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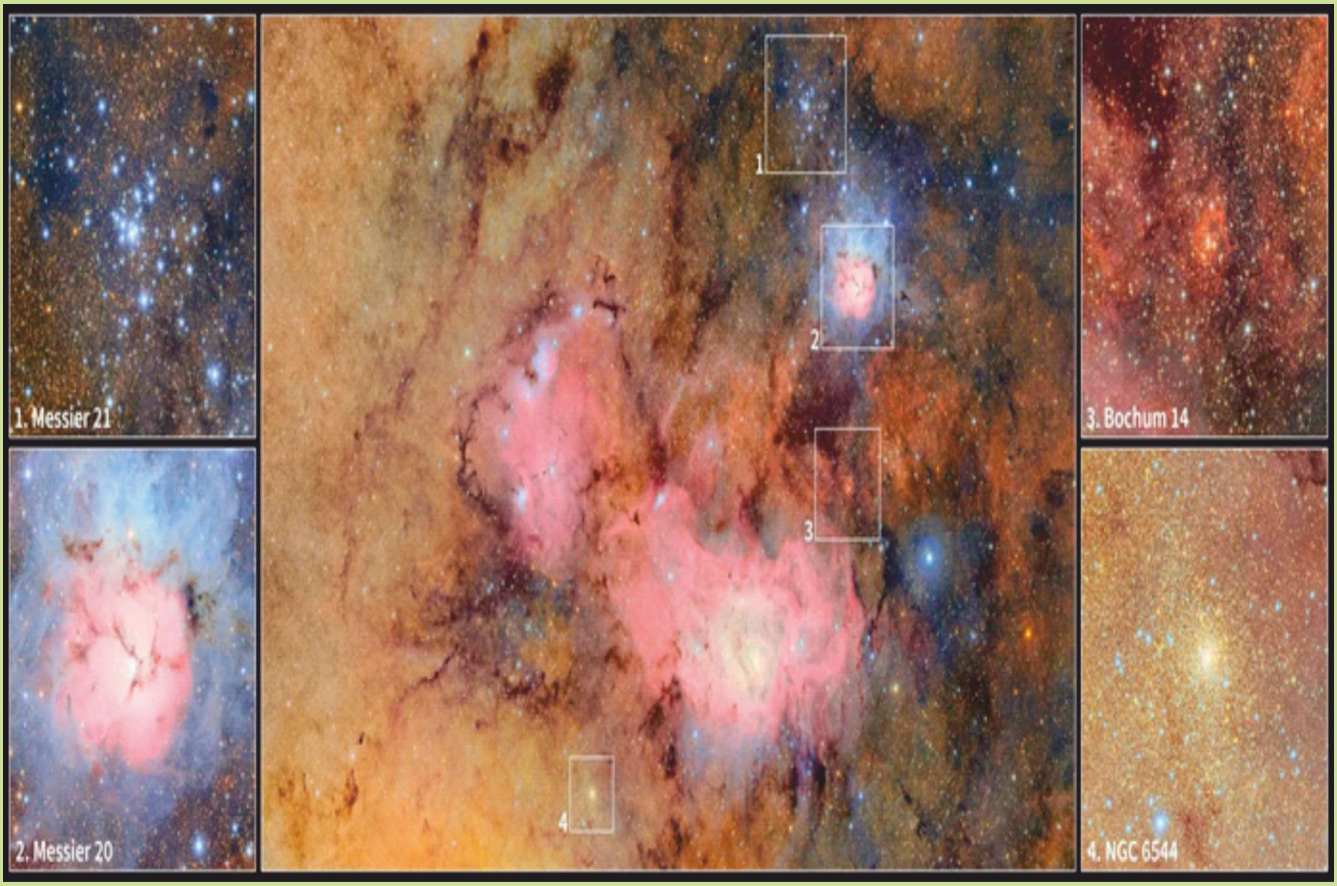

This image offers a closer look at the region surrounding the Lagoon Nebula, as seen in this First Look image captured by NSF–DOE Vera C. Rubin Observatory. The Lagoon Nebula is the central pink, kidney bean-shaped area that spans much of the image. At the upper-right is the open star cluster Messier 21. Beneath that is the star-forming Trifid Nebula, known as Messier 20. Further down is the open cluster Bochum 14. Finally, to the bottom-left of the Lagoon Nebula is the globular cluster NGC 6544.

Credit: NSF–DOE Vera C. Rubin Observatory

Link: https://rubinobservatory.org/gallery/collections/first-look-gallery

Bulletin of The Indian Association of Physics Teachers

http://www.indapt.org.in

The Bulletin is the official organ of the IAPT. It is a monthly journal devoted to upgrading physics education at all levels through dissemination of didactical information of physics and related areas. Further, the Bulletin also highlights information about the activities of IAPT. All communications should be addressed to:

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Editorial

Down with Copying

During the centenary year of our Founder President Prof D.P. Khandelwal, many programmes had been conducted across the country by the IAPT, conspicuous among the focus of these being the emphasis on experiments. On the basis of inputs received from such programmes held at different parts of the country it has been felt unanimously with great concern that laboratory work has been losing its importance. The reason behind such a scenario is manifold as per a national level survey conducted to understand about the exact status of laboratory-based physics education at the 10 + 2 and the UG levels.

Based on the issues that have emerged out of the survey and even otherwise, IAPT has made very serious efforts towards bridging the gap which includes holding of workshops on conduct of physics experiments at different levels at several institutions across the country. Apart from the students, teachers have also been taking part at these workshops. The idea has been to groom the teachers as master trainers so that a cascade mode of training gets underway. Even in some cases students have come forward to disseminate the acquired knowledge and skills among their peers cutting across the institutional boundaries. There are quite a few instances of showcasing the performance of experiments even by way of holding science exhibitions.

The results of such endeavours are definitely encouraging as it gets reflected in arousal of interest in experiments among the learners, but quite unfortunately its sustainability gets adversely affected due to logistics such as the pressure of syllabus, non-academic workload of teachers and above all the dwindling importance of evaluation method adopted for practical examination. So, all the enrichment gained through the training programmes generally perishes without leaving much of a mark.

In this regard it is worth mentioning that the NEP 2020 has *inter alia* (Items 11.1, 11.2, 11.3) made very strong recommendations about holistic approach towards education [1], development of scientific temper and above all experiential learning. It is ironical that our practical classes, the best ground for experiential learning do not serve the desired purpose. The students as well as the teacher have a fixed mind set regarding the standard results. Rather than doing the experiments with the spirit of discovery, the students aim to obtain the standard results by hook or by crook. Such an attitude goes completely against the premise of the development of spirit of inquiry, which has been enshrined in our Constitution [2] as a duty of a citizen. Coming to a very common practice, we find that the students record their observations in a Laboratory Notebook, whereas the notebook is seldom used in the laboratory. They take the data on a so-called rough notebook and copy the data in the laboratory notebook. Regarding this practice, the famous physics teacher G.L Squire has mentioned about three problems [3]

- Copying from one notebook to another is a wastage of time
- There can be a mistake while copying the observed data from one notebook to another
- There is an irresistible temptation of being selective

The third one happens to be most disturbing and the students fall prey to such an attitude. Let us presume that while performing the experiment of verification of Ohm's Law, a learner has taken ten observations of current vs. voltage. But out of the ten observations, two do not appear on the straight line passing through the origin. The learner without sparing any thought would consider those two data as inadmissible, while

presenting the results to his teacher. It is unfortunate that the teacher in most of the cases would not probe about the missing data.

Such a practice does complete injustice to scientific integrity to the extent that the students do not hesitate to reject observations made by their own eyes without citing any valid reason. They do not realise that they are disbelieving their own god-gifted eyes. It is one of the banes of our education system which goes against the development of aptitude for research.

