₹ 25/-

ISSN 2277-8950

Bulletin of

THE INDIAN ASSOCIATION OF PHYSICS TEACHERS

A MONTHLY JOURNAL OF EDUCATION IN PHYSICS & RELATED AREAS

VOLUME 14 NUMBER 09 SEPTEMBER 2022

The CREX Collaboration, a large group of researchers from different universities worldwide who are involved in the Calcium Radius Experiment (CREX), has recently collected a precise measurement of the broken mirror symmetry in the elastic scattering of longitudinally polarized electrons in ^{48}Ca which is a signature of the nuclear weak force. Their measurement allowed them to determine the difference in the distribution of neutrons and protons within the ^{48}Ca nucleus. Their experiment was performed at the Thomas Jefferson National Accelerator Facility (JLab), in Newport News, Virginia. The image (above) shows the electron-beam's eye view of the green laser light in the Compton beam polarimeter used for CREX in Hall A at Jefferson Lab.
(https://phys.org/news/2022-08-precise-neutral-weak-factor-ca-.html)

The Story Of Cosmology Through Post Stamps 24

OBSERVATIONAL ASTRONOMY

SPACE TELESCOPE / OBSERVATORY

It is a telescope located in outer space. It avoids the filtering of ultraviolet frequencies, x-rays and gamma rays; the distortion -scintillation of electromagnetic radiation; as well as light pollution which ground based observatories encounter. In 1946 Lyman Spitzer suggested the idea of space observatory.

The souvenir sheet depicts Edwin Hubble with his telescope in the vignette

Set of six celestial objects, photographed by Hubble Space Telescope are depicted in stamps Brief description of each .is printed at the back side of each stamp

Edwin Powell Hubble (1889-1953) with Hooker Telescope at Mount Wilson Observatory established the field of extra galactic astronomy and observational cosmology, provided famous Hubble's Law that redshift increases with distance and suggested that nebulae are actually Galaxies beyond Milky way

Gala Satellite; consist of Space observatory be ESA to create 3d Image of Milky Way (launched by ISRO)

Miniature Sheet – depict Hubble Telescope in Orbit, launched in 1990 have 2.4m mirror reflector RCT and instrument to observe in UV, IR and visible light

BULLETIN OF
INDIAN ASSOCIATION OF PHYSICS TEACHERS
http://www.indapt.org **(ISSN 2277-8950)**

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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 on physics and related areas. Further, the Bulletin also highlights information about the activities of IAPT.

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Enjoy Physics

Physics is regarded difficult – even physicists believe it. But if we look it this way – creating new physics and understanding what already exists – it is not any more difficult than , say, music. Creating new physics is as difficult as inventing a new note in music, or, for that matter, adding anything new in the already existing product of human endeavor. The difference lies in the fact that physics as such does not affect your senses in a direct manner as music or painting does - which immediately stir your emotions . But those who do physics enjoy it in the same manner as the music lover enjoys the music. Reason is simple – one will enjoy a thing if one is familiar with the finer points of the same. A casual onlooker of a cricket game, no doubt , gets pleasure watching it but a cricket player enjoys every bit of that, to the extent of comments on the wrong moves .

The activities which affect your senses in a direct manner give you more pleasure. Physics is different. Here one has to make a distinction. Physics based activities like a magic show can be very enjoyable, a viewer does not need to know physics for that. But to get pleasure out of doing physics, one will have to know the physics that already exists.

So, students please, come and learn the physics that already exists so that you can enjoy doing new physics and contribute in building the edifice of physics higher and higher.

U.S Kushwaha

PHYSICS NEWS

The entanglement of two quantum memory systems 12.5 km apart from each other

The quantum internet could open fascinating possibilities for numerous quantum technology applications. For instance, it could enable more secure communications, more precise remote sensing and distributed quantum computing networks. Researchers have recently demonstrated quantum entanglement between two memory devices located at 12.5 km apart from each other within an urban environment. Their paper could be a further step towards the development of a quantum internet.

While some previous studies had demonstrated quantum connections over long distances, they primarily involved the transfer of entangled photons. On the other hand, this research is towards the entanglement between two atom-based quantum memory devices. This could enable connectivity between several different nodes, which is a key requirement for establishing reliable quantum computing networks.

Read more at : https://phys.org/news/2022-08-entanglement-quantum-memory-km.html

Original paper : Physical Review Letters (2022). DOI: 10.1103/PhysRevLett.129.050503

Evidence for a new type of disordered quantum Wigner solid

Physicists have been trying to determine the ground states of 2D electron systems at extremely low densities and temperatures for several decades. The first theoretical predictions for these ground states were put forward by physicists Felix Bloch in 1929 and Eugene Wigner in 1934, both of whom suggested that interactions between electrons could lead to ground states that had never been observed before.

Researchers have gathered evidence of a new state that had been predicted by Wigner, known as a disordered Wigner solid (WS). Measurements of the team's sample's resistivity and differential resistance showed that they had in fact observed a new quantum WS at a zero magnetic field, using an anisotropic material system.

In the future, these recent findings could thus inspire new theoretical and experimental studies aimed at better understanding this newly identified quantum state with an intrinsic anisotropy. These studies could, for instance, try to determine the state's characteristic lattice shape.

Read more at: https://darik.news/usa/science/evidence-for-a-new-type-of-disordered-quantum-wigner-solid-2.html

Original paper : Physical Review Letters (2022). DOI: 10.1103/PhysRevLett.129.036601

Researchers demonstrate error correction in a silicon qubit system

One important challenge today is choosing what systems can best act as "qubits"—the basic units used to make quantum calculations. Some of the popular systems today include superconducting circuits and ions, which have the advantage that some form of error correction has been demonstrated, allowing them to be put into actual use albeit on a small scale. Silicon-based quantum technology is known to have an advantage in that it utilizes a semiconductor nanostructure similar to the current production technology.

However, one major problem with the silicon-based technology is that there is a lack of technology for error connection. Researchers have now demonstrated full control of a three-qubit system (one of the largest qubit systems in silicon), thus providing a prototype for the first time of quantum error correction in silicon. Their next step will be to scale up the system working together with semiconductor industry groups capable of manufacturing silicon-based quantum devices at a large scale.

Read more at : https://phys.org/news/2022-08-error-silicon-qubit.html

Original paper : Nature (2022). DOI: 10.1038/s41586-022-04986-6.

Pankaj Bhardwaj
ASML Holding
The Netherlands

ARTICLE

Metastable Phases Of Materials: An Opinion

Dr. N.V. Chandra Shekar, Dr. Mayanka Chandra Shekar, Sh Vivaswan Chandra Shekar

ஆவித்³யகம்ஶரீராதி³ த்³ரு'ஶ்யம்பு³த்³பு³த³வத்க்ஷரம்।
ஏதத்³விலக்ஷணம்வித்³யாத³ஹம்ப்³ரஹ்மேதிநிர்மலம் -ஆத்மபோதா ॥ 31 ॥ (tamil script)

The body and so on, created by avidya and of the nature of an object, are perishables, like bubbles. Realise through discrimination that you are the stainless Brahman completely different from them. – Atma Bodha (31) by Adi Sankaracharya -Translation by Swami Nikhilananda

Although humankind is aware of the impermanence of the body, they aspire to own and work with the most "*stable*" substances. An undeniable example are the structures of rocks and stones humans have built - which are relatively stable surviving for hundreds of years. If we look at our daily life, the aspect of "*stability*" is associated with many materials – which seem permanent. Salt is one such substance which seems permanent! Sodium gives its outer most electron to chlorine; a very stable compound is formed, with a stable octet electronic structure. Also, because in transferring electrons and becoming ions, very powerful electrostatic forces are established between ions of opposite charge, it also forms a very stable cubic structure. It is known that materials which usually decompose rapidly are stabilised with a coating of salt – pickling. By the same token, products are often marketed with a slogan about their permanency - "Diamonds are forever".

In common terminology, a chemical substance is said to be "stable" if it is not particularly reactive in the environment like in the presence of air, moisture or heat, and under the proposed conditions of application. Principally so if it retains its useful properties on the timescale of its expected usefulness. Conversely, the material is said to be unstable if it can corrode, decompose, polymerize, burn or explode under the conditions of anticipated use or normal environmental conditions. In this report, we look at '*meta'-stable* materials that are not stable from a thermodynamics perspective.

What is a metastable phase-thermodynamically?

In physics, metastability is a stable state of a dynamical system other than the system's state of least energy. A metastable phase is one which has a chemical potential or Gibbs' free energy less than that for any other known phase of the same composition and which is separated from a stable phase (of minimum free energy) by a finite barrier or activation energy. It is well known that near the transition temperature or pressure the free energy difference (between the stable and metastable phases) is vanishingly small, whereas the activation energy may be up to 1 eV. Also, a metastable system is one in which one or a few of its relaxation processes are too slow to measure in at least some thermodynamic experiments. At low enough temperatures, therefore, it is probable that the same chemical entity may form, exist, and persist (if not forever, for a significantly long time by experimental standards) in any one of the several metastable arrangements. . Therefore, not formation, not existence, and expressly, not persistence are sufficient criteria as indications of thermodynamic stability.

This logically leads to the consideration that such metastable arrangements of materials are rife in the world of materials science. And indeed, they are.

Metastable phases in condensed matter

Metastable phases can be found in all disciplines of Materials Sciences, from Metallurgy to Biomedical Sciences. Some of these are established and well-researched. An example of one, contrary to popular

belief, would be diamond. It is a stable phase only at very high pressures but is a metastable form of carbon at standard temperature and pressure. It can be converted to graphite (plus left over kinetic energy), but only after overcoming a Himalayan activation energy of about 370 kJ/mol. This cues in the familiar sense of its permanence.

Another notable example is Anatase, which is a metastable polymorph of titanium dioxide found in igneous and metamorphic rocks. Despite commonly being the first phase to form in many synthesis processes (as a consequence of lower surface free energy than other phases of TiO_2), it is always metastable. While rutile is the most stable phase at all temperatures and pressures. Anatase has been well studied due to its high photo-catalytic performance in many applications.

Furthermore, there are many esoteric metastable materials found participating in biological processes. One example of such a material that is quite recognizable is Adenosine triphosphate or ATP. ATP is a highly metastable molecule. It is the intracellular energy *currency*, facilitating several metabolic pathways. It is also employed in several other extracellular mechanisms, e.g., as neurotransmitters [12]. Although it has been seen that extracellular ATP in abiotic conditions is quite unstable, the lifetime of an ATP molecule can range from less than a second to a several hundred seconds depending on the mechanism surrounding it [11]. Further, they have several biomedical applications, e.g., in diagnosis and treatment protocols in cardiology, pulmonology and oncology.

Apart from naturally occurring metastable phases of recognizable materials, there are a myriad of materials synthesised through decades of research and development in applied and industrial sciences. A preliminary example could be Martensite, a metastable phase used to control the hardness of most steel.

Generally, emulsions/colloidal systems and glasses are metastable too. For example, the metastability of silica glass is characterised by lifetimes of the order of 10^{98} years compared with the lifetime of the Universe which is about $14x10^9$ years!

High entropy alloys (HEAs) are found by mixing equal or relatively large proportions of five or more elements. They have been found to possess desirable properties like higher fracture resistance, tensile strength, corrosion, and oxidation resistance than conventional alloys. It has been found that the compositional metastability of HEAs enables a large degree of freedom for precipitation design.

Several reports suggest the formation of new metastable semiconducting alloys with compositions deep within a compositional miscibility gap. These have resulted in increased photoluminescence intensity, minority carrier lifetime, and carrier mobility. The use of metastable alloy materials within device structures can expand the range of optical and electronic properties.

Metastable *high-pressure materials* often possess outstanding properties. However, the stabilization of metastable high-pressure materials is challenging. w-BN is a metastable high-pressure polymorph of BN (Boron Nitride) with a wurtzite structure. New reports show a system of metastable phases could be synthesised by 3D networks of planar defects [8].

Metastable phase of methylammonium lead iodine ($MAPbI_3$) and similar compounds are excellent solar to electric power converters with efficiencies - PCE-20%. This extraordinary performance of these metastable compounds is due to their large absorption efficiency, favourable band gap, high charge mobility, and long-range electron-hole transport [9].

