning nuclear fusion at room temperature.

## Why was it a blunder?

Other scientists failed to replicate their results, and their experiment was discredited.

## 4. Einstein's Rejection of Quantum Mechanics

## What happened?

Einstein disliked the idea of quantum mechanics being probabilistic. He famously said, "God does not play dice with the universe."

## Why was it a blunder?

Quantum mechanics turned out to be correct. Einstein's own EPR paradox helped inspire Bell's Theorem, which later confirmed quantum entanglement.







#### 1. Dark Matter and Dark Energy

Observations show that galaxies rotate faster than expected based on visible matter. This suggests the presence of dark matter, an unknown substance that makes up about 27% of the universe.

Additionally, the universe is expanding at an accelerating rate, which physicists attribute to dark energy, making up about 68% of the universe. The true nature of both remains unknown.

#### 2. The arrow of Time

Time moves forward, but why? The arrow of time is linked to entropy, but physicist still don't fully understand why time behaves differently from space in fundamental equations.

#### 3. Quantum Gravity

Einstein's General Relativity explains gravity on large scales, while Quantum Mechanics describes particles on small scales. However, a unified theory of quantum gravity that works at all scales remains undiscovered.

## 4. What Happened Before the Big Bang?

Cosmology describes the early universe, but what happened before the Big Bang? Some theories propose cyclic universes, quantum fluctuations, or higher-dimensional origins.

## 5. Matter-Antimatter Asymmetry

According to the Big Bang theory, matter and antimatter should have been created in equal amounts. But our universe is dominated by matter. Why? What happened to all the antimatter? This imbalance remains one of the biggest puzzles in cosmology.







1. I introduced the concept of wave-particle duality in quantum mechanics and won a Nobel Prize for my equation describing the behavior of matter waves. Who am I?

💡 Hint: My last name is also a wavelength!

2. I was the first woman to win a Nobel Prize and the only person to win in two different scientific fields. My discoveries led to the development of nuclear physics. Who am I?

💡 Hint: My notebooks are still radioactive today!

3. I developed a thought experiment involving a cat that could be both alive and dead at the same time, highlighting the paradoxes of quantum mechanics. Who am I?

P Hint: My cat is more famous than me!

4. I predicted the existence of antimatter and my equation combined quantum mechanics with special relativity. Who am I?
P Hint: A type of fundamental particle is named after me!

I. Louis de Broglie, Z. Marie Curie, 3. Erwin Schrodinger, H. Paul Dirac





## **Meet the Editors**



Shefali Pareek Research Scholar



Kritika Garg Research Scholar



Sandeep Kumawat Research Scholar



Aashima Sharma Research Scholar

## **Editorial Advisor**



Dr. Manoj Kumar Saini Assistant Professor