It would be worthwhile to narrate an interesting incident, related to above, which happened during the BSc Practical Examination of a university. The examinees are required to present their sessional practical notebooks during the examination. In a particular year the university authorities issued instructions that the candidates would have to produce along with their fair notebooks the copies wherever they had actually taken the data. And the hell broke loose; the candidates started the bizarre operation of creating such apparently non-existing notebooks from the data in their fair notebooks. One came across many mismatches in dates and even ridiculous instances such as the record of room temperature was above 40^0C, while the date of experiment was in the month of December and so on.

The lesson from the above incident is that rather than issuing such instructions in a piecemeal manner, the authorities should take steps to ensure that only those notebooks, which are meant for recording experimental data in practical classes, are made to be produced as sessional documents during the examinations. It should also be the duty of the teachers to see that such instructions are strictly followed by the students.

Further, it is suggested that before a student rejects a data taken by him, it should be made binding on him to provide a rationale behind the decision. Thus, he will be able to learn to reason out scientifically as to why there is a departure between the value obtained by him and the standard accepted result. The other factor that keeps bothering a student is that he feels scared about committing mistakes, which may lead to making the overall presentation untidy. He needs to be convinced that just a line-through over a presented data, without any over-writing, does not affect the neatness. It will also provide a learner with the advantage that there need not be any duplication of effort as regards maintenance of the laboratory notebook. Everything takes place inside the laboratory.

Finally, an appeal is being made through this write-up to the fellow physics teachers across the country to adopt this change as regards record-keeping of experiments performed in the class in the academic interest of instilling some sense of sanctity along with inculcating the moral and ethical values in respect of conduct of practical.

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Chinmoy Kumar Ghosh

Physics News

Fermilab Muon g-2 experiment final result!

Muon g-2 uses Fermilab's powerful accelerators to explore the interactions of short-lived particles known as muons with a strong magnetic field in "empty" space. Scientists know that even in a vacuum, space is never empty. Instead, it is filled with an invisible sea of virtual particles that in accordance with the laws of quantum physics pop in and out of existence for incredibly short moments of time. Scientists can test the presence and nature of these virtual particles with particle beams traveling in a magnetic field. As the muons orbit around the storage ring at nearly the speed of light, their internal bar magnets will rotate around the magnetic field.

As the muons travel around the ring, they are continually decaying into neutrinos and positrons. The neutrinos fly away undetected, but the positrons, which travel in the same direction that the bar magnet was pointing when the muon decayed, can be measured. The main goal is to test the Standard Model's predictions of this value by measuring the precession rate experimentally to a precision of 0.14 parts per million. If there is an inconsistency, it could indicate the Standard Model is incomplete and in need of revision.

Read more at: https://muon-g-2.fnal.gov/

Original Paper: https://arxiv.org/abs/2506.03069 DOI: 10.48550/arXiv.2506.03069

Physicists recreate forgotten experiment observing fusion

A Los Alamos collaboration has replicated an important but largely forgotten physics experiment: the first deuterium-tritium (DT) fusion observation. The DT fusion reaction is central to enabling fusion technologies, whether as part of the nation's nuclear deterrence capabilities or in ongoing efforts to develop fusion for civilian energy. The team collaborated with experimental physicists from Duke University, based at the Triangle Universities Nuclear Laboratory in North Carolina, to replicate Ruhlig's work with a modern, rigorously executed duplication of the original experiment. The team used the laboratory's Tandem accelerator at its lowest operating power, producing a 3.5-mm deuteron beam. They paired that beam with a thin, cobalt-alloy foil between the accelerator vacuum and target that effectively duplicated as best as possible Ruhlig's 500 keV beam. Importantly, the measurements derived from the experimental techniques employed by Ruhlig and re-tested by the Los Alamos and Triangle Universities Nuclear Laboratory researchers can be applied to active fusion efforts such as at NIF.

Read more at: https://phys.org/news/2025-06-physicists-recreate-forgotten-fusion.html

Provided By: Physical Review C (2025). DOI: 10.1103/PhysRevC.111.064618

Atom tweezer arrays reveal how phase transitions unfold in mesoscopic systems

As the number of particles in a physical system increases, its properties can change and different phase transitions can take place. Microscopic systems are thus typically very different, even if the types of particles they are made up of are the same. Mesoscopic systems lie somewhere between microscopic and macroscopic systems, as they are small enough for individual particle fluctuations to impact their dynamics and yet large enough to support collective particle dynamics. These optical cavity systems, consisting of two highly reflective mirrors facing each other, can be used to study a wide range of physical processes. These include atom-light interactions, collective light scattering, the collecting of mid-circuit measurements in quantum computers, and the exploration of the quantum limits in sensing applications and more. This study came to fruition through a team effort between experimentalists and theorists,

Read more at: https://phys.org/news/2025-06-atom-tweezer-arrays-reveal-phase.html

Original paper: Nature Physics (2025). DOI: 10.1038/s41567-025-02916-7

Soumya Sarkar
IISER PUNE

Article

Some subtle issues in teaching Physics at higher secondary level -Part 2

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Abstract

This second article in our series continues to address key challenges in higher secondary physics, a critical stage for bridging basic understanding with advanced scientific thinking. Building on our previous discussion, we explore deeper into subtle conceptual issues that often hinder student's understanding. Our aim is to clarify and resolve these subtle issues, building a stronger foundation for student's future studies in physics.

1. Introduction

In the previous article, we explored topics such as the concept of an infinite line charge, the temperature dependence of susceptibility, and the challenges of plotting electric and magnetic fields with identical magnitudes in diagrams for alternating current. Many students get fascinated by phenomena related to light when experiments are conducted in laboratory and also during classes. But, there is a gap of in depth understanding of the concepts among the students and some of the topics are discussed in detail in this article. In this Part 2 of article series, we will address the concepts: the correct definition of refraction, the significance of applying the Cartesian Sign Convention (CSC) at two critical stages—first during derivation and again during problem-solving, the limits of extrapolating the i-d curve, and the rationale behind considering minimum deviation to be small for small-angled prisms. Through this series of articles, we aim to clarify such foundational issues and examine potential sources of confusion in the standard textbook material for higher secondary students. Four issues are discussed here.

2. Can normal incidence of light on a transparent medium be considered as refraction?

If you interact with students and tutors at higher secondary level about the phenomenon of refraction, most of them will probably stress 'the bending of light' as the most important idea of refraction [1–4]. The textbook defines refraction as follows: "The direction of propagation of an obliquely incident ray of light that enters the other medium changes at the interface of the two media. This phenomenon is called refraction of light." This statement implies that for refraction to occur, light must strike the interface at an oblique angle. In reality, refraction occurs whenever light passes from one medium to another with a different optical density, which causes a change in its speed, wavelength, and often direction. Refraction can occur with or without a noticeable change in direction, depending on the angle of incidence.

"The book Fundamentals of Physics Extended", 12th Edition by Resnick, Halliday, and Jearl Walker provides a more comprehensive definition: "The travel of light through a surface (or interface) that separates two media is called refraction, and the light is said to be refracted. Unless an incident beam of light is perpendicular to the surface, refraction changes the light's direction of travel." Thus, it's clear that the conventional definition may not be sufficient for teaching refraction, as it overlooks cases where light enters perpendicularly, resulting in no directional change despite refraction occurring.

3. Why we apply Cartesian Sign Convention(CSC) two times, one during derivation and the second during problem solving?

The Cartesian sign convention [5–7] helps us to:

1. Clearly distinguish between object distance, image distance, and focal length with specific sign assignments.
2. Aid in the physical interpretation of images—whether they are real or virtual, upright or inverted—and in determining the location and nature of images based on the signs of calculated values.
3. Use the same formula for convex and concave mirrors:

$$\frac{1}{f}=\frac{1}{u}+\frac{1}{v}$$

4. Apply a unified formula for convex and concave lenses:

$$\frac{1}{f}=\frac{-1}{u}+\frac{1}{v}$$

where u represents the object distance, v represents the image distance, and f represents the focal length.

Once the general formula has been derived, the Cartesian sign convention is applied again when solving a specific problem. At this point, actual values for object distance, image distance, and focal length are substituted into the formula applying CSC.