It is evident that many technologically relevant materials are kinetically stabilized and not at their true thermodynamic minimum, i.e., they are metastable. Many of these kinetically stabilized materials show improved functionality over their thermodynamically stable counterparts. Despite the increasing appreciation for the technological importance of metastable materials, there has been a dearth in systematic ways to incorporate and actively design for functional

metastability. Discovery of novel metastable material for target applications has become one of the main pillars in advancing technology, which has been revolutionised by high-throughput Density Functional Theory (DFT) and the material databases that emerged from it. The biggest challenge is this accelerated material design paradigm is the lack of the capability to predict the synthesizability of material. There is an attempt setting the upper limit on free energy on the basis of the amorphous state.

Design of thermodynamically metastable materials

In a recent report on large-scale data mining, scientists have explicitly quantified the thermodynamic scale of metastability of several thousands of observed inorganic crystalline phases. They propose that "*Synthesis of novel metastability crystalline phases should target conditions where they are thermodynamically stable and aim to kinetically retain the conditions where metastable. If conditions of thermodynamic stability cannot be found, realization of the predicted metastable phase may not be possible*" [3].

The Centre for Next Generation of Materials Design (CNGMD) couples first-principles theory with state-of-the-art synthesis and characterization to understand and predict structure, properties, and phenomena at the molecular, nano, and meso scales. Further, the centre is specifically designed to overcome four critical scientific "gaps"—multiple-property design, accuracy and relevance, metastability, and synthesizability—to make computational materials design a robust tool delivering new functional materials. Their initial materials focus has been semiconductors for solar energy conversion, solid-state lighting, and related technologies [10].

These efforts might pave the way for designing and making promising next-generation materials for use in everything from semiconductors to pharmaceuticals to steels.

Synthesizability of metastable materials

With the increase in the prevalence of Artificial Intelligence, many techniques help accelerate the synthesizability of metastable materials. Autonomous experimentation has shown the accelerated timeline for material synthesis. This autonomous reasoning agent-based method plays a unique role with metastable materials, as they require unconventional parameter space to achieve equilibrium. The Scientific Autonomous reasoning agent uses a parallel material synthesis approach and employs optical spectroscopy to rapidly identify phase transitions [13,14]. Before the experiment stage, the synthesizability of metastable materials becomes a question that needs to be answered. The latest deep learning approaches have shown the ability to predict the synthesizability of material based on a 3-dimensional image of the structure [15]. With the rapid growth in ai-based generalizable models, we might be able to predict possible equilibrium states for a given metastable material prior to synthesis. Opening the world of metastable possibilities through artificial intelligence.

References For Further Reading

1. R. Roy, *Neglected role of metastability in high pressure research*, in Reactivity of Solids, Eds: Mitchell J W, DeVries R C, Roberts R W, Cannon P (Wiley-Inter-science, New York, 1969) p777

2. N. V. Chandra Shekar and K. Govinda Rajan, *Kinetics of pressure induced transformations: A review*, Bull. Mat. Sci. **24** (2001) 1

3. M. Aykol, S. S. Dwaraknath, W. Sun, K. A. Persson, *Thermodynamic limit for synthesis of metastable in organic materials*, Sci. Adv. **4** (2018) eaaq0148; https://newscenter.lbl.gov/2016/11/18/new-understanding-metastability-clears-path-next-generation-materials/

4. S. Wei, F. He, and C. C. Tasan, *Metastability in high entropy alloys, A review*, J. Mater. Res. **33** (2018) 2924

5. T. F. Fuech, S. E. A. Babcock and Luke Mawst, *Growth far from equilibrium: examples from III-V compounds*, Appl. Phy Rev. **3** (2016) 8040801

6. A. Jain etal, *Commentary: the material project: A material genome approach to accelerator materials innovation*, APL materials **1** (2013) 0110022

7. W. Sun, S. T. Dacek, Shyue P. Ong, G. Hautier, A. Jain, W. D. Richards, A. C. Gamst, K. A. Persson, G. Ceder. *The thermodynamic scale of inorganic crystalline metastability*, Sci. Adv. **2** (2016) 1600225

8. C. Chen, D. Yin, T. Kato, T. Taniguchi, K. Watanabe, X. Ma, H. Ye, Y. Ikuhara, *Stabilising the metastable super hard material wurtzite boron nitride by three-dimensional network of planar defects*, PNAS **116** (2019) 11181

9. G.P. Nagabhusham, R. Shivaramaiah, Alexandra Navrotsky, *Direct calorimetric verification of thermodynamic instability of lead halide hybrid perovskites*, PNAS **113** (2016) 7717.

10. *Center For Next Generation of Materials Design: About*, Cngmd-Efrc.Org, 2022,

    https://www.cngmd-efrc.org/about.html.

11. Nescerecka, A., Juhna, T. & Hammes, F. Behaviour and stability of adenosine triphosphate (ATP) during chlorine disinfection. *Water Research***101,** 490–497 (2016).

12. Agteresch, H. J., Dagnelie, P. C., van den Berg, J. W. & Wilson, J. H. Adenosine triphosphate. *Drugs***58,** 211–232 (1999).

AI-related material

13. Ament, Sebastian, Maximilian Amsler, Duncan R. Sutherland, Ming-Chiang Chang, Dan Guevarra, Aine B. Connolly, John M. Gregoire, Michael O. Thompson, Carla P. Gomes, and R. Bruce van Dover. "Autonomous synthesis of metastable materials." *arXiv:2101.07385* (2021). https://arxiv.org/abs/2101.07385

14. Ament, Sebastian, Maximilian Amsler, Duncan R. Sutherland, Ming-Chiang Chang, Dan Guevarra, Aine B. Connolly, John M. Gregoire, Michael O. Thompson, Carla P. Gomes, and R. Bruce van Dover. "Data from: Autonomous synthesis of metastable materials." (2021). https://ecommons.cornell.edu/handle/1813/104247

15. Davariashtiyani, Ali, Zahra Kadkhodaie, and Sara Kadkhodaei. "Predicting synthesizability of crystalline materials via deep learning." Communications Materials 2, no. 1 (2021): 1-11. https://www.nature.com/articles/s43246-021-00219-x.pdf

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ARTICLE

Microphones and Loudspeakers – An Introductory Survey

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Abstract

Microphones and loudspeakers are the primary components of a Public Address System. Various types of microphones, with different frequency response characteristics, are used selectively (depending on the requirement) for recording or amplifying the received audio signals. Loudspeakers, in turn, are used to broadcast audio signals (speech, music etc.) over a wide area. In this article, we shall discuss the working principles of some of the common types of microphones and loudspeakers.

Introduction

We are all familiar with microphones and loudspeakers (speakers in general). No large public gathering is complete without them: they are the primary components of a Public Address System. Police vans are usually equipped with microphones and loudspeakers to enable the officers to make announcements while moving. Important as the devices are, little effort has been directed towards expounding the principles of operations of these devices to Physics students. The aim of this article is to take a small step in the desired direction.

Microphones [1,2]

There are two main types of microphone: (1) The moving coil microphone; (2) the condenser microphone.

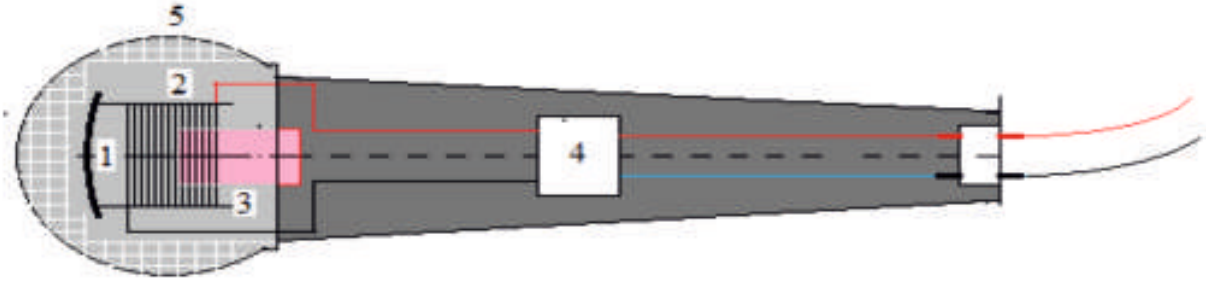

Fig. 1

1. The principal functional parts of a typical moving coil microphone are shown in Fig. 1. The coil ('Voice coil'), which is attached to a thin diaphragm, moves in accordance with the displacements of the diaphragm. The diaphragm is driven by the pressure exerted by the incident sound waves. As the coil moves to-and- fro over a permanent magnet, an alternating voltage of the same frequency as that of the incident sound wave is induced in the coil. This is magnified by a transformer and fed to an external processing circuit.

The sensitivity or 'response' of a microphone to sound waves (audio signals) arriving from different directions with respect to the axis of the device depends on its structural features.

For the microphone shown in Fig. 1, the angular distribution of sensitivity (which has azimuthal symmetry about the axis), when projected on a plane passing through the axis, looks like a cardioid (See Fig. 2). The distance from the centre of the coil to any point on the cardioid is proportional to the sensitivity in decibels.

Another well-known type (called 'omnidirectional') is equally sensitive to sound arriving from any direction.

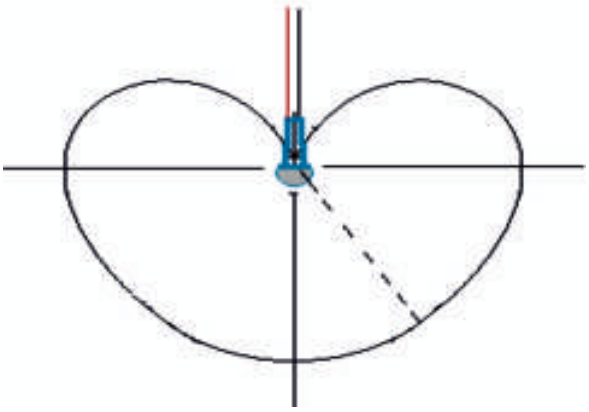

Fig. 2

2. The condenser-type microphone, as its name implies, employs a condenser whose capacitance (and hence the voltage across it) varies as sound waves hit the device, causing one plate to move towards or away from the other (fixed) plate. See Fig. 3.

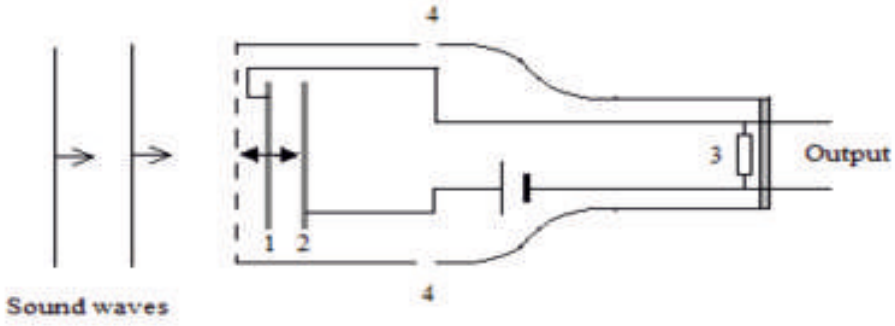

Fig. 3

An electret microphone is a type of condenser microphone where the externally applied voltage used for a conventional condenser microphone is replaced by the voltage due to the permanent charges in an electret material placed on the back plate. An electret is made from a ferroelectric material (like Barium Titanate) that has been suitably *polarized*. The name comes from *electr*ostatic and magn*et*; a static electric dipole moment is produced in an electret by the alignment of the molecular dipoles in the material.

Due to their good performance and ease of manufacture, a sizable fraction of microphones made today are electret microphones; according to some estimates annual production of electret microphones exceeds one billion units.

Electret microphones are used in many applications, from high-quality audio recording and lavalier (lapel or collar) microphones to built-in microphones in small sound recording devices and telephones. Before the introduction of MEMS microphones nearly all cell-phone, computer and headset microphones were of the electret types. Note that unlike other condenser microphones, they require no polarizing voltage (supplied by a battery, as shown in Fig. 3), but usually contain an integrated preamplifier that requires external power.

Circuit symbol used to depict a microphone

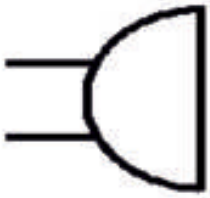

Fig. 4. Circuit symbol of a microphone

Methods used to reduce noise are shown in Fig. 5 and Fig. 6.

