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This view of the Antennae Galaxies, two large galaxies colliding 60 million light-years away, is one of the first research images from the Super Pressure Balloon Imaging Telescope (SuperBIT) that launched on a scientific super pressure balloon April 16, 2023 (local time New Zealand). This image and one of the Tarantula Nebula were captured as the balloon-borne telescope floated at 108,000 feet (approximately 20.5 miles or 33 km) above Earth's surface, allowing scientists to view these scientific targets from a balloon platform in a near-space environment.

The SuperBIT telescope captures images of galaxies in the visible-to-near ultraviolet light spectrum, which is within the Hubble Space Telescope's capabilities, but with a wider field of view. SuperBIT's goal is to map dark matter around galaxy clusters by measuring the way these massive objects warp the space around them.

(Link: https://www.nasa.gov/image-feature/superbit-sees-colliding-antennae-galaxies)

The Story Of Cosmology Through Post Stamps 05

COMET

HALLEY'S COMET-IP/Halley

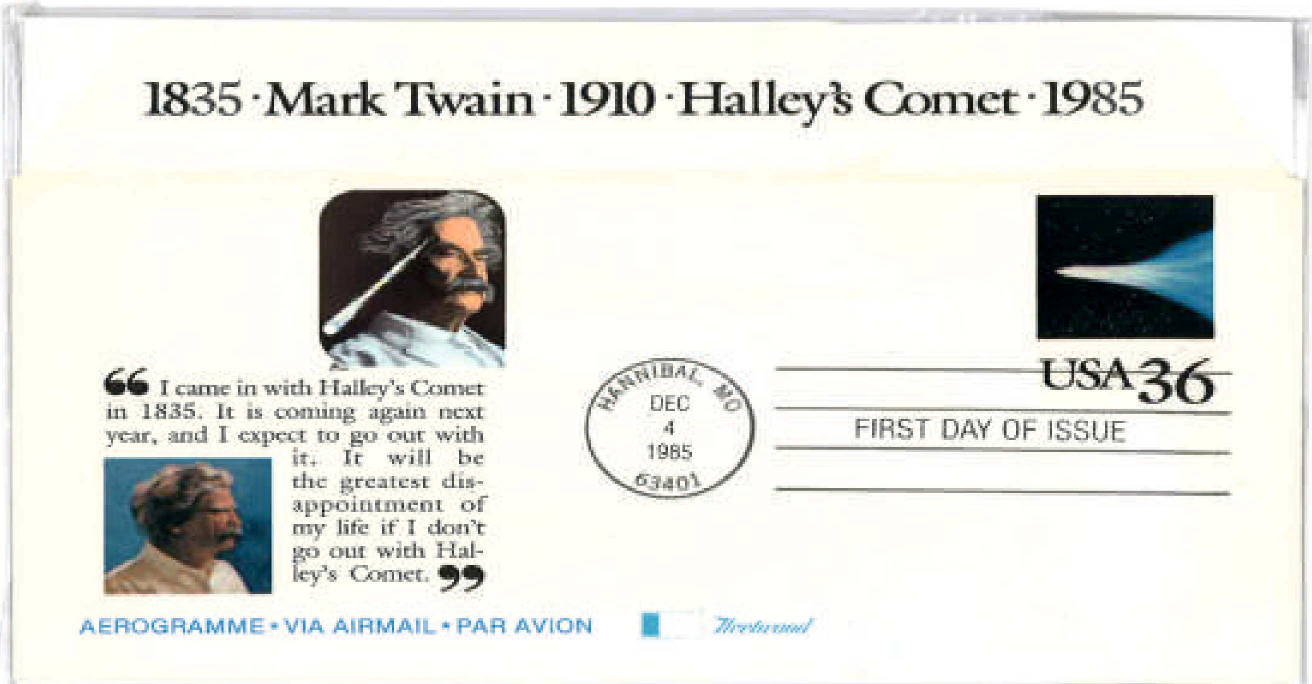
It is a short period comet, visible every75-76 years. It has been recorded and observed since 240 BCE. The comet's periodicity was first determined by Edmund Halley in 1705. Its orbit around the Sun is highly elliptical with perihelion 0.6AU and aphelion 35 AU.