To demonstrate the importance of using the Cartesian sign convention, let's apply the mirror formula for a **convex mirror** with and without applying this convention. Practically, we can observe that a **convex mirror** only forms one type of image: Virtual, Upright, and Diminished, with the image appearing to be located behind the mirror. All these characteristics must be met when solving problems. We will show that only by using the Cartesian sign convention we obtain results that satisfy these conditions.

3.1 Results with Cartesian Sign Convention

Let f = +15 cm (focal length is positive) and u = -30 cm (object distance is negative). We need to find v (image distance). The mirror formula is given by:

$$\frac{1}{f}=\frac{1}{u}+\frac{1}{v}$$

Substituting the values using the Cartesian Sign Convention (CSC)

$$\frac{1}{15}=\frac{1}{v}+\frac{1}{-30}$$

Rearranging gives

$$\frac{1}{v}=\frac{1}{15}+\frac{1}{30}$$

Thus we get v = + 10 cm. The positive value of v indicates that the image is virtual and located 10 cm behind the mirror, which is consistent with the properties of convex mirrors. The magnification according to the CSC is

$$m=\frac{-v}{u}=\frac{-10}{-30}=\frac{1}{3}$$

This means the image is diminished, and since the magnification is positive, it indicates that the image is upright (same orientation as the object). This confirms that our use of the Cartesian Sign Convention yields the correct result.

3.2 Results without Cartesian Sign Convention

Now, let's examine what happens when we ignore the Cartesian Sign Convention or are unaware of its application. Let us use the same numerical values as in the above problem. However, different possibilities arise

$$u=+30cm, f=+15cm$$
$$u=+30cm, f=-15cm$$
$$u=-30cm, f=-15cm$$

The mirror formula remains the same

$$\frac{1}{f}=\frac{-1}{u}+\frac{1}{v}$$

Substituting the values, we get

$$v=+30cm, -10cm, -30cm$$

These values do not agree with practical observations, which shows the importance of applying the Cartesian Sign Convention to obtain correct results.

4. Can we extrapolate the i-d curve of a prism?

The answer to this question is "No". There is always a minimum angle of incidence below which the light will undergo total internal reflection at the second surface of the prism. This means we will not observe an emergent ray. It is often seen that students extrapolate the obtained curve which will create errors. To study the curve, both 30 degree and 60 degree prisms can be used and the deviation has always a single minimum point [8–10]. Let i_{min} be the minimum angle of incidence for a prism with a particular refractive index n and apex angle A. We have

$$r_1+r_2=A$$

When $r_2=r_{max}$, the ray will be totally internally reflected. Let r_{min} be the angle of refraction at the first surface corresponding to r_{max}. Then, we have

$$r_{min}+r_{max}=A$$

For this minimum angle of incidence i_{min}, r_2 becomes $r_{max}=C$ and the angle of emergence $i_2=90^{\circ}$, where C is the critical angle. Using Snell's law, we get

$$\frac{sini_2}{sinr_2}=n=\frac{sin90^{\circ}}{sinr_{max}}$$

Thus, we can solve for r_{max}

$$r_{max} = sin^{-1}\frac{1}{n}$$

From Snell's law, we can express the minimum angle of incidence i_{min} as

$$i_{min} = sin^{-1}nsinr_{min}$$

Since $r_{min} = A - r_{max}$, we substitute this into the equation for i_{min}

$$r_{min} = A - sin^{-1}\frac{1}{n}$$

Finally, we obtain

$$i_{min} = sin^{-1}\left(nsin\left(A - sin^{-1}\frac{1}{n}\right)\right)$$

For a 60° prism, when n = 1.6, we get $i_{min} = 36^{\circ}$, and when n = 1.5, we get $i_{min} = 28^{\circ}$. So we can arrive at two remarks about i-d curve of a prism

1. There is a minimum angle of incidence, i_{min}, beyond which the curve will not exist.

2. Therefore, when plotting the i-d curve, do not extrapolate beyond i_{min}, as we cannot be certain whether the next value exists or not.

The laboratory instructor should always measure the refractive index and then determine i_{min}. The students should be instructed to plot the curve for a prism with an angle of incidence greater than i_{min}.

5. For small angle prism can we say D is small?

In order to derive an expression for a small-angle prism, the textbook assumes that when the apex angle A is small, the angle of deviation D is also small [11-13]. But is this assumption true? Let us find out. For refraction of light through a prism, we have the following relationships

$$r_1 + r_2 = A, d = i_1 + i_2 - A$$

where r_1 and r_2 are the angles of refraction at the first and second surfaces, i_1 and i_2 are the angles of incidence, A is the apex angle of the prism, and d is the angle of deviation. From Snell's law, we have

$$sini_1 = nsinr_1$$

For second surface we have

$$sini_2 = nsinr_2$$

where n is the refractive index of the prism. The angle of deviation d is given by the equation

$$d = i + sin^{-1}\left[nsin\left(A - sin^{-1}\left(\frac{sini}{n}\right)\right)\right] - A$$

This is a convex equation, meaning it has a minimum value for a particular angle of incidence. Using this equation, we can calculate the values of i and d for small-angle prisms with $A = 5^{\circ}, 10^{\circ}, 15^{\circ}$ as shown in Table 1.

i (degrees)	$d = 5^{\circ}$	$d = 10^{\circ}$	$d = 15^{\circ}$
-20	47.0	51.0	55.0
-15	44.0	48.0	52.0
-10	41.0	45.0	48.9
-5	38.0	42.0	46.0
0	5.0	10.0	15.0
5	5.2	10.3	10.4
10	5.5	10.7	11.0
15	5.9	11.2	11.7
20	6.5	11.9	12.4

Table 1: Angle of incidence and deviation for vertex angles $5°, 10° \wedge 15°$

We can see from the table that d = D when $i = 0°$. We know that for a prism

$$n = \frac{sin\frac{A+D}{2}}{sin\frac{A}{2}}$$

This formula must be modified for a small angled prism. The table shows that for small apex angles $A = 5°, 10°, 15°$, the corresponding minimum deviation D is also small. Therefore, both A and D are small for small-angle prisms. In this case, we can approximate the expression for n. Can we use the approximation $sin\theta \approx \theta$ for the expression of n ? To check, let us examine the values of $sin\theta$ for different angles, as shown in Table 2.

$\theta(degrees)$	$\theta(radians)$	$sin\theta$
0	0.00000	0.00000
5	0.08727	0.08716
10	0.17453	0.17365
15	0.26180	0.25882

20	0.34907	0.34202
25	0.43633	0.42262
30	0.52360	0.50000
35	0.61087	0.57358
40	0.69813	0.64279
45	0.78540	0.70711
50	0.87266	0.76604
55	0.95993	0.81915
60	1.04720	0.86603

Table 2: Comparison of θ in radians, degrees and $sin\theta$ for angles from 0° to 60° in 5° steps

Table 2 shows that up to 30°, the approximation $sin\theta \approx \theta$ is reasonable. This means that for small angles, this approximation works well. Therefore, we can approximate the refractive index n as

$$n = \frac{\frac{A+D}{2}}{\frac{A}{2}}$$

Rearranging, we get the expression for the deviation $D = (n-1)A$

6. Conclusions

Physics concepts in higher secondary textbooks at many places are presented with conceptual gaps that can hinder student's understanding of key principles. This article has addressed some of these issues, aiming to give students a clearer and more in-depth understanding. We once again request readers to share similar challenges they encounter, as they are needed for future discussions. In the upcoming article, we will continue to explore additional concepts and further enhance this ongoing conversation.

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July: The Month in the History of Physics

2nd July

The celebrated German-American physicist Hans Bethe was born on *July 2nd, 1906*. He was awarded the Nobel Prize in Physics in 1967 for his path-breaking research in stellar nucleosynthesis.

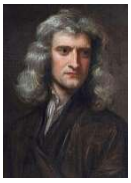
On *July 2nd, 1992*, "A Brief History of Time" by Stephen Hawking achieved the unprecedented feat in the annals of British publications by way of staying on the bestseller list for a record 42 months.