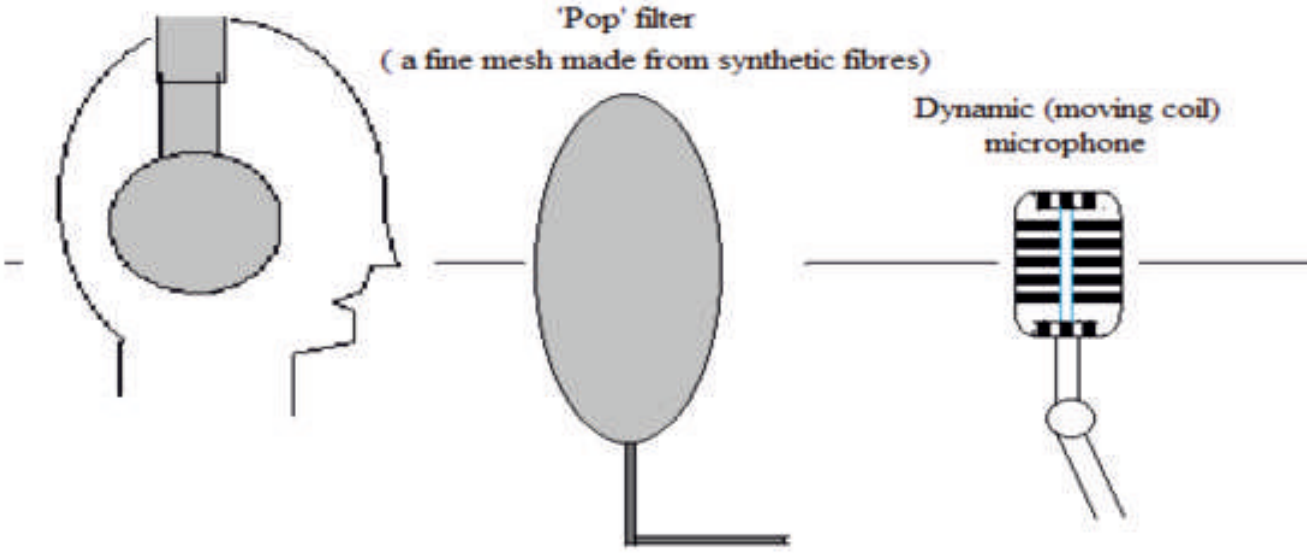

Fig. 5. A 'Pop' filter reduces 'breathing' or other inadvertently made 'blowing' sounds.

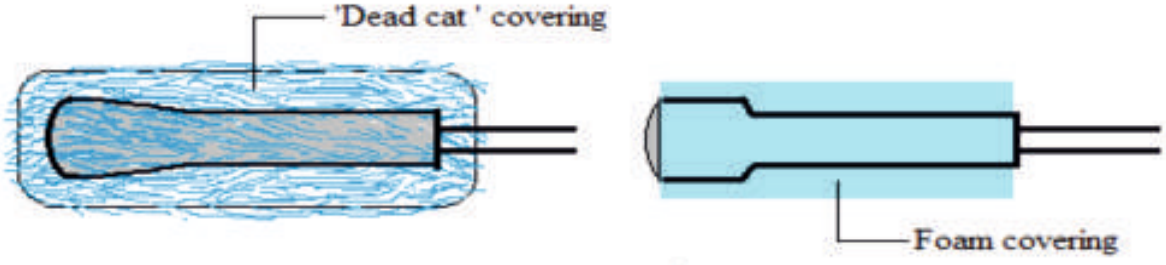

Fig. 6. 'Dead cat' (a thick fibre envelope) and 'Foam' covers prevent wind disturbances.

Speakers and Loudspeakers [3,4,5]

The diagrams given below show the cross-sectional view (Fig. 7a) and the front view (Fig.7b) of a common moving-coil-type speaker. Construction-wise, it is somewhat similar to a 'dynamic' microphone. Functionally, its action is opposite to that of a microphone: an oscillatory electric current fed to the 'Voice coil' causes it to move in a magnetic field. The movement of the coil is

communicated to a cone-shaped diaphragm attached to it; whose vibrations, in turn, result in vibrations of nearby layers of air molecules and that is how sound waves are produced.

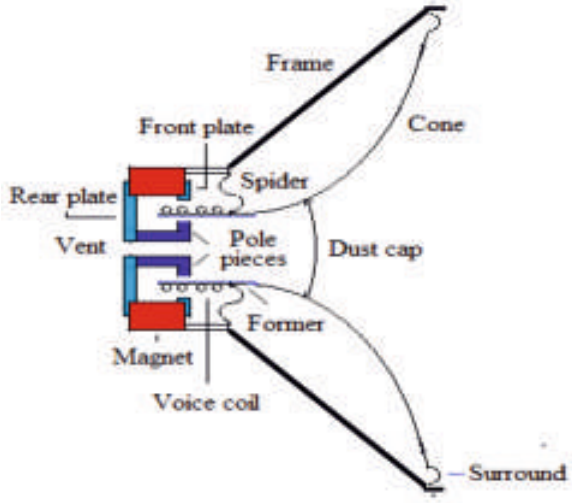

Fig. 7a

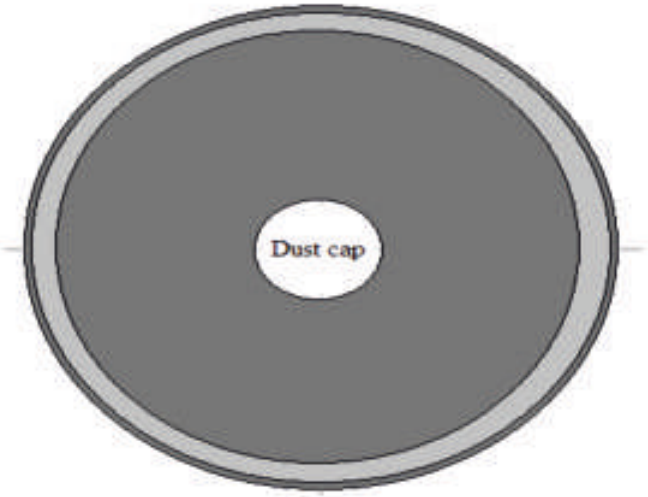

Fig. 7b

The horn loudspeaker:
A horn-shaped waveguide improves the coupling efficiency between the speaker driver and the outside air. It may be thought of as a device that provides impedance matching between the diaphragm that is driven by the oscillating magnetic force and the air outside the horn. This results in the delivery of greater acoustic output power from a given driver.

Acoustic impedance:
The acoustic impedance Z of a pipe [3] having cross-sectional area S, containing a medium of density ρ and velocity of sound v_s, is given by

$$Z = S\rho v_s$$

Impedance matching between two coaxial conjoined pipes with acoustic impedances Z_1 and Z_2 is achieved if

$$Z_1 = Z_2.$$

As is well known, maximum power transfer occurs when the impedance of the driver matches that of the load.
Suppose a sound wave travelling through the first pipe reaches the interface between the two pipes. When impedance matching is realized, all the sound energy that falls on the interface between the two pipes from the side of the first pipe gets transmitted to the second pipe (and vice-versa): the transmission coefficient (α_t) is 1 and the reflection coefficient (α_r) is 0.
If the media inside the two pipes are identical but their cross-sectional areas (S_1 and S_2) are different, then a part of the incident energy is reflected back into the incident channel. In such a case, the transmission co-efficient is given by

$$\alpha_t = \frac{4S_1S_2}{(S_1 + S_2)^2}$$

For example, if $S_2 = 4\ S_1$, $\alpha_t = 0.64$; for $S_2 >> S_1$, $\alpha_t \rightarrow 0$.

Consider now a sequence of 3 pipes, filled with the same medium, with

$$S_3=2S_2=4S_1$$

Suppose the wave-number of the incident wave is k and the length of the second tube is L. Then the transmission coefficient is

$$\alpha_t = \frac{4S_1S_3}{(S_1+S_3)^2\cos^2 kL + \left(S_2 + \frac{S_1S_3}{S_2}\right)^2 \sin^2 kL}$$

Using the assumed relations between S_1, S_2 and S_3, we have

$$\alpha_t = \frac{16}{25\cos^2 kL + 16\sin^2 kL}$$

Thus $\alpha_t = 1$, if cos kL = 0. On the average

$$\alpha_t = \frac{32}{41} \approx 0.78$$

which is also more than 0.64, the value obtained for two pipes with $S_2 = 4\ S_1$. Thus by dividing the horn of the loudspeaker into several sections with progressively larger areas, considerably larger output power may be obtained.

Incidentally, if each section of the pipe has the same length L and the cross-sectional area doubles after each section, then

$$S_i = 2S_{i-1} = 4S_{i-2} = \ldots = 2^{i-1}S_1 = e^{(i-1)\ln 2}S_1$$

If the sections are circular and D_i is the diameter of the ith section, it follows from the above equation that

$$D_i = e^{(i-1)\ln\sqrt{2}}D_1 \ .$$

So the flaring increases exponentially as a function of the index number 'i'.

As mentioned earlier, a horn loudspeaker is a speaker which uses an acoustic horn to increase the overall efficiency of the device that produces the sound. A common form (Fig. 8a) consists of a unit, called driver, which generates sound waves with a small metal diaphragm vibrated by an electromagnetic arrangement (Fig. 8c); the diaphragm is attached to the horn which is basically a flaring duct to conduct the sound waves to the open air. Fig. 8b shows a cross-sectional view of the horn as seen from its open end. The circumference of the open end of the horn equals the longest wavelength (lowest frequency) of sound that can be efficiently generated by the loudspeaker. As far as the angular distribution of the intensity of the emitted sound is concerned, higher frequency sound is mainly emitted in the axial direction; thus the distribution is anisotropic.

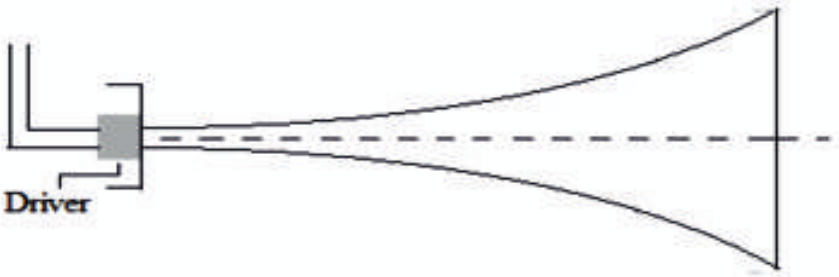

Fig. 8a

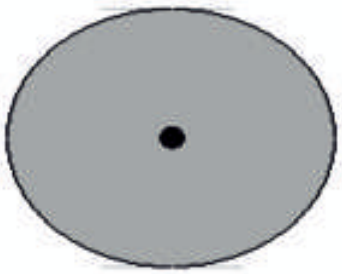

Fig. 8b

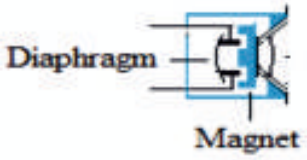

Fig. 8c

Another type of horn loudspeaker has a vibration driver mounted in an enclosure which is divided by internal walls to form a zigzag flaring duct which functions as a horn; this type is called a *folded horn* speaker (Fig. 9a). Fig. 9b depicts the front view of a typical folded horn speaker.

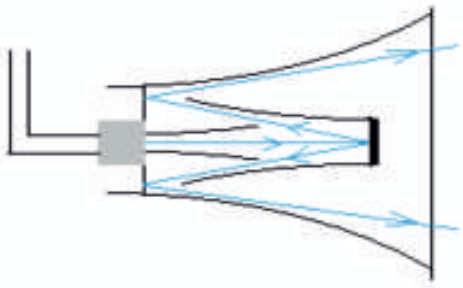

Fig. 9a

Fig. 9b

A different design principle is used for the horn in the 'Tractrix' speakers. A set of equidistant points (such as A, C, E) is marked on the axis of the horn. From the point (say, E) nearest to the driver, where the horn is to be narrow, a straight line of pre-fixed length is drawn at a small angle with respect to the axis. This is the line EF in Fig. 10a. From the next point, C, another line CD of the same prefixed length is drawn on the same side at an angle 2 to the axis. Similarly, another line AB of the same length is drawn from A; this line makes an angle 3 with the axis of the intended horn. This procedure is followed till the last point marked on the axis is reached. F , D and B are the corresponding points on the other side of the axis. Now a curve is drawn joining the points F, D, B etc. such that EF is tangential to the curve at F, DC is tangential at D and so on and similarly a curve is drawn joining F , D , B etc. These two curves give the profile of the horn (Fig. 10b). Incidentally, the length of the axis is so chosen that the tangent corresponding to the terminal point is perpendicular to the axis of the horn.