In "Synopsis of Astronomy of Comet" by Edmund Halley, he used Newton's law to calculate orbit of the comet

Edmund Halley and comet with background constellations

Se-tenant pair with color registration marking on margin-illustrate robotic space probe -**Giotto**, first to make a close study of the comet during is flyby mission

Arrival of Halley comet in 1985 was commemorated by a coincidental event of Birth and death of famous writer Mark Twin which occurs at the same time of the appearance of Halley Comet. His famous quote is shared on the 36 cent Aerogramme, with first day cancellation of his native place-Hannibal MO



National Curriculum Framework for School Education 2023

The NCF for School Education 2023 published recently is a welcome document as it initiates a thinking process. It is quite comprehensive and needs to be understood thoroughly as it will shape the future of the school education in the days to come, and will also impact the higher education scenario. 'Curriculum' pervades the entire learning experiences of students in their schooling years, and entails syllabus, teaching-learning-evaluation process as also the overall activities, and hence the draft NCF 2023 runs through over 625 pages. We may call it volume I, with several others to come out (including one each on Science, Maths education) and gauging it substantially takes time. A few points are highlighted here to stimulate discussion among the IAPT fraternity.

The said document provides guiding principles and goals, from which the syllabi, textbooks, assessment methods etc will be developed by States, Boards and schools. The NCF dwells at length on all the subtle aspects of School education. Chapters 3, 4 and 10 of part B are focussed respectively on Maths education, Science education and Sr. Secondary stages 11-12th. At the secondary stage (chapter 2), there will be 16 *essential courses* which all students must take. The document reads, '*students must clear 8 Board examinations at the end of grade 10*'. This is not clear, as it amounts to a big increase in the Board exams in schools. Exams have to be there anyway, to assess students' knowledge and competence, but the *Board exam* brings in its wake issues like truncation in teaching time, already affected by extended festivals and official programmes.

Another recommendation is that the Grades 11th and 12th would be divided into semesters. The semester system is working well at the PG levels and in Engineering. In Gujarat the system was also in vogue at the school levels, but has been scrapped after bad experiences. Besides the semester exams at (11th and) 12th grade, we will have State common entrance tests, CUET, JEE, NEET etc!! The so-called burden of learning is in part the burden of too many Board/competitive exams.

The document appropriately mentions on p. 177, '*Mathematics ....will be very important for India's future.'* Indeed, Maths for Physics needs no elaboration, and hence along with the proposed four courses in Physics (p. 55), Maths is a must.

One of the aims of Science education (*cf* p. 213), is '*developing an understanding of the relationship between science, technology, and society'.* Therefore, the first chapter of the physics textbook of 11th class, introducing the subject in relation to technologies, and to the present society, must be restored.

We would be more interested in Physics, for which the illustrative courses suggested for 11-12th Grades (p. 478-479) are inadequate. The course on waves and optics must include electromagnetic waves. When India is developing quantum technologies, how can we forget quantum theory, electronics, transistors and communication systems?! In the last five years, important topics in Physics class 11-12th have been removed, and this has resulted into a larger 'band gap' between grade 12th and higher education. Topics removed in the recent years must be reinstated as a follow-up of the NCF 2023. Burden of learning can be reduced by making the subject interesting.

After all, the goal for our younger generation must be,
Citius, Altius, Fortius ....

- K. N. Joshipura
Ex-GS IAPT

Guidelines for the contributors

The IAPT Bulletin recommends for publication:

- Articles, reviews and short notes on subject matter related to physics content and physics teaching at secondary, undergraduate and postgraduate levels. The write-up must offer some new insight into the topic under discussion. Mere reproduction of information available on the internet be avoided.
- Letters and comments on matter published in the Bulletin.
- Reports, news and announcements about important physics related IAPT activities/events in the country.

Articles, reviews and short notes

- Research papers in specialised fields of mainstream physics may not be sent. Research journals catering to specific areas of physics already exist. However, reviews of recent developments in various fields are welcome.
- All the matter should be sent by email to iapt@pu.ac.in. Acknowledgement via email will normally be sent within 10 days. Submissions received via post without soft copy may be considered provisionally, but if accepted for publication then soft copy must be provided. Authors should retain a copy of their write-up, rejected articles will not be sent back. Contributors should give their contact number as well.
- The length of the write-up should not, ordinarily, exceed 6 pages of the Bulletin, including diagrams, photographs, tables, etc.
- All matter received for publication is subject to refereeing. The editors reserve the right to abridge/alter the write-up for the sake of clarity and brevity.