4th July

4th July, 2012 is an important milestone in the history of physics. A large group of scientists at CERN (The European Organisation for Nuclear Research) announced the discovery of Higgs Boson, nicknamed 'The God Particle'. The key device was the Large Hadron Collider which confirmed the existence of the new elementary particle that makes the other particles acquire mass. The discovery of the said particle, produced by quantum excitation of what is known as the Higgs Field, *inter alia* led to the validation of the Standard Model of particle physics. The particle (H^0) which was predicted in 1964 is a colorless, electrically neutral, even parity, massive (125.11 GeV/ c^2) scalar boson of life time of the order of 10^{-22} s. Following the identification of the particle on 4th July, 2012, Francois Englert and Peter Higgs were awarded Nobel Prize in Physics in 2013.

Marie Curie, the famous Polish and naturalized French scientist, the winner of Nobel Prizes in Physics (1903) and Chemistry (1911) passed away on *4th July, 1934*. The cause of her death is said to be aplastic pernicious anaemia, which is attributed to long exposure to radiation during her work. She is known for her path-breaking research contribution in radioactivity.

5th July



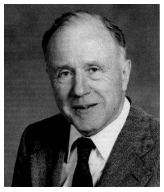
Publication of Sir Isaac Newton's Principia Mathematica happened on *5th July, 1687*. The text is the fountain head of classical mechanics and the universal law of gravitation

William John Macquorn Rankine, a Scottish mathematician and physicist, who made phenomenal contribution in the field of thermodynamics was born on *5th July, 1820*. He also developed the Rankine Scale of temperature.

6th July

The German mathematician and physicist, George Simon Ohm, famous for his Ohm's Law, passed away on *6th July, 1854*.

9th July



John Arcibald Wheeler, known for his significant contribution in general relativity, nuclear fission and the conceptual development of black holes was born on *9th July, 1911*.

Adrastea, the dwarf moon of Jupiter got detected during the flyby at closest approach to Jupiter (3,50,000 miles) of Voyager-2 on *9th July, 1979*.

11th July

The Russian experimental physicist Aleksandr M Prokhorov, who along with two other scientists had won the Nobel Prize in Physics in 1964 for his pioneering work on Maser-Laser was born on *11th July, 1916.*

Cesar Lattes, a Brazilian Physicist, who played a vital role in the discovery of the composite sub-atomic particle pion (pi-meson), was born on *11 th July. 1924.*

18th July

18th July happens to be the birthday among others of the English polymath and physicist Robert Hooke (b.1635), famous for his law of elasticity and the Dutch theoretical physicist Hendrik Lorentz (b.1853), well known for Lorentz Force and the transformation equations consistent with the special theory of relativity.

24th July

Sir James Chadwick, the English nuclear physicist, who discovered the neutron and won the Nobel Prize in Physics in 1935 passed away on *24th July, 1974.*

27th /28th July

Lorand Eotvos was a Hungarian physicist, He is known for his torsion pendulum which is a sensitive device for measurement of density of the underlying rock strata. He was born on *27th July, 1848*. John Stewart Bell, well-known for the famous theorem in his name (also referred to as Bell's inequality) which essentially shows that truth in local realism rules out the replications of the predictions of quantum mechanics. He was born on *28th July, 1928*.

July 1957 (without any specific date)

John Bardeen, Leon Cooper and John Schriffer (BCS) came out with their iconic theory of superconductivity in *July 1957* for which they received the Nobel Prize in 1972. The crux of the theory is that electorns which are fermions, at extremely low temperature exhibit a bosonic behaviour resulting in a collection of quantum states which manifest in the form of giving rise to the peculiar property of electrical conductivity at zero resistance.

Some Landmarks occurring in July

- The first detonation of atomic bomb created out of the Manhattan Project at the Alamogordo Bombing Range at New Mexico on *16th July, 1945*.
- NASA (National Aeronautics and Space Administration) founded on *29th July, 1958*
- Apollo 11, a spaceflght conducted from the USA lands on moon with Neil Armstrong and Edwin Aldrin on *20th July, 1969*.
- Comet Hale-Bopp discovered separately on *23rd July, 1995* by Alan Hale and Thomas Bopp prior to it becoming visible to the unaided eye.
- First ever direct evidence of Tau Neutrino found at Fermilab, Illinois, USA on *20th July, 2000,* thereby putting the neutrino hypothesis proposed by Wolfgang Pauli in 1930 in a firm footing.

References

https://en.wikipedia.org for Higgs Boson, BCS Theory and Tau Neutrino

Disclaimer: *The list provided is not exhaustive.*

Chinmoy Kumar Ghosh

AMU Physics Department Lights the Way with a UNESCO-Endorsed Celebration of the International Day of Light 2025

Jai Prakash and B. P. Singh

Department of Physics, Aligarh Muslim University, Aligarh – 202002, India

In a remarkable blend of academic fervour and scientific celebration, the Department of Physics at Aligarh Muslim University (AMU) hosted a special programme on 17th May 2025 to mark the International Day of Light (IDL). Recognized globally under the aegis of UNESCO, this annual observance on May 16 commemorates the anniversary of the first successful operation of the laser by physicist Theodore Maiman in 1960. The International Day of Light is much more than a tribute to a scientific achievement—it serves as a beacon for raising global awareness about the central role that light plays in science, culture, art, education, sustainable development, medicine, and communication. The event, held in the department's Conference Hall, was attended by faculty, researchers, and students, reflecting AMU's vibrant academic ecosystem. The programme commenced with a welcome address by Prof. Anisul A. Usmani, Chairman of the Department of Physics. Prof. Usmani highlighted the enduring legacy of the department in advancing physics education and research in India. Prof. Usmani emphasized that the Day of Light is not just a ceremonial observance but a moment to reflect on the profound impact that optics and photonics have had on human civilization—from enabling our first glimpse of distant galaxies to powering today's digital communications.

A major highlight of the event was the keynote address by Prof. Gautam Singh from the Amity Institute of Applied Sciences, Amity University, Noida. In his talk titled **"Liquid Crystals with Light: Academia to Industry".**

Dignitaries present on the dais

Prof. Gautam Singh provided scholarly exploration of how light interacts with liquid crystal materials—a fusion of fundamental physics and practical engineering. His talk offered a historical trajectory of liquid crystal research, from its early days in display technologies to its current applications in optics, smart windows, LCD displays, biosensors, and photonic devices.

Prof. Gautam Singh from the Amity Institute of Applied Sciences, Amity University, Noida

He emphasized how academic institutions and industries can collaborate to translate light-based technologies into scalable, real-world innovations.

"Light is not just a tool of exploration; it is a medium of transformation," he remarked, inspiring young attendees to view light science as a gateway to multidisciplinary discovery.

Adding a deep scientific dimension to the celebration, Prof. B. P. Singh, an experimental nuclear physicist, spoke on the fundamental nature of light. He spoke on "Light and energy". He further delved into its dual identity as both wave and particle, the implications of quantum optics, and its significance in modern-day experimental physics. Prof. B. P. Singh highlighted how light-based techniques such as spectroscopy, laser-induced fluorescence, and photon correlation spectroscopy are integral to research in nuclear, condensed matter, and materials physics. "Light is

nature's most articulate messenger—it carries the codes of the cosmos," he reflected, capturing the awe and potential that light holds within the scientific imagination.

The event was further enriched by the presence of Prof. Sartaj Tabassum, Dean of the Faculty of Science, who presided the function and praised the Department of Physics for its dynamic role in promoting scientific literacy and outreach. He noted that the department has consistently embraced international observances like the IDL to engage the community in conversations that bridge scientific research with societal development. His remarks encouraged students to remain curious and proactive in connecting classroom learning with global scientific goals.