The shape of the horn in three dimensions can be obtained by rotating any one of these two curves around the axis.

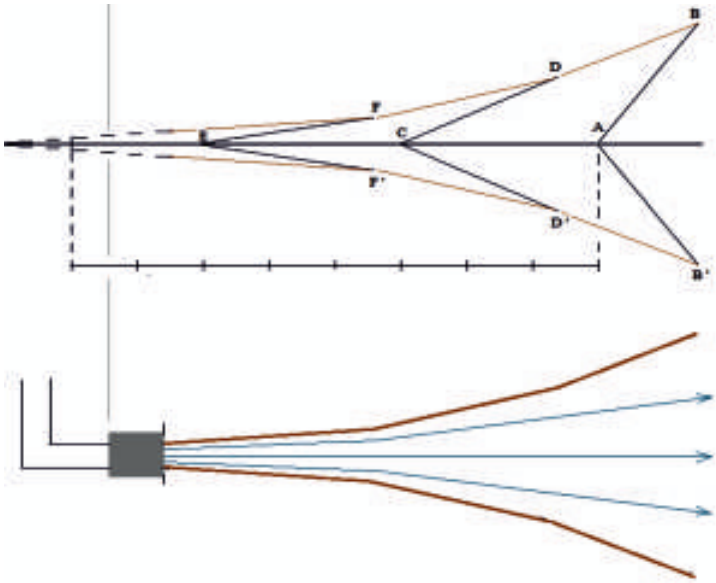

Fig.10. (a) Top, method used in the design; (b) bottom, a schematic profile.

An approximate analytical expression for the profile curve:
Let the X-axis and Y-axis of a coordinate system be aligned along the axis of the horn and perpendicular to it, respectively. Then, for the curve above the X-axis,

$$y \approx y(0) - \frac{1}{k} \ln(\cos kx).$$

If the length of the horn is H, $kH = \frac{\pi}{2}$, or $k = \frac{\pi}{2H}$.

Commonly used circuit symbols for a speaker (loudspeaker) are shown in Fig. 11.

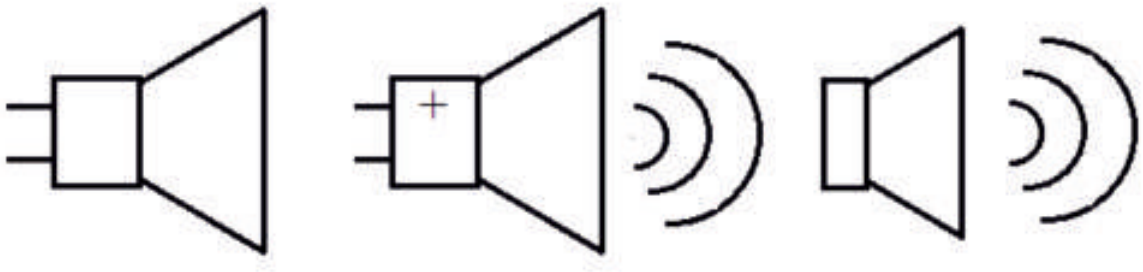

Fig. 11

Concluding remarks

It is hoped that this article will spur the interest of the reader to make deeper forays into the subject of 'sound engineering' – specifically, the designs and operating principles of different types of microphones and loudspeakers. The writer is not an expert in the subject, but merely a curious person. Many complex issues, not possible to cover in this article , are required to be to be adequately well understood before a commercially viable product can be launched. (Hints and references regarding these issues are given in the articles listed below).To get an idea about how much research work goes into the design of just the enclosure of a world-class speaker system (Bose speakers). I recommend that the reader look up Ref. [5].

References

1. Wikipedia entry on microphones (en.wikipedia.org/wiki/Microphone)
2. The Different Types of Microphones_Home Studio Essentials February 2022.html
3. D. P. Raychaudhuri, Advanced Acoustics (The New Book Stall, Calcutta, 1987)
4. Wikipedia entry on horn loudspeakers (en.wikipedia.org/wiki/Horn_loudspeaker)
5. D. G. Meyer, Introduction to Loudspeakers and Enclosures
[https://engineering.purdue.edu/ece103/LectureNotes/SRS_Speaker_and_Enclosure_Intro.pdf]

Experiential learning

Venue: NPS Chikkabanavara, Bengaluru

Date: 3 Aug 2022

No of Students: 89

Class: Std X, XI, XII

Teachers: 9-Biology, History, Maths, Chemistry, Physics, English, Languages, Social Studies.

Resource Person: Sarmistha Sahu

Topic: Science Skills

After two and a half year of pandemic and online classes, this was the first in-person interaction with students, for a hands-on activity. The Physics teacher, Ms Madhura P had kept the twin mirrors and accessories ready for the 20 odd groups of 5 students each. The informal student-groups had a fine mix of peer discussion and group activities.

The discussion in the beginning brought forth the knowledge creation that happens when you observe, analyse, imagine, and link the old ideas with new ones and create complex knowledge.

Pic1. Collaborative session.

Activities were suggested by the facilitator, the students performed and shouted out the results enthusiastically. Questions and brainstorming helped them to infer from their observations. The students thought aloud, shared their ideas and together they formulated a general equation for the angle of inclination of the mirrors and the corresponding images.A truly student-scientist effort!

The application of their equation to the life situations was even more interesting. Naman said "when the mirrors are at zero-degree inclination, the incident ray undergoes multiple reflections in the normal direction to give a large number of images in the 2 mirrors. We have seen this in malls, parlours, saloon, mazes and more!"

Mathematical expression by plotting graphs, determining the slope and intercept and plunking them together to give an equation, was all so neat and scientific. Daksh explained this to the group with confidence and charm and was treated with claps for minutes.

Pic2. Daksh's Solution To His Own Question

Further, the activities were geared to understand solid angles and its relationship with multiple reflection. A short demonstration was enough for the group to grasp and gauge the relation of the two. Three four activities and discussion were enough for Vishishtha to pronounce the relation succinctly, "4pi/solid angle = no. of object and images", a novel achievement of school students in a one and half hour hands-on activity!

Vote of thanks by the budding scientist, Khushi N marked the close of a very satisfying session.

Principal Ms Mary Thomas took time off to motivate her physics teacher by narrating her mother's passion of teaching Physics. Our immediately reaction was to see oneself in the story!

Sarmistha Sahu
Secretary

Voyage to Explore Roots of Prof. D.P. Khandelwal

Following the directions of Prof. Samanta and Prof. B.P. Tyagi, in the morning of 2nd August, 2022 Prof. Y.K. Vijay, Prof. K. B. Joshi and Dr. Vivek Mandot embarked on a journey from Udaipur to Dungarpur to explore reminiscences of a visionary student of physics, Prof. D. P. Khandelwal. Around 10:30am the trio stepped in to the premises of Government Maharaval Senior Secondary School, Dungarpur. This is the venue where IAPT has decided to organize its special session on 5th and 6th Sept., 2022 in the memory of Prof. D.P. Khandelwal. Principal of the school Shree H.C. Roat, Lecturer of Chemistry Shri Rajesh Choubisa and other colleagues from the science faculty of the school received the visitors. In the seminar room of the school the interaction meeting with students formally started. Principal Shri Roat pointed out importance and motivation of this interaction. He expressed his gratefulness to IAPT office bearers for choosing the Maharaval Senior Secondary School for the vital cause, purpose and mandate of the IAPT.

Outside the chamber of the Principal of Government Maharaval Senior Secondary School, Dungarpur.
From left Shree Rajesh Choubisa, Dr. Vivek Mandot, Shree H.C. Roat, Prof. Y.K. Vijay and Prof. K.B. Joshi.

The name of the school in 1906 is carved on a block above the peripheral structure of the gate "Pinhey School Dungarpur 1906".

Prof. Joshi spoke about the motivation, importance and purpose of organizing the interaction meeting in Dungarpur. He highlighted the work of Prof. D. P. Kandelwal and his contributions in making learning of Physics easy through simple experiments and playful methods. He conveyed the views of Prof. J. Varma who has been contemporary to Prof. Khandelwal and retired from the Physics Department of ML Sukhadia University, Udaipur. Prof. Varma has always been admirer of the grip and passion of Prof. Khandelwal on the basic concepts of Physics and the way he transpired these among students. Most of the time they had interaction in Jaipur where Prof. B.L. Saraf also used to join them in discussion and planning of developing experiments of nuclear physics and detectors. Occasionally he invited Prof. Khandelwal to Udaipur to conduct practical examinations and to discuss latest developments in teaching and research activities of mutual interest.

Presentation of Prof. Vijay and his interaction with students was the core of the program which went immensely well. Prof. Vijay performed live experiments and demonstrated phenomenon of diffraction by laser. Role of various types of obstacles on diffraction pattern using same source of a monochromatic light was performed live. The importance of measurement techniques was explained by creating curiosity of pressure measurement followed by preparing a device to measure pressure inside a balloon. The students participated in the learning process and understood how a query leads to development of a concept which turns into quantitative assessment. Using households items approachable to one and all, the concept of resonance was conveyed. Students responded how the concept is similarly applicable in a joyful swing in a park. Various configurations acquired by a number of mutually interacting atoms in a 2-Dimensional lattice was lucidly demonstrated. Students could easily grasp the notion of polymorphs using the model of magnetic balls floating in a water tub. The motion of an oscillator under various types of potential was visually explained. This helped students to develop insights and the rudiments of trap of a particle in potential well and then decay by means of tunneling.

Prof. Vijay and Dr. Vivek Mandot displayed a few movies made on real time experiments. The in phase and out of phase motion of vibration modes of methane molecule was simple in demonstration but profound in concept. Phase dependent motion, energy exchange mechanism through coupler and attainment of stable state were shown through movies. The entire program was participatory in nature. Students realised that physics can be made easy through such experiments. It brings and

nurtures innovative ideas, skill and critical thinking.
Interestingly, out of about 150 students 50 percent were girls from tribal background. They went home with a message that physics is there in every act of life, all the time wherever one is. One needs to look into these events with keen interest and scientific rigor. The students have hardly seen science teaching by such playful methods. The program rested eagerness of the incoming major program in the first week of September. The moderator Shree Rajesh Choubisa ended the program with vote of thanks to all who were instrumental in organizing this meeting including the IAPT.
In the post meeting interaction the plan of the September program was discussed with Principal Shree H.C. Roat and his colleagues. A visit of the facilities and infrastructure was taken. Locations were identified for the display of posters and exhibition of experiments. A request was made to get more information about Prof. Khandelwal and his connectivity with DungarpurFinally,

Thanks giving note and briefing about the incoming events of IAPT in Dungarpur on ,6 Spet.,2022 by Shree H.C. Roat and Shree Rajesh Choubisa.

Dr. Vivek Mandot lead the team to Veerbala Kalibai Government Girls College, Dungarpur. The plan was discussed with the Principal of the College Dr.P. L. Katara and requested him to encourage the students to participate in the forthcoming program of 5 and 6 September with zeal and enthusiasm. The team reached Udaipur at about 7 PM and departed giving a warm thank to Dr. Vivek Mandot for conducting this fruitful visit. .

Students watching the movies of various models.

To our readers

For change of address and non-receipt of the Bulletin, please write (only) to:
our New Address :

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Kalyanpur, Kanpur-208017
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Mob. : 09935432990

Minutes of EC Meeting

A meeting of executive members of IAPT was held on July (03 and 17), 2022. Following members were present:

1. Prof. P. K. Ahluwalia, President, IAPT
2. Prof. A. K. Jain, VP-Central Zone
3. Prof. Ranjita Deka, VP-East Zone
4. Prof. S. A. Masti, VP-West Zone
5. Prof. Ravi Bhattacharjee, VP-North Zone
6. Prof. P. N. Nagaraju, VP-South Zone
7. Prof. H. C. Verma, VP General and Coordinator NANI
8. Prof. O. P. Sharma, Member RC-01
9. Prof. Meenakshi Sayal, Member RC-02
10. Prof. Pawan Kumar, Member RC-03
11. Prof. Sunder Singh, Member RC-04
12. Prof. Y. K. Vijay, on behalf of Member RC-06
13. Prof. C. G. Limbachiya, Member RC-07
14. Prof. S. B. Mane, Member RC-08
15. Prof. P. K. Dubey, Member RC-09
16. Prof. A. K. Shrivastava, on behalf of Member RC-10
17. Prof. M. Krishnaiah, Member RC-11
18. Prof. M. S. Jogad, Member RC-12
19. Prof. Ananda Vadivel, Member RC-13
20. Prof. Makhanlal Nanda, Member RC-15
21. Prof. Samrat Dey, on behalf of Member RC-17
22. Prof. Kalipada Adhikari, Member RC-18
23. Prof. Miskil Naik, Member RC-21
24. Prof. Madhusudan C. on behalf of Member RC-22

Ex-Officio Members:

25. Prof. K. N. Joshipura, Immediate past General Secretary.
26. Prof. B. P. Tyagi, Chief Coordinator, IAPT Examinations.
27. Prof. Sanjay Kumar Sharma, Secretary, IAPT Kanpur Office
28. Prof. D. C. Gupta, Treasurer, IAPT

Co-Opted Members:

29. Prof. Bhupati Chakrabarti
30. Prof. G. Venkatesh
31. Prof. Anil Kumar Singh

Invited Members:

32. Prof. S. K. Joshi, Coordinator, NCEWP
33. Prof. Geetha R. S. Coordinator, NCIEP
34. Prof. Pradipta Panchadhyayee, Coordinator, NCICP
35. Prof. T. N. Soorya, Proposer, YAWA IAPT.