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The report must contain the following:

- Name of the activity
- Date/duration
- Venue of the activity
- Organising institute along with collaborators, if any
- Sponsors, if any (IAPT, RC or any other funding agency)
- Summary of the activity
- Name of the coordinator/convener/organiser along with address, email and mobile number

Maximum two photographs, if available, may be sent separately via email, preferably of the activity or audience.

Please send the report soon after the activity is over, not later than, say, three months.

If you are sending reports of more than one activities for publication in one issue of the Bulletin, kindly send a consolidated report of all the activities in a single communication.

PHYSICS NEWS

No need for a super computer: Describing electron interactions efficiently and accurately

One of the outstanding challenges in the field of condensed matter physics is finding computationally efficient and simultaneously accurate methods to describe interacting electron systems for crystalline materials The Ismail-Beigi team has developed a method related to a class of approaches that use what's known as an auxiliary or subsidiary boson. Typically, these approaches require much less computational resources but are only moderately accurate as they treat one atom at a time. Ismail-Beigi's team tried a different tack. Rather than examining one atom at a time, the researchers treat two or three bonded atoms at a time (called a cluster).

This method then gives a very highly accurate description with even a relatively small cluster of three atoms. Compared to literature benchmark calculations, the new method is three to four orders of magnitude faster.

The researchers said they look forward to applying this method to more complex and realistic materials problems in the near future.

Read more at: https://phys.org/news/2023-04-super-electron-interactions-efficiently-accurately.html

Original paper: Physical Review B. DOI: 10.1103/PhysRevB.107.115153

Improving bloodstain pattern analysis with fluid dynamics

Often left on the surfaces of a crime scene or on the clothes of an accused criminal, blood backspatter can be used as evidence for forensic scientists to reconstruct what occurred. However, the fluid dynamics at play are complicated, and neglecting the interaction between the blood and the muzzle gases from the firearm could skew the results.

In the journal *Physics of Fluids*, researchers from the University of Illinois Chicago and Iowa State University modeled the behavior of blood drops during secondary atomization to examine how the phenomenon affects a crime scene. This discovery could explain how a short-range shooter might stay clean from blood stains, like in the famous case of Phil Spector presumably murdering Lina Clarkson while keeping his outfit practically clean. In the future, the group is interested in studying the spatter of brain tissue in similar short-range shooting events. They believe such work could help distinguish between a suicide and a staged homicide.

Read more at: **:** https://phys.org/news/2023-04-bloodstain-pattern-analysis-fluid-dynamics.html

Original paper: Physics of Fluids DOI: 10.1063/5.0142146

Quantum liquid becomes solid when heated

Solids can be melted by heating, but in the quantum world it can also be the other way around. In a joint effort, an experimental team led by Francesca Ferlaino in Innsbruck, Austria, and a theoretical team led by Thomas Pohl in Aarhus, Denmark, show how a quantum liquid forms supersolid structures through heating. The scientists obtained a first phase diagram for a supersolid at finite temperature.

Supersolids are a relatively new and exciting area of research. They exhibit both solid and superfluid properties simultaneously. In 2019, three research groups were able to demonstrate this state for the first time beyond doubt in ultracold quantum gases.

With the new model, they now have a phase diagram for the first time that shows the formation of a supersolid state as a function of temperature. The surprising behavior, which contradicts our everyday observation, arises from the anisotropic nature of the dipole-dipole interaction of the strongly magnetic atoms of dysprosium.