The programme was coordinated by Dr. Jai Prakash, Associate Professor, and an alumnus of the Indian National Young Academy of Sciences (INYAS) and current member of National Academy of Sciences India (NASI) and Global Young Academy (GYA) Germany. Dr. Jai Prakash provided a comprehensive overview of the history and objectives of the International Day of Light, explaining its alignment with the goals of the United Nations 2030 Agenda for Sustainable Development. He emphasized that innovations in light-based technologies— ranging from energy-efficient lighting and lase

Prof. Sartaj Tabassum, Dean, Faculty of Science addressing the faculty, scholars, and students

surgery to fibre-optic communications and solar energy harvesting—are critical to addressing challenges in healthcare, climate change, and digital equity. His dedication to science outreach and public engagement was evident throughout the event. The celebration also included a question-and-answer session that encouraged interaction between students and invited experts. Participants were awarded certificates of participation, and a digital brochure highlighting key developments in light science was distributed to all attendees. The enthusiastic participation of students, research scholars, and faculty not only reflected the academic vibrancy of the department but also demonstrated the power of such initiatives to ignite scientific curiosity and creativity. The event served as a platform to inspire young minds to explore careers in optics, photonics, and interdisciplinary sciences.

The Department of Physics at AMU has long been at the forefront of science communication and public engagement. With a legacy of pioneering research in nuclear physics, materials science, liquid crystal physics and laser applications, the department continues to uphold the vision of AMU's founder, Sir Syed Ahmad Khan, who believed in education as the ultimate tool for empowerment and progress. Through events like the International Day of Light, the department reaffirms its role in shaping not only future scientists but also enlightened citizens. As the world enters an era of quantum technologies, artificial intelligence, and space exploration, the study and application of light remain at the core of innovation. The International Day of Light 2025 celebration at AMU stands as a shining example of how universities can serve as catalysts for a scientifically informed, technologically driven, and socially inclusive future. In echoing UNESCO's global vision, the programme proved that science is indeed a light—one that must be shared, celebrated, and sustained for the collective good of humanity.

The authors express their heartfelt gratitude to UNESCO for recognizing the Department of Physics, Aligarh Muslim University, Aligarh, as one of the official centres for organizing the International Day of Light (IDL) 2025 celebrations. This recognition is a matter of great pride for the department and reflects its longstanding commitment to science communication and public engagement. The authors also sincerely thank UNESCO for featuring the event on its official website, thereby providing it with international visibility, and encouraging wider participation in the global dialogue on the importance of light-based technologies.

Report (RC-15)

Two-Day Workshop on Hands-on Experiments in Physics

A two-day workshop on hands-on experiments in physics was successfully held on April 26 and 28, 2025, at Boruna Satsanga High School (H.S.),located at P.O.- Chaipat, Block- Daspur-II, Ghatal, Paschim Medinipur. The event was organized by the SKS Innovation Hub (Narajole Raj College Unit), managed by Manabik Samsthan and Muhurta Foundation, in collaboration with RC-15.

The workshop saw enthusiastic participation from 120 students of Class IX, X, and XII, representing the host school and eleven neighboring schools. The objective of the workshop was to promote experiential learning through hands-on activities and demonstrations in physics.

Class XII students were engaged in performing experiments related to light and electricity, including the use of convex and concave lenses, spherical mirrors, potentiometers, Ohm's law verification, and the determination of the figure of merit of a galvanometer, using low-cost items. Meanwhile, students of Classes IX and X participated in interactive demonstrations, enhancing their conceptual understanding and interest in physics.

The second half of the concluding day featured a seminar on Cyber Security, delivered by Mr. Kalyan Mukhopadhyay, a retired IPS officer. His insightful presentation introduced students to the importance of digital safety and ethical online behavior.

The program was graced by the presence of several dignitaries, including Subhash Chandra Samanta. The workshop was formally inaugurated by Dr. Paresh Chandra Jana, Dean of Students' Welfare (Science), Vidyasagar University, Midnapore.

The event was a resounding success, enriching students' understanding of physics through practical exposure and highlighting the relevance of scientific learning in contemporary contexts.

Dr. Makhanlal Nanda Goswami explaining the experiment related to optics.

Mr. Anirban Samanta is describing the experiment on electricity.

Sandip Sarkar

Report (RC-15)

IAPT on the online talks as the part of celebration of IYQ

The UN has declared the year 2025 as the International Year of Quantum Science and Technology (abbreviated as IYQ) to mark the one hundred years of the birth of Quantum mechanics (QM). The significance of QM can only be overemphasized to the students of physics but the quantum technology (QT) is an area that has been strengthened in a great way only during this century. The steady movement of QM to QT mark a paradigm shift of the QM from the domain of science to the field of technology with no reduction in its importance in several branches of fundamental science particularly in that of physics.

IAPT planned right at the end of the last year that the

organization will give a huge push to the celebration of the IYQ as it provides a big platform for the all stakeholders in physics starting from the plus two level students to the frontline researchers and senior scientists and professors. IAPT President Prof P.K. Ahluwalia chalked out a plan to distribute the responsibility of this celebration through a series of online talks to be organized by the different Regional Councils in different months of the year 2025. As a part of this initiative IAPT RC 15 (WB, Sikkim & A & N Islands) organized the online talks for the month of May 2025. Six talks were organized in last three weekends of the month. Dr Pradipta Panchadhyayee as the coordinator of the program had a big role in identifying the frontline speakers and the make the entire program spread over three weekends a very lively one. The topics and the speakers were identified with care to provide the audience an exposure to quite a few diverse aspects of the QM and its journey through last one hundred years. A brief outline of the program and the talks has been provided below. All these talks are now available in the YouTube, and the links are provided in this write up.

Set I Talks (Sunday, May 18, 10-00-12-45) Theme: History of Quantum Science

Talk 1, Speaker, Prof Ajoy K Ghatak; [M.N. Saha distinguished Chair, Professor, NASI, Prayagraj

Topic: Schrodinger Equation and Uncertainty Principle

Talk 2, Speaker, Dr Bhupati Chakrabarti [Former GS, IAPT & Retd faculty, City College, Kolkata]

Topic: Pathways to the Centre Stage: Significance of Work of S. N. Bose in “Old Quantum Theory”

Prof Ajay Ghatak planned his talk in such a way that starting from the students to senior professors of physics could very comfortably walk with him. He began with the basic ideas of physics and gradually showed why the quantum mechanics is necessary for dealing with them. He underlined the importance of a wave equation once the idea of matter waves was given by de Broglie and how that prompted the Schrodinger equation to emerge. He talked about the uncertainty principle with special emphasis on its role in defining the probabilistic nature of QM. Prof Ghatak being an erudite speaker with immense experience made his talk on basics of QM very lively and the audience thoroughly enjoyed it.

Dr Bhupati Chakrabarti focused on the work of S N Bose who in 1924 sitting in relative isolation far away from Europe could come up with an idea that led to the emergence of quantum statistics. Of course, Einstein had a very positive role for this to happen. He also underlined how Einstein used the ideas of Bose, to predict what is now known as BE Condensate. The speaker highlighted the contents of some of the letters exchanged among the different important figures involved in the emergence of QM where Bose's work found special mention indicating the significance of his contribution.

This session was conducted by Prof. C.K.Ghosh

You Tube link for Set I talks:

https://youtu.be/GuYks1lmwml

Set II Talks (Saturday, May 24, 18-30 – 20-45)
Theme: Quantum Mechanics to Quantum Materials

Talk 1, Speaker, Prof G.P. Das [Emeritus Professor, RISE, TCG CREST, Kolkata]

Topic: From Quantum Mechanics to Quantum Materials

Talk 2, Speaker, Prof P.K. Ahluwalia [President IAPT & Retd Professor H.P. University]

Topic: A Quantum Material from the Flatlands of Crystals: Graphene

Prof G.P Das is a well-known material physicist who has a long experience of working in various reputed laboratories both in India and abroad. He talked about how QM has led to the emergence of quantum materials with tailor made properties. Now materials with desired properties can be prepared using the knowledge of QM. Density function theory (DFT) is playing a big role in the task. He also talked about how the quantum refrigerators work and about the initiatives taken all over the world including in our country to make use of this 'quantum revolution.'