Following business was transacted on Sunday, July 03, 2022. (10:00 am to 5:30 pm)

Prof. Rekha welcomed all the members of Executive Council of IAPT and other invited members. Prof. P. K.

Ahluwalia, President, IAPT Chaired the meeting.

1. To read and confirm the minutes of last EC meeting.

Minutes of the last EC meeting held on January 28, 2022 were unanimously confirmed.

2. Statement of the IAPT President

Prof. P. K. Ahluwalia in his statement gave his impression about the activities and reach out to different RC's in the last six months. He touched upon the following points

(i) Rejuvenating IAPT Activities in various RCs: At the outset, Prof. Ahluwalia thanked all the members for helping initiating dialogue with the RC's and membersin their regions and sharing their concerns formally and informally with him and the General Secretary Prof. Rekha Ghorpade. He expressed his appreciation for the Zonal Vice-Presidents who are taking a pro-active role in reaching out to Regional/Sub- Regional Councils and facilitating meetings of the President and the General Secretary with the members of the ECs of the RCs of their respective regions.

(ii) Interaction with RCs: He informed that interactions with RCs for last six months has been an enlightening experience and that despite local constraints they are holding meetings to initiate both offline and online programs after the pandemic. He was glad that number of activities in the different regions have started happening on the ground. He congratulated Prof. Ranjita Deka Vice President North-East for encouraging RC's in her Zone, which is worth emulating to activate the dormant RC's. As a result in that region number of programs have been conducted. he further informed that following RC's have been virtually visited by him and the G. Secretary:

- RC 01 Delhi, Haryana
- RC 02 Punjab, J & K
- RC 03 Himachal Pradesh, Chandigarh
- RC06 Rajasthan
- RC 08 Maharashtra
- RC 12Karnataka
- RC 14 Kerala, Lakshadweep
- RC 15 W.B., Andaman, Nicobar, Sikkim
- RC 17 Assam, Arunachal Pradesh
- RC 18Tripura, Meghalaya, Mizoram, Manipur, Nagaland
- RC 21Goa
- RC 22 Telangana

(iii) APHO-2022: He congratulated Asian Physics Olympiad 2022 team and GEHU Dehradun as a host institution for flawlessly conducting this international event on-line in very trying circumstances, which has been a huge and creditable international event for IAPT supported by Ministry of Education, Govt. of India and Department of Science and Technology New Delhi. He thanked Prof. Ravi Bhattacharjee for leading this event successfully. He profusely thanked GEHU team of students and faculty, Prof. Tyagi and his team and the academic team who together put a lot of efforts in creating theoretical and experimental problems through many cycles of designing and fine tuning them.On behalf of IAPT, he put on record an appreciation to each member of the team APHO-22 and informed that they will be given a certificate of appreciation for undertaking this task.

(iv) IAPT's Role in NEP20: He shared the ideas generated during the meetings on workshop on syllabus in the light of NPE2022 and curricular frame works coming up at the level of NCERT and UGC, He proposed that IAPT as an apex body of the subject of physics must follow these developments and come out with position paper and Model Curriculum for school curriculum, college curriculum and university curriculum in the

subject of Physics. He suggested that IAPT must work on these position papers and Model curriculum frame works for presenting to the Ministry of Education, Govt. of India, UGC New Delhi and state Higher Education Councils.

(v) Hand Shake with Sister Organisations/ Institutes nationally and Internationally: In this regard Prof. Ahluwalia informed that he has started talking to sister organisations/institutes having similar interests. He conveyed that a channel has already been penned with Dr. Arun Grover (former VC Punjab Univ. and former Professor at TIFR) and currently Member of IUPAP (Physics Education) to help IAPT in organising international conference on Physics Education in collaboration with IIT Ropar in December 2023. He is also going to request Indian Physics Association to nominate one representative to IAPT EC.

(vi) Propagating Innovation hubs: Referring to the request from a Govt. agency from HP to set up 8 Innovation Hubs, He congratulated Prof. Y. K. Vijay and RC06 for making huge efforts to design experiments and setting up Innovation Hubs. He further said, it was satisfying thing that people are interested in quality activities of IAPT.

(vii) Good initiatives by RCs of Quality Programs: He informed, some of the RCs, e.g. Delhi &Haryana(RC1), Maharashtra(RC8), WB(RC15) are going ahead with innovative programmes which are exemplary and worth emulating. They are emerging as the leaders to reach the unreached. He suggested an exercise to all the states/regions with 100 or more members to become Sub RCs and encourage them to organize activities locally. He appreciated Maharashtra RC 08B, for conducting workshops by charging registration fees, which is an example to have self-sustaining activities and be followed.

(viii) Raising Funds: He thanked Finance committee members, Prof. ML Ogalapurkar, Prof. BP Tyagi, Prof. Ranjita Deka, Prof. Sanjay Sharma, Prof. D. C. Gupta for deliberating on fundings, proposals to strengthen the RCs financially.

(ix) He thanked IAPT community for coming forward to help our very dedicated central office staff Shri Vinod Prajapati, in his difficult times.

Lastly, he thanked everyone for being the part of this EC meeting

3. Agenda Items for discussion and decision

I. Update on Accounts and Finance.

a) Statement of Account: Prof. Sanjay Sharma, Prof. D. C. Gupta presented the Income-Expenditure statement for the financial year 2021-22. The audited statement will be shared in the bulletin.

b) Seed Money and Special Assistance to RCs with low NSE enrolment: Prof. Sharma and Prof. Gupta informed that the disbursement of seed money (on the basis of registration at IAPT exams) to RCs for the FY 2022-23 is in the process. The cheques to 18 RCs (in the name of President/secretary/treasurer) are already sent by registered post. The other RCs would receive their cheques within the week. They informed that It was decided by the finance committee that 'One time Incentive' of Rs 10000/- should be given to those RCs where the registration is very poor and their activities should not suffer due to lack of funds. It should be noted that this decision of financial strengthening of RCs is only for this year. However,Prof. Sharma appealed to the EC members that the states/regions must try to increase the enrolment for National Standard Exams and National Graduate Physics Exam to improve their share from the funds generated through NSEs and NGPE

c) Funding to CSC Midnapur: Prof. Shivanand Masti raised a query about the funding to IAPT CSC, Midnapur and Nagpur centres.Prof. Bhupati Chakrabarty informed that the funding to CSC, Midnapur is provided from the corpus created from the donation by Prof. S. C. Samanta in his name and his wife's name. He also informed that late Prof. Khandelwal created the corpus for IAPT Nagpur centre, however, the centre did not function further, so there is no question of funding to this centre. Prof. Makhanlal Nanda, EC member RC15 requested more funding to CSC, Midnapore. Prof. Tyagi mentioned that the Innovation Hub is installed at CSC without any charge

d) Prof.Babu Lal Saraf Birth Centenary Celebrations: Prof. P. K. Dubey, EC member RC09, requested for the funds for their forthcoming programmes of Late Prof. Babulal Saraf Birth Centenary Celebrations. He was suggested to submit the proposal in a prescribed format to the General Secretary, IAPT.

e) Remarks by the President: Prof. Ahluwalia also suggested that the members who have raised some points for the agenda of Finance committee may be invited for the Finance Committee meetings. He informed about the self-sustaining programmes conducted by some of the RCs.

II. Review on the distribution of bulletin online/print version

A very detailed discussion happened on the distribution of IAPT Bulletin as detailed below

a) Prof. **Sanjay** Sharma informed the members that very few members have responded to our request of 'Option Mail' for hard copy. Hence the printing of bulletin has not yet cut down.

b) Prof. A. K. Jain said we must think on highest expenditure on bulletin, while we may continue to have both, E-copy as well as physical copies. However, he suggested, it is not difficult to make 21 IITs in the country the institutional members thereby increasing the funding to the IAPT. Similarly, we may encourage other National institutions to become members. Three years, five years or life institutional membership may be created. He further suggested, to meet the higher expenses on the printing of bulletin, it can be made self-sustainable. Physical copy can be made available on subscription.

c) Prof. Ahluwalia shared his membership experience with KALYAN Magazine published by Geeta press, Gorakhpur. Instead of asking to fill up the form and send money, they send an annual volume by VPP. Similarly, IAPT bulletin annual subscription can start from January.

d) Prof. Bhupati Chakrabarty said, we are committed to provide the bulletin to the members. He suggested not to give option of payment/non-payment. Decide a policy and stick to it.

e) Prof. Sanjay Sharma reminded, by giving reference of the constitution, bulletin should be given free of cost to Life members. He also reported that only 150 requests were received in response to our request published in the bulletin from January to March 2022, as resolved in the EC meeting at Indore convention.

f) It was decided to publish the notification in the bulletin up to March 2023, till then we shall continue the current practice, as suggested by Prof. H. C. Verma.

g) It should be noted that, printing cost for large number of bulletin is less, while for small number it will be more.

h) It was decided to give only E-version of the bulletin.

i) Prof. Rekha Ghorpade suggested to create a window for updating the information of life members (current address, phone number, email address etc). A team of members can be assigned this task. Prof. Ahluwalia requested all the Vice Presidents to take the responsibility to update the information of life members. Data updation is done once in a year, however it should be done regularly. He requested Prof B. P. Tyagi to call a meeting for such a work. We must have a meeting dedicated for this point.

III. Status of the incorporation of amendments in the constitution passed by the General body:

Prof. D. C. Gupta informed the members, the application with the documents was submitted in the month of March 22 at the office of Registrar, Kanpur. However, it was returned to the office with the request to furnish the changes in exact item numbers. It was suggested to contact Prof B. P. Tyagi and Prof. J. P. Gadre for further action.

IV. Status of IAPT NSE Nagpur office

Prof. Rekha informed the members, Nagpur office has been closed in December 2021 and the material which was in good condition has been returned. (Ref: Mail received from Prof. Vijay Soman)

V. Report by Coordinator, APhO-22

a) Prof. Ravi Bhattacharjee presented a report on APhO-22which was hosted by India, with the Nodal centre at Dehradun. Prof. Ravi Bhattacharjee was the convenor.

b) Conduct: He informed the preparations for APhO-22 started in 2019. There were many hurdles due to

pandemic, which were resolved. Finally, it was decided in the month of January 22, that the event would be online. RC05, students, faculty and administrative staff at GEHU provided a great support. 21 countries with Japan and Brazil as guest countries participated in the event. Special softwares were developed for online tests, theory and experiments. He mentioned it was managed single handed by Dr. Praveen Pathak which was done professionally.

c) Quality of Question Papers: Central body minutes have highly appreciated the quality of question papers. The standards of the problems was very high and can be emulated in future.

d) In all, 11 gold, 13 silver, 34 bronze and 64 honourable mention were awarded.

e) Organising Effort: He appreciated Prof. Tyagi and his team at the background. The special thanks were given to Prof. Vijay Singh and Prof. Praveen Pathak for their extraordinary contribution towards Academic inputs through out the process of preparation of APHO-22. He informed, Prof. B. P. Tyagi will send a detailed report of APhO-22.

f) Report on the Indian Team's Performance: He requested Prof. Rekha Ghorpade, Leader of Indian team for APhO-22, to present a report on Indian Team. Prof. Rekha thanked Prof M. L. Ogalapurkar, the coordinator of Indian team and R. Jhunjhunwala college, Ghatkopar, Mumbai, the host college for the great support. The technical team played a very important role in conducting the tests online without any technical glitch. The timeline was maintained in downloading question papers, scanning and uploading the answer scripts. The other leader, Dr. Usha Singh, IPS Academy, Indore, Prof. C. K. Desai, Former director, Exploratory, Pune (observer) and Gr. Leena Joshi, Associate Professor, St. Xavier's college, Mumbai(observer) were profusely thanked. She also informed that there was no time to train the students of Indian team, and the performance was not very good. Indian Team was awarded one silver, 4 bronze medals and one honourable mention.