Read more at: https://phys.org/news/2023-04-quantum-liquid-solid.html

Original paper: Nature Communications. DOI: 10.1038/s41467-023-37207-3

Soumya Sarkar
IISER PUNE
INDIA

Characterization Techniques for Synthesized Nanomaterials

Dinesh Kumar[1,*], Kavita[2]

[1]Govt. Victoria Girls Senior Secondary School, Patiala-147001
[2]Department of Physics, Multani Mal Modi College, Patiala-147001
[*]E. Mail: dineshk_2@yahoo.co.in

Introduction

In order to explore novel physical properties, phenomena, realize potential applications of nanostructures, Nanomaterials, the ability to fabricate, process Nanomaterials and nanostructures is the first corner stone in nanotechnology. There exist a number of methods to synthesize the Nanomaterials which are categorized in two techniques "top down and bottom up". Solid state route, ball milling comes in the category of top down approach, while wet chemical routes like sol-gel, co-precipitation, etc. come in the category of bottom up approach. Characterization of Nanomaterials is necessary to analyze their various properties.

Characterization techniques

1. Powder X-ray Diffraction

Powder X-ray Diffraction (PWXRD) is one of the most powerful non- destructive techniques that reveal the information about the atomic structure of crystalline compounds. It provides information on structures, phases, preferred crystal orientations (texture), and other structural parameters, such as average grain size, crystallinity, strain and crystal defects in crystallites.

Fundamental Principle

X-ray diffraction occurs when a collimated beam of monochromatic X-rays is scattered by atoms arranged in an orderly array in crystals. The crystal acts as a three dimensional grating to this radiation. The orderly arrangements of atoms, results in the scattered X-rays within the crystal being in phase in specific direction dictated by symmetry and atomic spacing (constructive interference) and out of phase in all other directions (destructive interference). When there is constructive interference from X-rays, an intense diffraction peak is observed, while for those that interfere destructively, have minimal emergence. This systematic combination of constructive and destructive interference arising from the periodicity of atoms in crystals is X-ray diffraction. The condition for constructive interference is expressed by Bragg's law:

$$n\lambda = 2d_{hkl}sin\theta_{hkl} \qquad 2.1$$

Where θ_{hkl} (Bragg's angle) between the atomic planes and the incident (and diffracted) beam (Fig. 1.), n is the order of diffraction, λ is the incident X-ray wavelength and d_{hkl} denotes the interplanar spacing for a specific set of planes.

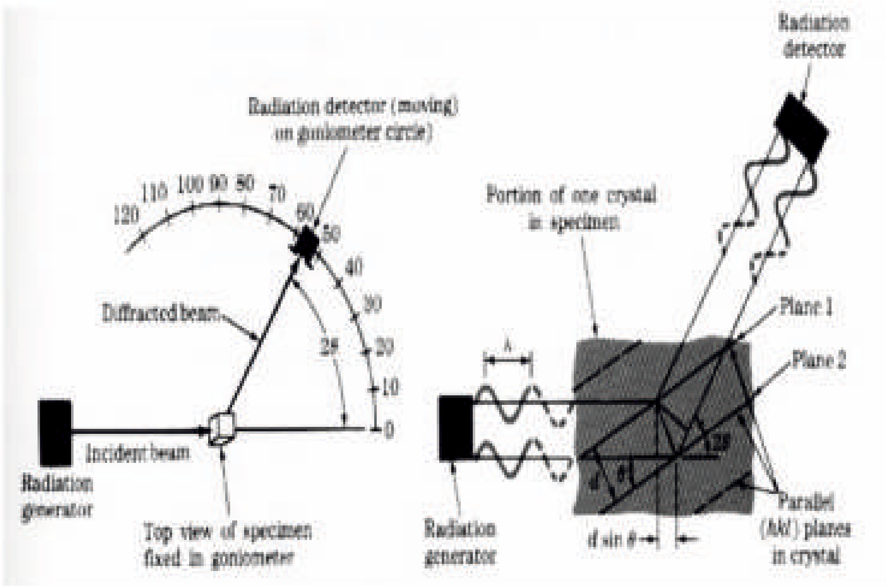

Figure 1.The diagram shows underlying principle and working of X-ray diffractometer

an X-ray detector situated on the circumference of a graduated circle centered on the powder specimen. Divergent slits, located between the X-ray source and the specimen, and divergent slits, located between the specimen and the detector, limit scattered (non-diffracted) radiation, reduce background noise, and collimate the radiation. The detector and specimen holder are mechanically coupled with a goniometer. so that a rotation of the detector through 2θ degrees occurs in conjunction with the rotation of the specimen through θ degrees, a fixed 2:1 ratio. The principal radiation sources utilized for X-ray diffraction are vacuum tubes utilizing copper, molybdenum, iron, and chromium as anode; copper X-rays are employed most commonly for organic substance. For each of these radiations there is an element that will filter off the Kβ radiation and permit the Kα radiations to pass (nickel is used, in the case of copper radiation). In this manner the radiation is practically monochromatized. The common configuration for an X-ray diffractometer is shown in Figure 2.