Prof P.K. Ahluwalia began his talk about the structure of various materials that are chemically similar but are having quite different physical properties. Then he talked how these properties may further be changed keeping targeted applications in mind as well as by proper understanding of the properties of the materials from the standpoint of quantum mechanics. He specifically mentioned the example of the wonder material graphene in this context. He also talked about the research activities that his group has undertaken at H.P University in this field and mentioned how Prof Das has inspired his group.

This session was conducted by Prof. C.K. Ghosh

You Tube link for Set II talks:

https://www.youtube.com/live/-UydF_GDmc8?si=dca7tQAoZk-Oryrc

Set III Talks (Friday, May 30, 18-30–20-45) Theme: Advanced applications of Quantum Mechanics

Talk 1, Speaker, Prof Bhupendra. Nath Dev [Professor, CQuERE, TCG CREST, Kolkata]

Topic: Quantum Mechanics to Quantum Computers: Quantum Science to Quantum Technology

Talk 2, Speaker, Prof Ananda Dasgupta [Professor, Dept of Physical Sciences, IISER, Kolkata]

Topic: Coherent and Squeezed States: Theory and Applications

Prof Bhupendra Nath Dev in his talk very lucidly described how in its journey of one hundred years QM has given rise to quantum technology. Felix Bloch's quantum description of solids is the beginning of quantum revolution. Today's mobile, laptop and supercomputer are its early fruits. He spoke about the second quantum revolution and the developments viz. quantum computers. We learnt about the single cubit quantum computer, put together by Prof. Dev and colleagues at TCG Crest. He mentioned that one five-qubit quantum computer will come next.

Prof. Ananda Dasgupta spoke about the coherent states of the simple harmonic oscillator and explored issues viz. Heisenberg Uncertainty bound, the classical limit of Quantum mechanics using these states.

He discussed in details the case of the harmonic oscillator and the eigenstates. An eigenstate for the lowering operator, a coherent state is a displaced ground state. He also showed that the raising state has no eigenstate. A coherent state remains coherent. Prof Dasgupta also spoke on displacement operators and squeezing operators, the squeezed vacuum and mentioned that non-linear media can be exploited for precision measurements viz. in LIGO.

This session was conducted by Prof. Manimala Das.

You Tube link for Set III talks:

https://www.youtube.com/watch?v=OYEUepF0QA

Prepared by Bhupati Chakrabarti & Manimala Das with inputs from Pradipta Panchadhyayee

Report (NANSI)

Overnight Sky-watching Event for School Students

On the night of April 26th, an engaging Overnight Sky-watching Event was organized by the Professor Rajendra Singh Science Exploratory (PRSSE) near Pench Forest, Nagpur, attracting around 65 enthusiastic school children aged 10-16 years. The Resource persons included, Prof. Hemant Kumar, National Co-ordinator of the National Astronomy Network of IAPT (NASNI), and Prof. S.W. Anwane, President SRC Vidarbha, Dr. Govinda Lakhotiya, Vice-President, SRC Vidarbha, Dr. Seema. Ubale, Director PRSSE, Dr. Prashant Ambekar and Dr. Jasmir Randhawa were the other senior faculties. Participants enjoyed a variety of activities such as popular talks on black holes and astronomy, telescope sessions to observe celestial bodies like the moon and Venus, hands-on activities for creating constellations, and guided sky walks. The event aimed to ignite curiosity about astronomy in young minds, offering them a unique opportunity to learn from experts and explore the universe's wonders. Such events are conducted annually to foster interest in sky-related inquiries among students enrolled in their year-long laboratory training program. The event was a resounding success, providing an enriching experience for all involved.

Govind Lakhotia

Report (RC-15)

Conduction of Part C, 2025 NGPE

This year the NGPE-2025, Part C was organized by RC-15, in collaboration with Indian Institute of Engineering Science and Technology, Shibpur, Howrah on June 7-8, 2025. A total of 14 students from across the country participated in the examination. Members of RC-15 played a pivotal role in various phases of this examination, which is a celebration of the problem-solving abilities, conceptual understanding, and practical insight of the examinees. It reflects their journey through physics so far and offers a stepping stone for future growth.

Dr. Syed Minhaz Hossain of Dept of Physics, IIEST, and a member of RC 15 was instrumental in successfully organizing this examination as being the Centre coordinator.

The day began with the Inaugural Session on the morning of 7th June, 2025. This session marks the formal commencement of the examination process and was graced by several dignitaries, faculty members, and students. A hearty welcome address was given by Dr. Krishnendu Mukherjee, HoD, Dept. of Physics, IIEST followed by a motivating inaugural speech by, Prof. U. M. S. R. Murthy, Director, IIEST. In his address, Prof. B. P. Tyagi, Chief Coordinator of Examination, IAPT warmly welcomed all students, invigilators, and staff, emphasizing the importance of conducting the examination with discipline, fairness, and academic integrity. Prof. P. K. Dubey, coordinator of NGPE delivered a brief but stimulating talk. The session set a tone of seriousness, preparedness, and encouragement, fostering a positive atmosphere as the examinations commenced. Dr. Shinjinee Das Gupta, Secretary of RC15 also welcomed the students.

The next session comprised of an intriguing talk delivered by Prof. Ananda Dasgupta of IISER, Kolkata. The title of his talk was "How the quantum keeps our secrets". He began by defining **cryptography** as the art and science of securing communication through coded messages. Then, he talked about the contribution of Feynman in the emerging cryptographic field of **quantum computing. He explained how the standard encryption using prime numbers i.e.,** RSA encryption has faced challenges with the advent of quantum mechanics. Prof. Dasgupta then discussed about working principle and downsides of the so-called unbreakable code, that is the "onetime pads". Elaborative discussion was made on the B92 protocol, which is a **quantum key distribution (QKD) and** uses **polarization of light**. His talk mesmerized the audience and piqued their interest in this cutting-edge research area.

In the post lunch session, a workshop was organized where Dr. Syed Minhaz Hossain of IIEST, Shibpur delivered a lecture with demonstration on "Image processing and video tracking apps". Students got the hands-on training on how to perform image analysis with "ImageJ" software, with specific programs of python, which can be carried out even by the smart-phone pydroid app, use of video tracker software. Hope this workshop will help them in realizing the power of **image processing** and **video tracking applications** tools for experimentation, analysis, and visualization.

On 8th June, 2025 the examination commenced from 8:30 am. The students had to perform two experiments each for one hour and one experiment for two hours. These innovative experiments have been designed by the senior members of RC 15 namely Prof. Surajit Chakrabarti, Prof. Bhupati Chakrabarti, Prof. Debapriyo Shyam, Prof. Ananda Dasgupta, Dr. Syed Minhaz Hossain, Dr. Pradipta Panchadhyayee and Dr. B. N. Das.

In one of the experiments students were asked to determine the refractive index of the material and the radii of curvature of a given equiconvex lens. They had to determine the approximate focal length of the equiconvex lens by focusing a distant object on to a wall and then adopting the u − v method to find a more accurate value of focal length, where the mobile torch will be used as the source. They were asked to employ the idea that an equiconvex lens can be used as a concave mirror for arriving at the final results.

Aim of other experiment is to analyse the given time-temperature data for cooling of the water and to study the associated characteristics. In this experiment. They need to draw a cooling curve from the supplied data. To find the rate of cooling they had to follow the procedure explained. They should use a mirror to draw the normal to the curve at different points. Then by drawing another line perpendicular to the normal students can get the values dϴ/dt at different temperatures. Finally, by plotting this data the constants of the equation representing the cooling curve can be estimated.

The third experiment aimed to determine the amount of Stokes' shift in the spectrum of a given liquid. In this experiment, the students shall study the Stokes' shift in commonly used inks in highlighter pens made using rhodamine dyes. Diluted pink highlighter ink shows strong yellow emission under green (532nm) laser excitation. The scattered yellow light breaks into red shifted green, yellow and red colored bands upon diffraction through a suitable grating (a transmission grating made by cutting a CD and lifting off the metallic coating was used in this case). The image of the diffracted spectrum can be recorded using a mobile phone's camera. The colored image can be analyzed to get the emission spectrum in two steps. First, by converting the pixel values of the image into a suitable length scale and then by calculating the corresponding wavelength values employing a suitable calibration technique, students got the brightness variation as a function of wavelength. Finally, by measuring the shift in the energy between the peaks of incident and emitted light, students were able to measure the amount of Stokes' shift.