VI. IAPT Exams, Report by CCE

(i) Prof. B. P. Tyagi, CCE, presented a document on NSE-21. He raised concern about National Standard Exams. Last two years, due to pandemic two stages of exam, NSE (IAPT) and INO (HBCSE) were combined to have IOQs. Also, as the enrolment and centre allotment was done by the external agency, the problems faced by the candidates were out of control of IAPT. He informed this year IAPT wish to conduct NSE on our own. Prof. Venkatesh and some other members expressed the same. Prof. Ravi Bhattacharjee suggested to have committee to discuss these issues. Prof. Ahluwalia informed, IAPT is talking to HBCSE and there is a positive discussion taking place. Prof. Tyagi informed a timeline to be given to HBCSE. He also declared the NSE-22 would be held on 27th November2022.

(ii) Prof Rekha suggested, we can publish NSE-22 notifications only after NSC meeting, however, our preparations will continue.

(iii) General Secretary informed that HBCSE has sent a proposal to handover entire Junior Science Olympiad to IAPT from this cycle of Olympiad, i.e. 2022-23. All the members welcomed this proposal and resolved that IAPT should accept it. Prof. A. K. Jain raised a concern about financial arrangements. Prof. Rekha informed, sufficient funding is available from Govt. of India routed through HBCSE.

(iv) Prof. Anil Kumar Singh presented a document on NGPE-22.

(v) Detailed report on IAPT exams will be sent to bulletin by Prof. B. P. Tyagi, CCE, IAPT Exams.

VII. Report on NANI

a) New Anveshikas: Prof. H C Verma, coordinator, NANI informed that two new Anveshikas have been set up, namely:

1. HIM-IAPT Anveshika, Dharamshala, HP(RC03). Coordinator, Shri Dinesh Sharma.
2. ADARSH-IAPT Anveshika, Balurghat, WB(RC15). Coordinator, Shri. Nani Gopal Mondol.

Prof. Verma appreciated the efforts by RC03 and said this Anveshika has taken off with very high expression and has become active in a short time.Prof. Verma also appreciated the activities of Adarsh Anveshika too. He also informed the closing down of Vidya-IAPT Anveshika at Dhanbad due to some reason.Currently there are 27 Anveshikas functioning across the country.

b) NAEST Skill Test: NAEST, National Anveshika Skill Test 2022 preparations have started in January2022. Last two years it was conducted online with the technical support from IIT Kanpur. A program 'Physics Pe Charcha' is initiated and conducted periodically once a month, where teachers are invited to appear in model NAEST for their understanding and clarity. They are given previous year's question papers to solve and discuss till the concepts are clear. About 500 teachers have gone through this model. Prof. Verma informed, NAEST-2022 is collaborated with Shiksha Sopan and the website is created for registration: naest.shiksha-sopan.org16000 registrations are done and we hope to reach 1,00,000. He also informed that all the Anveshika coordinators are involved from this year. QPs are prepared; 4-5 persons spent two months, 4-5 hours almost every day through online meets. Two rounds are conducted: Screening round: Video based MCQs Prelims round: 1000-1500 students are screened to do suggested experiments at home with available things, no apparatus is provided, however the write up is sent. This exam has broken all the norms of formal exams, e.g. there is no invigilation. The grading is difficult task, as students' thinking is unlimited, different students would come out with different set of apparatus. Semi-finals and finals are at Kanpur. Parents accompanying students are very appreciative.

c) Appeal to all EC Members:

1. Help us taking the registration to 1,00,000 (Std 9-12, B. Sc. M. Sc. Students). Visit Website and encourage students for different experience.
2. Need about 300 evaluators for prelims. The evaluation is subjective, tough as no model solution is provided, and goes on for 2-3 months.

d) Appeal for Sharing the Technology with RC's by President: Prof. Ahluwalia appreciated the NANI activities, their IT team and requested Prof. Verma to share the Information technology interventions they have developed with RCs. He also suggested to have a by-line in all the advertisements, that, *NAEST is a Flag-ship program of IAPT*

VIII. Report on Innovation Hub:

a) Proprietary certificate of authentication: Prof. YK Vijay, President RC06 informed that there are 31 Innovation Hubs installed countrywide and two are in the pipeline, one at VVVS, Indore and the other at IISER, Kolkata.Recently, there is a proposal from Himachal Pradesh Government Agency for 8 Innovation Hubs and they have asked for the proprietary certificate of authentication that we are the sole manufacturer. He appealed the EC members to approve the same. Prof. Ahluwalia said, if some RC is doing some good work central IAPT must support it. He stated, IAPT can authenticate the proprietary item. After discussion, It was decided to give a proprietary certificate of authentication.

b) Registration of Innovation Hub on GEM Portal: Prof. Y K Vijay further brought before the EC the registration of Innovation Hub for GST and placing it on GEM portal, stating that seeing the popularity of the Innovation Hub which is growing the turnover might go beyond 20lakh in future. Currently it is around 15lakh.It was suggested to set up a committee to discuss the issue with Chartered Accountant of IAPT and Assistant Commissioner IT. The committee members will be Prof. B. P. Tyagi, Prof. Sanjay Sharma, Prof. D. C. Gupta, Prof. R. K. Khanna.Prof. Y.K. Vijay assured that they are doing their best to take the mission that the education should become self-reliant and the instruments which are designed are low cost and cost effective.Prof Ahluwalia informed the members that this will be RC 06 activity and will remain with RC 06. Central office will not take the responsibility of designing or setting up the Innovation Hubs or filling the GST returns. Prof. Shivanand Masti suggested, wherever the Innovation Hub is set up, that institution can be asked to become an institutional member.

IX. Report on NCEWP

a) Change of last date for NCEWP: Prof. Joshi appealed EC members to conduct RC level competitions and send best entries to central competition. He also requested to extend the last date. It was approved and Prof. SK Joshi was authorized to take the necessary steps. Dr. P. K. Dubey said the competition timing is not appropriate and is not suitable to students of many states. Prof. Rekha suggested to have notification for all the competitions in the

month of January from next cycle, so that students and teachers will have vacation time for preparations. Prof Ahluwalia said, this means asking IAPT EC to give relook to calendar of activities and publish it on the first day of January every year.

b) Prof. Joshi further recommended to publish good essays/prize winning essays in the form of E-Book and upload them on IAPT website. However, it may incur some expenses to get it done from a professional person. Proposed expenditure is Rs. 9000. Members approved this and resolved that Rs.10000/- may be sanctioned for this project. Prof. Ahluwalia shared his observation that, even the prize-winning essays require editorial intervention. He suggested, make an editorial team with Prof. S. K. Joshi as chief editor and take the help of professional who can do the job with Coral. Prof. Joshi accepted the suggestion.

X. Report on NCIEP

a) Announcement: Prof. Geetha R S, coordinator informed the members that the announcement of NCIEP-22 has appeared in May-22 issue of the bulletin and informed the changes in the guidelines, viz. i) the categories and ii) the prize money. These are notified in the announcement. Prof. Geetha requested EC members to propagate this at RC level and encourage the participation at NCIEP.

b) Proposal for Student- Teacher Combination for the Participation In NCIEP: Prof. Ahluwalia asked whether we can bring down this competition to school level involving class XI, XII students. Also, we can think of Student-Teacher combination for the participation at experimental competition. He suggested to have an 'Online Window' for this segment.The idea was appreciated. However, it was noticed that November may not be the good time for highschools and higher secondary students, as they have their exam schedule around that time.

c) Prof. Rekha suggested, after this cycle of NCIEP, we can give notification in the month of December/January. We may call this segment as Category C and have this competition online in July.Prof. Masti suggested this part of the NCIEP can be coordinated with Anveshikas, which will complement each other.Prof.Ahluwalia suggested, the coordinator may have team around her from across the country and there may be few observers.

XI. Report on NCICP

Prof. Pradipta Panchadhyayee could not attend afternoon session due to his prior commitments, however, he sent his report to GS. She presented the report on his behalf. Prof. Pradipta reported, since there are only 8 registrations received so far, the last date may be extended to August31, 2022. He requested the members to take several ways to circulate the flyer and enhance the participation. He also reported, the NCICP22 announcement is not uploaded on the website till date and earlier announcement only appears. There has to be immediate upload of important announcements to reach the targeted audience. GS requested Prof. B. P. Tyagi to do the needful.It was resolved that the last dates of NCIEP and NCICP will be extended to August 31, 2022.

XII. You Ask We Answer: A proposal: In the light of starting a column inIAPT Bulletin, namely You Ask We Answer to invite questions from the students and answering them a presentation prepared by Dr. T.N. Soorya was shared with the participants. Presentation detailed the algorithm for initiating it online. The proposal was appreciated by the members and it was felt that this initiative has a very high probability of reaching across every corner of the country. It was suggested that instead of getting a software for this purpose which may take too long a time, social media platform such as Facebook may be tried in the first instance and questions invited on this and answered there itself as a reply. It was decided to pursue this matter further after a brainstorming session in the core group and a dummy run for this may be tried and presented in the next meeting of the EC

XIII. Formation of Prof. Babulal Saraf birth centenary celebration (2023) Committee (RC 06 Rajasthan) and creating a corpus fund: Prof. YK Vijay, President RC06, informed the members that 2023 is the birth centenary year of Prof. Babu Lal Saraf. He proposed that a committee for this purpose may be created and detailed program be chalked out to celebrate his contributions as a teacher, researcher and a communicator of

science. The celebration should also underline Prof. Saraf's contribution in creating innovative experiments developed in Centre of Development of Physics Experiments in University of Rajasthan. Prof. YK Vijay came forward to do the needful and work for creating corpus for this purpose and that RC06 Rajasthan will take responsibility to do it on the same lines as was done for Prof. DP Khandelwal birth celebration.

XIV. **Formation of Prof. H. S. Hans Birth Centenary Celebration (2023) Committee (RC=03) and creating a corpus fund**: The matter of celebrating Prof. HS Hans Birth Centenary Celebration was raised by the president that the preparations be initiated by Prof. CN Kumar and program be chalked about on similar lines as has been suggested for item IV.

XV. The agenda of the meeting could not **be** completed till late 6.00 P.M.so it was decided to adjourn the meeting and continue at some convenient day and time at the earliest. General Secretary thanked all the members for attending the meeting for whole day and participating in its deliberations enthusiastically.