To our readers

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our New Address :

The Managing Editor
Flat No. 206, Adarsh Complex,
Awas Vikas-1 Keshavpuram, \
Kalyanpur, Kanpur-208017
Email : iaptknp@rediffmail.com
Mob. : 09935432990

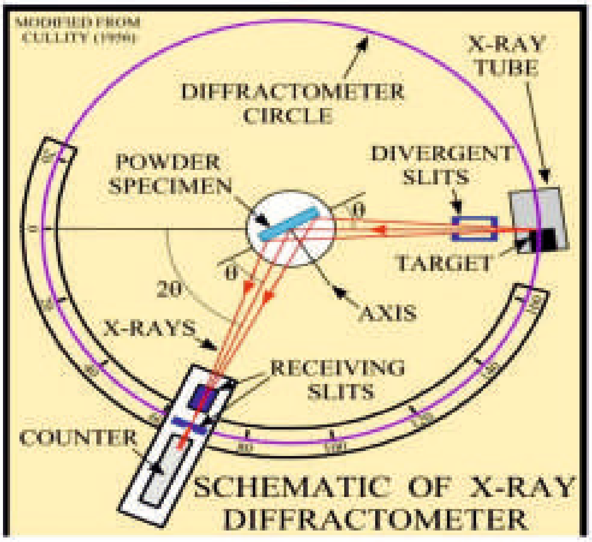

Figure 2. Common configuration of XRD unit

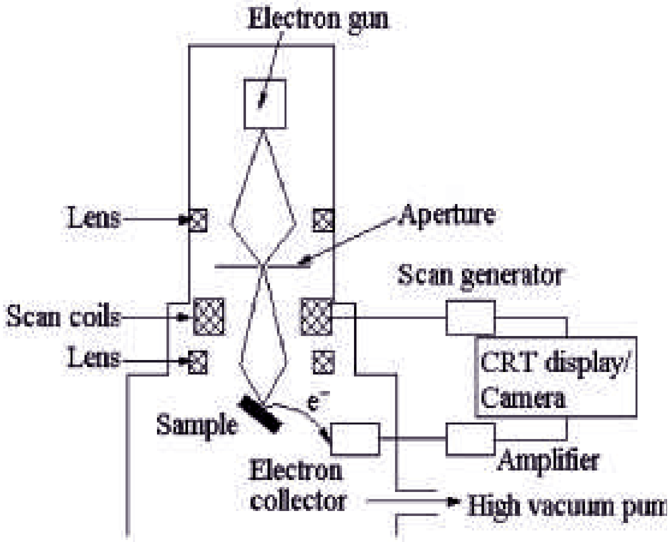

Figure 3. Schematic diagram of scanning electron microscope

2. Electron microscopy

Optical microscopy has limited resolution for imaging and manipulation of nanoscale objects since the objects are often smaller than the wavelength of light. For a wavelength λ the achievable resolution is often given by the diffraction limit δ[Heavens & Ditchburn, 1987] as

$$\delta = 0.61 \frac{\lambda}{NA}$$

With numerical aperture NA, which can be approximated by the angle of incidence $NA \approx \alpha \approx r_a/r_{wd}$ where r_a is the radius of the objective lens aperture and r_{wd} is the working distance. Optical microscopes can often reach a resolution of about 200 nm. For nano manipulation this resolution is not sufficient to distinguish for e.g. a single one nanotube from two adhering to each other, since they have diameters ≤ 100nm. One can achieve a considerable improvement in resolution with instruments such as the scanning electron microscope (SEM) and the transmission electron microscope (TEM).