Prof. B. P. Tyagi, Prof. P. K. Dubey and Prof. S.C. Samanta were the esteemed observers.

The chief graders of the three experiments were Prof. Ananda Dasgupta, Prof. Surajit Chakrabarti and Prof. Debapriyo Syam. The result was declared by Dr. B. P. Tyagi at the valedictory session. Dr. Syed Minhaz Hossain extended heartfelt thanks to all. We want to mention that this examination could not be conducted seamlessly without the effort of the members of RC15, the faculty members, staff and PhD scholars of Dept. of Physics, IIEST.

The entire team

Shinjinee Das Gupta &
Pradipta Panchadhayayee,

39th ANNUAL NATIONAL CONVENTION OF INDIAN ASSOCIATION OF PHYSICS TEACHERS - 2025

5th to 7th October, 2025

Venue: Goa University

Organized by
IAPT Goa RC - 21 and School of Physical and Applied Sciences Goa University

About the Convention

The National Convention of Physics Teachers brings together educators, researchers, and innovators from across the country to explore new trends, challenges and opportunities in teaching physics.

THEMES AND SUB THEMES

Empowering Physics Education

Quantum Science & Technology
- Quantum Computing
- Quantum Materials and Devices
- Quantum Simulation
- Quantum Optics & Photonics

Space Research Achievement
- Indian Space Mission
- Satellite Technology
- Indian astronomical observatories
- Astronomy public outreach

Physics Education Research
- Learning Physics through outreach
- Technology in Physics Education
- Pedagogical learning in Physics
- Use of AI in Physics Education

Challenges in Physics Education
- Laboratory infrastructure
- Diversity and inclusion
- Research &innovation in Physics
- Integrated & Holistic education

Highlights

- Eminent Physicist Talks
- Project Exhibition
- Awards
- Pre Convention Workshops
- Poster Presentations
- Oral Presentations
- Networking
- River Cruz

Registration Details

IAPT Members and participants

- **A - Participation:** Rs. 2500/-
  (Includes: Kit, Lunch, Convention Dinner)
- **B - Participation:** Rs. 6500/-
  (Includes: A + 4 nights sharing accommodation, breakfast, dinners)
- **C -Accompanying person:** Rs. 3500/-
  (4 nights sharing accommodation, breakfast, dinner)

Industry & Sponsorship

- **D - Industries:** Rs. 6000/- (Includes: A)
- **E - Sponsor:** Rs. 25000/-
  (Includes: A + Logo display)
- F- Sponsor: Rs. 50000/-
  (Includes: A + Logo display + Stall)

Abstract Submission Guidelines

Maximum Length: Maximum 250 words (Upto 1 page)

Formatting: Times New Roman, font size 12, single line spacing, justified alignment, Pdf format.

Bank Details for Payment

Name: INDIAN ASSOCIATION OF PHYSICS TEACHERS RC 21

A/C Number: 100710200017630

IFSC Code: BKID0001007

Bank Name: Bank of India, Panaji

Important Dates

Commencement of Online registration: 10th July 2025
Deadline for Online Abstract Submission: 10th August 2025
Communication of Acceptance of Abstract: 20th August 2025
Deadline for Online Registration: 30th August 2025

Contact Information

Registration Form Link: https://forms.gle/GAJL155tRb7neyzXA

Email: iaptgoarc@gmail.com

Welcome to International Conference of Physics Education 2025

Physics Education: Preparing for the future in the age of virtual labs, AI and Quantum Technologies

The main focus of ICPE-2025 is to bring together Physics Educators, Teachers, Researchers, Graduate Students, and Policy Makers working in Physics Education Research, Physics Teacher Education, and Physics Education from all parts of the world to share and exchange scientific information, views and experiences on essential issues in Physics Education and Research.

Significance of the Conference

ICPE, as an international gathering of physics educators, physics education researchers, physics teachers, and students of all levels, is a highly sought-after event on the calendars of all stakeholders interested in quality physics education. We invite you to join us in deliberating on Physics Education's present and future trajectory. This trajectory has been profoundly impacted by the COVID pandemic, which has resulted in the most inventive methods of content delivery at a mind-boggling pace. As a leading STEM discipline, Physics has excelled globally in research pertaining to subject-specific education, introducing innovative approaches to its content and pedagogy across all levels of Physics Education. India is presently executing the National Education Policy 2020 (NEP-2020), which anticipates a substantial transformation in the nation's approach to science and technology. ICPE-2025 presents a remarkable opportunity to engage with the global community, exchange experiences, and acquire knowledge from one another.

Themes

- Advancements in Physics Education Research
- Women in Physics
- Quantum Technology in Physics education
- New Techniques in Physics Education
- Physics-Enabled Virtual Adaptability in Education
- Development of Experiments for Physics Teaching
- Physics Outreach

Important Dates

Opening of Submission of Abstracts	5 June 2025
Opening Online Registration	Early bird, 5 June 2025
Closing of Abstract Submissions	31 July 2025
Acceptance Notification to Authors	30 August 2025
Closing of Early Bird Registration	31 August 2025
Closing of Online Registration	31 October 2025
Conference	16 – 20 December 2025

Contribution Types

Contributed Oral Presentation
Contributed Poster Presentation
Contributed Workshop Presentation

Type	Early Bird (Before 31st August)	Regular Registration (Before 31st October)	Late Registration
Academic and Government	Rs 6500	Rs 7500	Rs 8500
Students / School Teachers (India)	Rs 4000	Rs 5000	Rs 6000
Foreign delegates	USD 450	USD 500	USD 600
Private Organisations (Industry)	Rs 13000	Rs 15000	Rs 17000

Note: The registration fee includes a conference kit, three meals per day with tea/coffee, and local transportation to IIT Ropar (including pickup from Chandigarh Airport and Ropar Railway Station). The accommodation charges will be separate. More details about the accommodation will be updated soon.

Contact Details

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Website: www.icpe-2025.in

Submit Paper

https://indico.global/login/? next=/event/14213/

For More Information Visit
https://icpe-20025.in/

Submission Guidelines

The submission of abstracts for oral, poster and workshop presentations will be managed through a dedicated Indico page. To proceed with abstract submission, you are required to create login account and log in with your IBS Indico account.

Creating an Indico Global Account

- **On the Indico login page (https://indico.global/login/?next=/event/14213/), click on "Create one here" below the login fields.**
- **Fill in your "Email address" and complete the CAPTCHA, then click the "Send me a verification email" button.**
- **Check your email inbox and verify your email address by copying and pasting the link into a new browser tab.**
- **Complete the process to create your Indico profile.**

Invitation & First Circular (June-2025)

The IUPAP – International Conference on Physics Education (ICPE–2025) Flagship Conference of International Commission on Physics Education (ICPE) – C14 of IUPAP.

Date: 16-20 December 2025 | Venue: IIT ROPAR

Theme : Physics Education: Preparing for the future in the age of virtual labs, AI and quantum technologies

Welcome to the IUPAP – International Conference on Physics Education (ICPE) 2025! This flagship program, approved by the International Union of Pure and Applied Physics (IUPAP) C14 Commission, returns to India after a two-decade interval. The last event took place in 2005 at Vigyan Bhawan, New Delhi, organized by the Indian Association of Physics Teachers (IAPT) and launched by the then President of India, Dr. APJ Kalam, a scientist and former President.

Hosts & Venue

We are ready to host ICPE in India once more in the cool climate of the month of December. It will be co-hosted by the Indian Institute of Technology (IIT) Ropar, India, the Indian Institute of Science Education and Research (IISER) Mohali, and Indian Association of Physics Teachers (IAPT). IIT and IISER are leading National Institutes of Eminence. IAPT is the biggest body of Physics Teachers with an interesting vertical of school, college and university teachers from length and breadth of India for the last more than 40 years.