Proceedings of the meeting continued on Sunday, 17 2022

Following Members were present:

1. Prof. P. K. Ahluwalia, President, IAPT
2. Prof. A. K. Jain, VP-Central Zone
3. Prof. Ranjita Deka, VP-East Zone
4. Prof. Ravi Bhattacharjee, VP-North Zone
5. Prof. P. N. Nagaraju, VP-South Zone
6. Prof. H. C. Verma, VP General and Coordinator NANI
7. Prof. O. P. Sharma, Member RC-01
8. Prof. Meenakshi Sayal, Member RC-02
9. Prof. Pawan Kumar, Member RC-03
10. Prof. Devesh Tyagi on behalf of Member RC-04
11. Prof. Y. K. Vijay, on behalf of Member RC-06
12. Prof. C. G. Limbachiya, Member RC-07
13. Prof. S. B. Mane, Member RC-08
14. Prof. P. K. Dubey, Member RC-09
15. Prof. A. K. Shrivastava, on behalf of Member RC-10
16. Prof. M. Krishnaiah, Member RC-11
17. Prof. M. S. Jogad, Member RC-12
18. Prof. Ananda Vadivel, Member RC-13
19. Prof. Soumen Sarkar on behalf of Member RC-15
20. Prof. Samrat Dey, on behalf of Member RC-17
21. Prof. Kalipada Adhikari, Member RC-18
22. Prof. Miskil Naik, Member RC-21
23. Prof. Madhusudan C. on behalf of Member RC-22

Ex-Officio Members:

24. Prof. K. N. Joshipura, Immediate past General Secretary.
25. Prof. B. P. Tyagi, Chief Coordinator, IAPT Examinations.
26. Prof. Sanjay Kumar Sharma, Secretary, IAPT Kanpur Office
27. Prof. D. C. Gupta, Treasurer, IAPT

Co-Opted Members:

28. Prof. G. Venkatesh

XVI. Brief reports from following RCs were presented by RC representatives

Following Regional councils presented their reports of activities organised during January to June 2022

- RC 01 Delhi, Haryana
- RC 02 Punjab, J & K
- RC 03 Himachal Pradesh, Chandigarh
- RC 04 Uttar Pradesh
- RC 06 Rajasthan
- RC 07 Gujrat, daman & Diu
- RC 08 Maharashtra
- RC 09 Madhya Pradesh
- RC 10 Chhattisgarh
- RC 11 Andhra Pradesh
- RC 12 Karnataka
- RC 13 Tamilnadu, Puducherry
- RC 15 W.B., Andaman, Nicobar, Sikkim
- RC 17 Assam, Arunachal Pradesh
- RC 18 Tripura, Meghalaya, Mizoram, Manipur, Nagaland
- RC 21 Goa
- RC 22 Telangana

It was decided that RC reports will be published separately in the bulletin

XVII. Any other matter that comes before the chair.

(i) Student membership of IAPT Proposal by Prof. Mahesh Shetti: This is regarding how student membership of IAPT can be made effective, for this following activities may be taken for student membership:

a. Student members may help in organising IAPT programmes for RC and Sub-RC.

b. They may get priority in RC level programmes if selection is done or number of seats are limited.

c. Special journal/magazine may be run for the student articles and student members may get a copy of the same. This magazine can be of level of science reporter and hence may promote science communication skills

The matter was discussed and it was decided that student chapters in different institutions, Universities and colleges be created who can play a pivotal role in running the programs of IAPT. Student from among the student chapters be designated as Student Ambassadors and they be given enough autonomy to organise the programs of IAPT declared from time to time. It was also decided that in the light of this discussion Prof. Shetti be requested to fine tune the proposal for implementation.

General Secretary thanked the RC representatives for the reports, where many new initiatives on the part of RCs were tangible. And thanked all the members for their patience and participation in two days of this marathon Meeting. The meeting ended with a vote of thanks to the Chair.

Rekha Ghorpade
General Secretary

P. K. Ahluwalia
President

Science Sensitization Programme
A Unique 2-day Event

Date: 9-10 July, 2022.

Bhadrakali is a tiny village in the district of Paschim Medinipur of the state of West Bengal, 40 km away from the district town Midnapore and 25 km from IIT, Kharagpur. The school in this village Bhadrakali Gandhi Vidyapith that hosted the event is named after the Father of the Nation. This is perhaps to remind the future generations that once this area was the hot bed of August Revolution, part of British Quit India Movement in 1942, launched by Mahatma Gandhi.

More than 350 Students and teachers of fourteen neighbourhood schools participated in this festival. Yes, it was a festival after a great pandemic break when the students got a chance to meet their peers from other schools in the specially designed class rooms and dining halls along with delicious food and food for thought. Here one could see how a teacher explains a lot of basic physics and mathematics through participative demonstration using a first class lever prepared out of a home-made scale. In another occasion one might witness the enjoyment of the students through observation of the evolution of oxygen in the photosynthesis of hydrilla - the teacher designed an indigenous set for the purpose, out of plastic water bottles without spending anything, and so on. The students really enjoyed learning in this two- day event.

The Academic support was given by a science organization: EGRA Organization for Cultivation of Science, Egra, Purba Medinipur, West Bengal. Most of the resource persons are the life members of IAPT & each from a different school (Mr. Kanak Kanti Kar, H.M., Mr. Sharadindu Das H.M., Mr. Shankhadeep Pradhan, A.T., Dr. Subhasis Maity, A.T., Mr. Manik Panda, A.T., Mr. Rajendranath Maity, A.T., Mr. Amit Patra, A.T., Mr. Tanumoy Pal, TLC IIT KGP, Mr. Suman Kumar Dash, A.T., Mr. Asit Kr. Sahoo, A.T.). The president of OCS, the senior most teacher Mr Asit Kr. Sahoo of the host school, himself engaged in teaching chemistry through experiments. Mr. Asit Kr. Sahoo with the help of Mr. Suman Kr. Dash and TIC of the host school took initiative to organize the said Workshop & all the teaching and non-teaching staff of host school cooperated and stood by whole heartedly to make the ennobling mission a grand success. In fact, the students were asked to sit in a good number of class rooms and experienced teachers taught them different science subjects through experiments in a very disciplined manner. It was found that a good number of teacher-participants were members of Indian Association of Physics Teachers, IAPT. An EC member of IAPT and Associate Professor, Midnapore College(UG & PG), Dr. M. L. Nanda Goswami was a Resource Person for this event. Ex. Prof. Dr. Subhas Chandra Samanta, the executive president, IAPT- Midnapore College Center for scientific culture and Ex. General Secretary of IAPT also witnessed the proceeding of Event on the second day.

The most exciting episode in this 2-day activity is the speech by Professor of Chemistry, Dr N. G. Sahoo, FRSC, of Kumayun University, Nainital, an Alumnus of the host institution. Despite network problem he delivered a video speech in which he wished for the success of this event and congratulated the students. He also talked over his work, for which he had got the patent on the use of plastic waste for preparation of graphene. It is inspiring to note that Nainital is the place where late Dr. D.P. Khandelwal, founder of IAPT and a great physics teacher, designed a large number of physics experiments using inexpensive equipment, used in this Event also.

The entire finance has been managed by the organizers without any government or private support.

Suman Kumar Dash

Training Program on Advanced Research Instruments

Venue: Department of Physics, AMU, Aligarh (U.P.)
Duration: July 18 -24, 2022

A "One Week Training Program on DST Supported Advanced Research Instruments" under the "Synergistic Training program, Utilizing the Scientific and Technological Infrastructure (STUTI)" supported by the Department of Science and Technology (DST), Government of India was held at the Department of Physics, Aligarh Muslim University, Aligarh, India during July, 18 – 24, 2022. The training programme commenced with the inaugural function on 18.07.2022 in the Conference Hall of the Physics Department and culminated on 24.07.2022. As part of the "Azadi Ka Amrit Mahotsav" celebrations, the training programme consisting of scientific lectures, demonstrations and hands on training sessions were organized for the benefit of the faculty members/research scholars/scientists of nearby colleges/universities using the DST sponsored FIST supported equipments.

Inaugural Function of the STUTI programme
(L to R): Prof. Avinash C. Pandey (Chief Guest), Prof. Mohammad Gulrez (Pro-VC, AMU, Aligarh), Prof. Mohammad Ashraf (Dean, Faculty of Science), Dr. Jai Prakash (Co-PI,STUTI) and Prof. B.P. Singh (Coordinator-PMU, STUTI, AMU

About the STUTI training program

Synergistic Training program Utilizing the scientific and Infrastructure (STUTI) scheme is intended for the capacity building of human resources through open access to Science & Technological infrastructure across the country by organizing specialized training programs on DST-supported R&D equipment targeting Ph.D. Scholars, Post-Doctoral Fellows, Scientists, Faculty members, etc., actively involved in research. The role of Science and Technology is pivotal for the evolution of mankind. The program consists of both theory as well as hands on training with various instruments, supported by DST and FIST. The uniqueness of the program includes minimum four hours theory and remaining 50% of the duration on practical training on the equipment. Efforts are made for hands-on use of equipment for demonstration/ characterization by each participant. The program's aim is to promote the research collaborations to the maximum extent.

The program is open to a broad audience interested in acquiring in-depth knowledge on the analytical instruments such as XRD, TEM, SEM, EDX, NMR, UV-visible spectroscopy, FTIR spectroscopy, Polarizing optical microscopy, TGA/DSC, etc. After completion of the workshop, participants can appreciate how these techniques help in understanding materials, correlating structure-property relation and eventually for elucidating the structure of existing and newly discovered materials. This training program provides a platform for interaction and exchange of innovative ideas on current trends in the fields of Science and Technology. The Chief Guest, Prof. Avinash Chandra Pandey, the Director, Inter University Accelerator Centre (IUAC), New Delhi, India inaugurated the programme. The brochure of the week-long programme was also released by the Chief Guest during the inaugural function. Prof. Pandey presented his valuable views on the occasion. He highlighted the long association of AMU with IUAC, New Delhi through the utilization of research facilities at IUAC by AMU faculties and research scholars. Prof. Pandey also mentioned the contribution of early AMU Physics faculties in the inception of IUAC. He emphasized on capacity professional development, which is also initiative of Government of India, through multidisciplinary research. Pro-Vice Chancellor, Prof. Mohammad Gulrez also appreciated the achievement and long legacy of the Physics department in his presidential address. He mentioned that such training programes help

in the development of career of a young researcher. He also ensured to provide all possible support by the University to the department for conducting quality research and organization of such science outreach activities. The Guest of Honour, Prof. Mohammad Ashraf, Dean Faculty of Science, discussed the importance of such training programme in context of growth of early career researchers. He congratulated Physics Department for getting STUTI Project by DST, New Delhi and organizing a week-long program for youngsters. Prof. B. P. Singh, Chairperson, Physics Department, and PMU coordinator, welcomed the Chief Guest and all the faculty members as well as participants of the training programme. At the very start of the programme Prof. Singh highlighted the importance and usefulness of organizing training programme.

Release of Brochure of Training Program during inaugural session:

L to R: Dr. M. Wasi Khan (Co-PI STUTI), Prof. B.P. Singh (Chairman), Prof. Avinash C. Pandey (Chief Guest), Prof. Mohammad Gulrez (PVC, AMU), Prof. Mohammad Ashraf (Dean, Faculty of Science), and Dr. Jai Prakash (Co-PISTUTI)

Dr. M. Wasi Khan, Convener, introduced the STUTI initiative of DST to the audience and students and discussed its main features and components. Dr. Jai Prakash, as one of the conveners, convened the activities undertaken "One Week Training Program on DST Supported Advanced Research Instruments" in the department.

Prominent Lectures by Eminent Speakers

Lectures delivered by the eminent speakers were the major part of the event, where students were given theoretical knowledge of the subject covered. There were a number of enlightening lectures delivered by the faculty members/scientists. Dr. Subir Nath from IUAC, New Delhi delivered his lecture on *"Physics with Recoil Separators"*. In his talk, he discussed the importance of Recoil Separators in the separation and detection of reaction products formed in heavy ion-induced reactions amidst large background events. Dr. D. K. Shukla from UGC-DAE CSR, Indore delivered an excellent lecture on "Synchrotron X-ray Radiation Based Material Characterization Methods". He discussed the importance of synchrotron radiation and discussed its wide applications.

Dr. Jai Prakash talked on "*The fascinating world of liquid crystal"*. He discussed in depth the properties of Liquid Crystal (LCs) and its applications. Prof. Absar Ahmad, Founder Director, INC, AMU Aligarh spoke on "Translational research on bio inspired nanomaterials & drugs from endophytes". In his talk, he discussed the biosynthesis of various nanomaterials along with versatile applications of the same in medical, industry etc. Dr. M. Wasi Khan delivered an enlightening lecture on *"Transmission electron microscopy (TEM): A versatile tool for nonmaterial's characterization"*. He discussed the widespread application of the microscopic technique, Transmission Electron Microscopy (TEM), for the complete characterization of nonmaterial's and devices. Prof. Shahid Husain lectured a scientific topic on *"X-ray Diffraction: A Probe for Structural Analysis"*. He talked about the properties of X-ray diffraction and explained that X-ray diffraction is a versatile, non-destructive characterization technique that reveals detailed information about the chemical composition, crystallographic and microscopic structure of all types of natural and manufactured materials. He delivered another lecture on "*Role of Dielectric Measurement in materials Characterization"*. In this talk, he discussed the importance of dielectric measurement in material characterization. A prominent lecture was delivered by Dr. Sudhir Kumar Gupta, Department of Physics, AMU on *"The super-symmetric Universe"*. In his lecture, he discussed symmetries, explaining that symmetries are the guiding principles behind theories governing the Universe in terms of a set of elementary particles and the fundamental forces. An invited lecture was delivered by

Dr. Gautam Singh from Amity University. He delivered the lecture on "Liquid crystal nanoscience: Recent advances and future perspectives". In his lecture, he emphasized the importance of liquid crystal nanoscience in the field of liquid crystals. Another lecture was delivered by him on *"Characterization tools for liquid crystals and their composites"* where he discussed the properties of Liquid crystals (LCs) and their wide applications in ubiquitous liquid crystal displays (LCDs) and other electro-optical devices. Prof. B. P. Singh spoke on the topic *"Basics of experimental study of nuclear reaction dynamics at low energies in light and heavy ion reactions"*. Prof. Singh explained in detail about the formation of compound nucleus. Dr. S. S. Z. Ashraf delivered a scientific talk on *"Graphene: A Prototype Dirac Matter"*. In his lecture, Dr. Ashraf discussed the fact of how the low energy excitations are governed by Dirac equation in graphene and consider one illustration of it through the relativisticphenomena of Klein tunnelling in Graphene.