2.1 Scanning electron microscopy

Scanning electron microscopy is a highly important tool for the investigation of the surface morphology of nanostructures. By employing it one can investigate the diameter, length, thickness, density, shape and orientation of the nanostructures. SEM essentially offers a very high magnification with very high resolution capabilities and a large depth of focus. This characteristic makes it an indispensable tool for analysis of wide class of conducting, semi-conducting and insulating materials. In a SEM, the electron beam is scanned across the surface of the sample in a raster pattern, with detectors building up an image by mapping the detected signals with beam position.[Flewitt & Wild, 1994]

Fundamental Principle

In an SEM the accelerated electrons carry considerable amount of kinetic energy. This energy is dissipated as a variety of signals produced by the interactions of electrons with sample during the deceleration of incident electrons in the solid sample. These signals include secondary electrons, backscattered electrons, diffracted backscattered electrons, characteristic X-rays and continuum X-rays, visible light, and heat. Secondary electrons and backscattered electrons are usually used for imaging samples: secondary electrons are most important for showing morphology and topography on samples and backscattered electrons are most valuable for illustrating contrast in composition in multiphase samples. The inelastic collisions of the incident electrons with electrons in discrete shells of atoms in the sample generate X-rays. Returning to lower energy states, the excited electrons yield X-rays that are of fixed wavelength. SEM analysis is considered to be non-destructive; i.e., the X-rays generated by electron interactions do not lead to the volume loss of the sample, so it is possible to repeatedly analyze the same materials.

Scanning process

An electron beam, which typically has energy of few hundred eV to 40keV, is produced at the top of the microscope by an electron gun. Electron guns are typically one of the two types: **Thermionic guns**, which apply thermal energy to a filament (usually made of tungsten) to detach electrons away from the gun and toward the specimen. **Field emission guns**, on the other hand, create a strong electrical field to pull electrons away from the atoms they're associated. The anode, which is positive with respect to the filament, forms powerful attractive forces for electrons. This causes electrons to accelerate toward the anode. The electron beam follows a vertical path through the microscope, which is held within the vacuum. If the sample is in a gas filled environment, an electron beam cannot be generated or maintained because of a high instability in the beam. Gases could react with the electron source, causing it to burn out, or cause electrons in the beam to ionize, which produces random discharges and leads to instability in the beam. The transmission of the beam through the electron optic column would also be hindered by the presence of other molecules. Because the SEM utilizes vacuum conditions and uses electrons to form an image, special preparations must be done to the sample. All water must be removed from the samples because the water would vaporize in the vacuum. All metals are conductive and require no preparation before being used. All non-metals need to be made conductive by covering the sample with a thin layer of conductive material. This is done by using a device called a "sputter coater." The sputter coater uses an electric field and argon gas. The sample is placed in a small chamber that is at a vacuum. Argon gas and an electric field cause an electron to be removed from the argon, making the atoms positively charged. The argon ions then become attracted to a negatively charged gold foil. The argon ions knock gold atoms from the surface of the gold foil. These gold atoms fall and settle onto the surface of the sample producing a thin gold coating.

The beam travels through electromagnetic fields and lenses, which focus the beam down towards the sample in the sample chamber. Once the beam hits the sample, electrons and X-rays are ejected from the sample. Detectors collect these X-rays, backscattered electrons and secondary electrons, and convert them into a signal that is sent to a screen similar to a television screen this produces the final image [Flewitt & Wild, 1994]. Areas ranging from approximately 1 cm to 5 microns in width can be imaged in a scanning mode using conventional SEM technique. The resolution of SEM can approach a few nanometers and it can operate at magnifications that are easily adjusted from about 10X-300,000X. Because the SEM image relies on electron interactions at the surface rather than transmission it is able to image bulk samples and has a much greater depth of view, and so can produce images that are a good representation of the 3D structure of the sample. SEM images are therefore considered to provide us with 3D, topographical information about the sample surface.