Ropar and Mohali are close to *Chandigarh* the capital city of Panjab and Haryana conceived and built under the famous French architect Le Corbusier. It is the first planned city of India after India and is known world over as city beautiful. Both Ropar and Mohali are in its neighborhood. This Area is known as an academic and research center of north India with premiere Universities and Research Institutions.

Significance of the Conference

ICPE, as an international gathering of physics educators, physics education researchers, physics teachers, and students of all levels, is a highly sought-after event on the calendars of all stakeholders interested in quality physics education.

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Themes and broad sub themes of the conference*:

- Advancements in Physics Education Research
- Quantum Technology in Physics Education
- Physics-Enabled Virtual Adaptability in Education
- Physics Outreach
- Women in Physics
- New Techniques in Physics Teaching
- Development of Experiments for Physics Teaching

*In each of these sub themes distinct tracks have been identified to facilitate participation in a variety of topics. Please see the suggested tracks

We hope to have a good number of participants from India and abroad. Effort has been to invite leading experts from across the world for plenary talks, invited talks, invited workshops, oral presentations, poster presentations, stage shows and a lot of opportunities to interact and network with Physics Education Community internationally. Looking forward to seeing you, to enjoy the conference, the deliberations and Incredible India.

Registration and Updates

To have more information and latest updates please visit conference website: https://icpe-2025.in/

Important Dates

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TEAM ICPE-2025 India

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Invitation & First Circular (June-2025)

A document to facilitate participation of Physics Community in India and abroad

Suggested **Tracks** *within the* **sub-themes**

To facilitate participation of IAPT members following are the suggested **tracks** *within the* **sub-themes**

Advancements in Physics Education Research

- STEM and Physics Education: Synergies and Challenges
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- Indigenous Knowledges and Physics Education: Including Indian Knowledge System (Astronomy, Metallurgy and Design & Architecture)

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Narlikar - as I knew

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Dr. Jayant V Narlikar was perhaps one of the very few great scientists who were abundantly known internationally at the very young age of their lives. I have seen the Narlikar, who died recently, in the year 1998 at the 85th session of Indian Science Congress held at the Osmania University, Hyderabad. Several obituaries were flooded in the social media upon his death, by touching the different angles of this great personality but I think a few important points relating to his personal, scientific and administrative traits were do not seem to appear anywhere. This prompted me to write a short obituary exposing these facts about Dr. Narlikar- which I have personally seen and heard directly from him or perceived indirectly from him, as reported in some national dailies during his visits to the Hyderabad.

One important thing was - his aversion to give the autograph directly. As it has been wrote in several newspapers, I have witnessed this in the tea break of the Plenary Sessions of the 85 th Indian Science Congress, where the Narlikar was also a Keynote Speaker. A student who was perhaps known very much about him, prompted for his autograph while he was taking the tea, in the break. At the moment Narlikar was softly declined to give his autograph but advised the student that- he could give his autograph provided that the student should send a letter to him with some interesting question on science. As we know, this is his usual way of giving his autograph, as a reply to such letters with the signature at the end of the answer. But that student was then very much emotional and also almost shivering with a heavy sweat, I think probably, with the shock of witnessing a world famous scientist from India, directly. So, the student was not ready to heed his advice and hence didn't stop requesting him for the autograph even though by then Narlikar had already completed his taking of the tea. Understanding the gravity of situation, contrary to his natural way of giving the autographs, Narlikar has agreed to give his autograph and obliged. This was probably for the first time to give his autograph directly when it was prompted. This is a very lesser known fact about the Narlikar for which I was not only a silent witness but also next in the row to receive his autograph immediately after he entered the auditorium, after the tea break.

In his plenary talk, one important thing he remarked as the take away point but I think this is the very lesser known fact attributed to him in the scientific world. This was perhaps his bold proposition, almost something like his Steady State Theory, as I think - "... it is our ignorance to think that all the physical laws applied to the phenomena on earth are equally applicable to the universe at large". It sounds something like - “the more is different” philosophy of the condensed matter theory. This is perhaps the very important argument to ponder over for the macro world, as I think.

In one of his several visits to the Astronomy Department of the Osmania University, Hyderabad, which hosted some internationally acclaimed researchers like Prof. K.D. Abhyankar, Narlikar expressed his views on the science administration. He expressed his aversion on "applying the same routine auditing and accounting procedures for the research establishments" because the universities or research centres are not just the government offices to oblige the same routine procedures. He argued for the separate auditing and accounting procedures relevant for the scientific establishments and this was rarely reported anywhere, as I know.

Finally, the Telangana or the Undivided Andhra Pradesh had sought the services of Dr. J .V. Narlikar for the Department of Astronomy, Osmania University, Hyderabad, which is one of the oldest and very few separate departments for the astronomy in the country. The efforts were on when Sri B. Satya Narayanan Reddy of Shadnagar (now in Telangana) was working as the Governor from the Andhra Pradesh. But unfortunately, that was not fulfilled for the various reasons and this story was reported at times in the national dailies from Hyderabad.

With these new perspectives on him, I feel privileged to complement his great legacy.

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More on the `Product to Practice' Transition !

In this column we continue our discussion on the `product to practice' transition theme. We discuss a concrete example - the practice of making approximations - illustrating how physicists and physics teachers can contribute to facilitating this approach. We then move on to a related construct in PER called `epistemic agency'.

As discussed earlier, mathematical model building can be considered as the quintessential practice of physics. If we delve a bit deeper, we can see that it is in fact an ensemble of different scientific practices, of which making approximations is a common one. Approximations play a vital role in simplifying mathematical models and making them computationally tractable. It is intertwined and closely related to the practice of idealization, through which one transitions from the physical world to the world of physics or mathematical representations. The below paper presents some elementary aspects of approximations that are commonly encountered in college physics. It describes the design and development of a questionnaire we constructed to probe student conceptions of these elementary aspects recurring in different contexts in physics up to the senior undergraduate level. The questionnaire comprising of 14 multiple choice questions, divided into two paired parts, was administered to students from six different institutions spread across the country and analyzed.

Mashood, K. K., Kumar, A., & Mazumdar, A. (2024). Student understanding of approximations in physics. International Journal of Mathematical Education in Science and Technology, 55(9), 2316-2348. https://www.tandfonline.com/doi/pdf/10.1080/0020739X.2022.2149428

Coming back to the `product to practice' transition and let us reflect, how approximations are taught in our classrooms which mostly follows the traditional lecture based pedagogy. They are often just stated - in other words transmitted as a `product' - which students are expected to take as it is. A cliché example is from the derivation of simple pendulum, where at some point we state `now we take sin???' ! If we can recast the pedagogy of derivations as mathematical model building then naturally making approximations will get turned into a `practice' with clear rationale. The different themes pertaining to approximations discussed in the above paper will help teachers see making of approximations from the practice perspective.

When students start engaging in practices in contrast to being mere recipients of finished `products' of knowledge, their positioning in the classroom as a learner changes radically. This is referred to in the PER literature by the construct `epistemic agency'. In simple words students start developing ownership (or agency) in constructing the knowledge, which they are learning. The typical example of a scenario where there is no epistemic agency is the traditional lecture format where students sit with little engagement, no interactions except for some occasional clarificatory questions, silently noting down whatever is being transmitted by the instructor, rote memorizing it and then regurgitating in the exams. For more discussion on this and the importance of the notion, please refer to:

Miller, E., Manz, E., Russ, R., Stroupe, D., & Berland, L. (2018). Addressing the epistemic elephant in the room: Epistemic agency and the next generation science standards. Journal of Research in Science Teaching, 55(7), 1053-1075. https://onlinelibrary.wiley.com/doi/pdf/10.1002/tea.21459

As the paper suggests, it is important that we provide `opportunities for students to actively engage in knowledge construction themselves-to be doers of science, rather than receivers of facts'. And in this context a practice centered approach which enables epistemic agency of the learner is of significance!

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