Hands-On Training

The second most important part of the training program was hands-on training where the participants were given opportunity for practical training with various high-quality and modern equipments available in various research labs of the Department of Physics, AMU. The participants were divided equally into three groups and visited three different laboratories viz., the Liquid Crystal, Nuclear Physics and the Condensed Matter Physics Laboratories. There the participants were introduced to various experimental techniques and were provided with information about various laboratories of the University, where they gained practical knowledge of various characterization techniques, synthesis etc.

Valedictory Function

The week-long training program ended on July 24, 2022. In valedictory session, Chief Guest Prof. Qudsia Tehseen, Department of Zoology, Aligarh Muslim University graced the program with her presence. Prof. B. P. Singh narrated how Physics Department of AMU received the STUTI project and explained to the students the importance of such training programs for them. He encouraged and motivated the students to participate in such training program in future as well.

The Chief Guest Prof. QudsiaTehseen appreciated the department for organizing such an event and providing an opportunity to the students to explore various informative and enlightening things. She said that this would lead overall development of the students. She was mesmerized by the collection of students from different states of the country and regarded it as unity in diversity. In her address, she emphasized on quality of research. She motivated the students to work hard for quality research instead of running for many publications. She also stressed upon the students to work for the ideas where the society can be benefited more as the aim of science is to help society. She urged to organize such events in the respective areas in future also. In the valedictory session, the certificates, Prizes for the winners of quiz competition and Memorabilia were presented to the participants.

Valedictory Session:
(L to R)Dr. M. Wasi Khan (C0-PI, STUTI), Dr.S. S. Z. Ashraf,P rof. B.P. Singh, Prof. QudsiaTehseen (Chief guest) and Dr. Jai Prakash (Co-PI, STUTI).

Feedback

All the participants were happy with the excellence of the training program and the quality of the content and subject matter of the lectures covered during the training. The students were very much satisfied with the practical training provided to them by the faculty members and research scholars and appreciated the facilities provided to them for conducting experiments in the laboratories. Also, the participants appreciated the organization of the visit to the University. All the participants appreciated the efforts made by the organizing team to make their stay comfortable and provide them with all the necessary support. The participants were appreciative of all the team

Participants (showing certificates and mementos), Volunteers, attendees, PMU Coordinator, Prof. B. P. Singh, Programme conveners, Dr. M. Wasi Khan and Dr. Jai Prakash, Prof. Qudsia Tahseen (Chief Guest, concluding function) after successful completion of the training programme.

B. P. Singh
M. Wasi Khan
Jai Prakash

OBITUARY

An Obituary

Prof P.L. KALE

Prof. P.L. Kale passed away on 28th July 2022, after a prolonged illness for more than five years. He was my senior colleague in Abasaheb Garware College, Pune. We were close friends for the last 57 years. Prof Kale was very popular physics teacher. He had remarkable dexterity to explain difficult abstract concepts in physics. Thousands of students still remember him because of his elegant handwriting and attractive board work. Throughout his life he used to wear a white trouser and a white shirt. In annual social gathering every year there was a popular fish pond " Prof. Kale- a man in white". He was an efficient administrator-he worked as HOD-physics, life member of Maharashtra Education Society (parent body of Garware College) and Vice Principal of the college.

Prof. Kale has unforgettable contribution to IAPT. He had a lion's share in organizing 10th IAPT convention in 1995, at Garware College, Pune. We shared the same room at about ten IAPT conventions. When I was NSE coordinator, he helped me a lot in the exam work for nearly twelve years. Prof. Kale was the resident secretary of IAPT central office in Pune for about ten years.

Prof. Kale and myself have worked together for several projects/programmes over a long period of about 40 years. He helped me and offered valuable advice/guidance at a number of difficult situations in my personal life. By his sad demise, I have lost a loving friend, an active well wisher and also an elder brother. I offer my deepest condolences to Kale family and pray the god for eternal peace of the departed soul.

M. L. Ogalapurkar

NATIONAL GRADUATE PHYSICS EXAMINATION (NGPE-2023)

Conducted by

INDIAN ASSOCIATION OF PHYSICS TEACHERS

Registered Office : 206, Adarsh Complex, OPR 4, Awas Vikas-1, Keshavpuram, Kalyanpur, Kanpur - 208017
Web: www.indapt.org (Regd. No. K 1448)

Day, Date & Time of Examination SUNDAY, January 22, 2023
TIME : 10.00 AM to 1.00 PM

Last Date for Enrolment : 17th November 2022

Eligibility for Appearing in NGPE-2023 : Students of B.Sc. I, II and III (Pass, Hons. or Integrated) are eligible. (Any one who has already passed B.Sc. is NOT eligible)

Exam Information :

Registration Fee - ₹ 200 (Rupees Two Hundredy)
Language for NGPE - English, Hindi, Gujarati, Tamil, Telugu or any other language if 100 or more Students opt for it.

Format for NGPE :

Part A : 25 MCQs with any number of options (1,2,3 or all 4) may be correct.
Credit is given only if all the correct options are marked (6 marks each; Total 150 marks)
Part B1 : 10 Short Answer (5 to 6 Lines) Questions (5 marks each : Total 50 marks)
Part B2 : Ten Problems (10 marks each ; Total 100 marks)

Unique Features of this Examination :

- Fully voluntary examination in a stress free environment.
- Carry away the question paper both part A and part B.
- It provides Individual's own assessment at all India level.
- Same paper for all BSc I, II and III Year Students with separate national merit.
- Solutions in printed form are provided to Centre In-Charge for each participant.
- The only national level examination testing students in both theory & experiment.
- Previous Year (2022) Question Paper & Solution for every centre registered for NGPE - 2023.

CERTIFICATES AND AWARDS IN NGPE - 2023

(Cash Award will be released only if the candidate continues higher studies in Physics)

NGPE-2023 Awards

TOP 10% at Each Centre	:	Centre Topper Certificate
TOP 1% at State Level	:	State Topper Merit Certificate
TOP 1% at National Level	:	National Topper Merit Certificate + Book Prize
Top 5 Students in India	:	Merit Certificate + GOLD MEDAL + ₹ 20,000/- Cash Award

- Top 25 will be eligible for appearing in NGPE Part-C Examination - 2023 (an examination in experimental skill) for final selection for GOLD MEDAL and one time Scholarship (Max. 5 in Number) worth ₹ 20,000/- for pursuing higher studies in Physics. TA is paid and free lodging arranged.
- Top 25 will have eligibility for an interview for Admission in Post - B.Sc. Integrated Ph.D. Programme in Physical Sciences 2023 of S N BOSE NATIONAL CENTRE FOR BASIC SCIENCES, KOLKATA, (Only BSc III year students with more than 60% Marks)
  For more details must see website - http://bose.res.in/admission.htm or write email to admission@bose.res.in
- May get opportunity to attend one week EXPERIMENTAL PHYSICS WORKSHOP organized by IAPT AT KOLKATA (Regional Council - 15). TA is paid.
- Top 5 to 10 students of B.Sc. First year (of University 3Yr System) shall be eligible to participate in prestigious NATIONAL INITIATIVE FOR UNDERGRADUATE SCIENCE [NIUS] program of Homi Bhabha Cener for Science Education, TIFR, Mumbai. [This is A Govt. of India, DAE Program organized at Mumbai].
- Top 20 students of B.Sc. I appearing in NGPE-2023 may get an opportunity for two weeks Academic Workshop on Basic Physics at IIT Guwahati (Preferably for those from University 3-yr B.Sc. System)
- Some more programmes for toppers may be decalared later.

To obtain previous Ten Year Question Papers with complete solution deposit / transfer Rs. 150/- (One hundred fifty only) per set in IAPT account as per Bank details: Name of the account: Indian Association of Physics Teachers, Name of the bank : Central Bank of India, Branch : DBS College, Dehradun - 248 001, Account Number : 3750324600, IFSC Code : CBIN0283283. Then write a mail to laptddn@gmail.com

FOR FURTHER INFORMATION : CONTACT

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9632221945, Email: iapltddn@gmail.com

Local Contact
Tel : _____

NATIONAL COMPETITION FOR INNOVATIVE EXPERIMENTS IN PHYSICS (NCIEP) – 2022

Who can participate?

(A) The participant can be a teacher at any level or M. Phil. / Ph. D. awarded / Ph.D. pursuing student or a Scientist from national laboratories or a science communicator working in science centres, etc.

(B) The participant can be a student pursuing UG/PG course

Guidelines

The experiment should be an original one, designed by the participant himself/ herself. It can be even a demonstration type experiment.

Prizes

Category	Participants	First prize	Second prize	Third prize
A	Teachers/scientists/science communicators/ Students pursuing M.Phil/Ph.D	Rs 7000/-	Rs 5000/-	Rs 4000/-
B	Students pursuing UG/PG course	Rs 7000/-	Rs 5000/-	Rs 4000/-

Write-up of the experiment as an email attachment with clearly indicating the category is to be submitted to the coordinator at the email id: **gitars61@gmail.com** Selected entries from each category will be invited for demonstration at the 36th IAPT convention. Convention will be held in Patna from December 2-4th 2022. The invited participants will be paid railway fare from work place to convention place as per IAPT rules. Selected Student participants will receive Rs1000 towards experiment expenses **For more details refer May 2022 IAPT bulletin (page 161).**

Use of computers for data acquisition and display is not allowed.

Closing date to receive the entries has been extended to October 20th, 2022.

Dr Geetha R S
Coordinator, NCIEP
(m) 9449930024
E mail: gitars61@gmail.com

The Story of Cosmology through Poster Stamps- 25

OBSERVATIONAL ASTRONOMY *NEW GENERATION OPTICAL TELESCOPE*

In recent years number of technologies are used to increase the magnification, resolution and image quality of the telescope. Various advanced mechanism is also integrated in designing the telescope to get rid of different type of aberrations including atmospheric aberration. This is done by use of technology like: Active Optics, Adaptive Optics, Speckle Imaging, Optical Interferometry and Electronic Detector. ***Schmidt Camera or Schmidt Telescope***-is a Cassegrain type Catadioptric Telescope combine a Cassegrain reflector optical path with a Schmidt corrector plate. These types of telescope are good for narrow field, deep sky and planetary viewing

Schmidt telescope with reflective camera

Schmidt telescope at Baldone Observatory, Latvia

Pre stamped commemorative Airmail picture postcard- depicting Bernhard Woldemar Schmidt (1879-1935)- inventor of Schmidt Telescope which corrected various aberrations and make it possible to design wide angled reflective camera of short exposure for astronomical research

Ritchey Chretien Telescope, RCT- specialized variant of Cassegrain, with wider view free of optical error used in La Plata Observatory, Argentina

Double Astrograph Telescope, using Adaptive Optics with laser communication system to reduce atmospheric distortions, used in satellite tracking. Felix Aguilar Observatory, Argentina

Postally used cover with special cancellation to commemorate 1.8 m modern reflector of Bohyunsen Observatory Korea

Postal Regd. No. Kanpur City-28/2021-23 Date of printing 02-09-2022 Date of posting 08-09-2022 RNI No. UPENG/2009/29982

BULLETIN OF INDIAN ASSOCIATION OF PHYSICS TEACHERS

FOUNDED BY (LATE) DR. D.P. KHANDELWAL

VOLUME 14 NUMBER 09 SEPTEMBER 2022

IN THIS ISSUE

If underlivered please return to :

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Flat No. 206, Adarsh Complex,

Awas Vikas-1, Keshavpuram, Kalyanpur, Kanpur-208017

Published by R.N. Kapoor on behalf of Indian Association of Physics Teachers. For circulation amongst IAPT members/subscribers only.
L-117/302, Naveen Nagar, Kanpur-208025, Ph. 9415404969. Printed at Sharda Graphics Pvt. Ltd., 123/766, Factory Area, Fazalganj, Kanpur-208012, Ph. 9336845329
Chief Editor: Prof. U.S. Kushwaha