2.2 Transmission electron microscopy

A transmission electron microscope is a vital characterization tool allowing the visualization and analysis of specimens in the realms of microspace (1micron/1μm= 10^{-6}m) to nanospace (1 nanometer = 10^{-9}m). In TEM, a high-energy monochromatic and coherent electron beam is used to probe the specimen instead of photons. According to wave-particle duality, this electron beam can also be considered as a planar wave with a wavelength smaller than typical interatomic distances (for e.g., 0.025 Å at 200 keV). This extremely short wavelength yields to resolution down to the Angstrom level in modern-day instruments: i.e. much lower than that achievable with optical microscopes[Amelinckx et al., 1997]. In contrast with the SEM technique which is more often used in the research of nanomaterials, TEM reveals information about the interior of the specimen. Since TEM works in transmission, information about the subsurface of the sample is also acquired, while SEM is a surface investigation technique.

During TEM analysis, a focused electron beam is incident on a thin (less than 200nm) sample. It is convenient to divide up the TEM into three components: the illumination system, the objective lens/stage, and the imaging system.

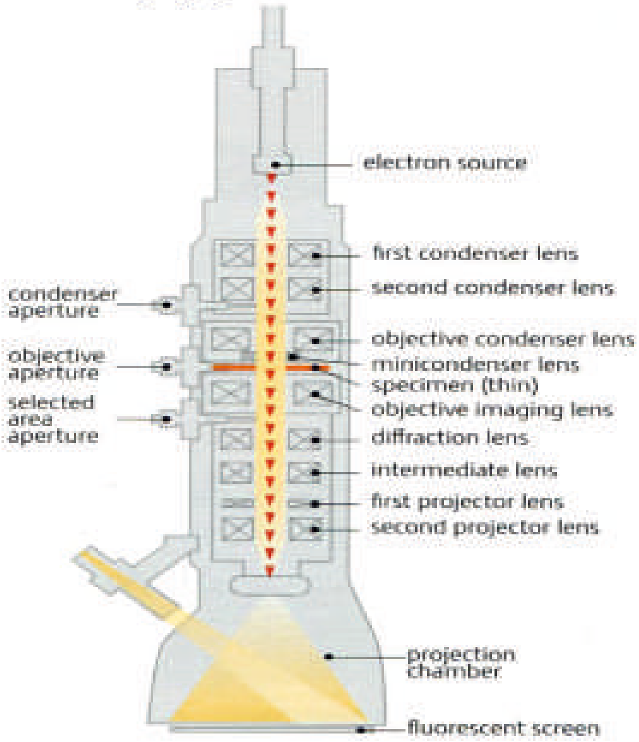

Figure 4. Schematic diagram of transmission electron microscope

The illumination system comprises the electron gun and the condenser lenses. Electrons are generated in electron gun, accelerated towards the anode and focused at the specimen with condenser lenses. The expedient way of generate electrons is thermionic emission. A tip generally made up of tungsten (high-melting temperature) or LaB_6 (with low work function) filament is heated until the electrons have sufficient energy to escape into the vacuum. The saturated current density of the thermionic emitted electrons is described by the Richardson-Dushman's law that involves the work function Φ of the tip material and the temperature T:

$$J = CT^2 e^{\frac{-\Phi}{kT}}$$

the current density J at thetip and Richardson-Dushman's constant C depending on the tip material. Generally the tips made up of LaB_6 are used because of the lower operating temperature which reduces the energy spread of the emitted electrons and increases the brightness.An alternative method to generate electrons from a source to generate electrons is to apply electric fields at the tip. Fields in the order of 10^7–10^8 V/cm are created at the tip (with radii typically 10-50 nm), enabling electrons to tunnel through the the potential barrier. With field emission guns, two anodes are used. The first acts as an intense electric field to extract electrons previous to the second accelerates the beam. The combined fields of the anodes create a fine point source. The illumination system can be operated in two pricciple modes: parallel beam and convergent beam. The first mode is used primarily for TEM imaging and selected area electron diffraction (SAED), whereas the second is utilized for scanning transmission electron microscope (STEM) imaging, analysis via X-ray and electron spectrometry, and convergent beam electron diffraction (CBED). The specimen hold/stage and the objective lens system is the spirit of the TEM, where all of the beam-specimen interactions occur. After electron beam strikes the specimen, these are either scattered or are transmitted unaffected through the sample. The probability of scattering is described in terms of the interaction cross-section or the mean free path and can be elastic or inelastic. This results into non-uniform distribution of electrons in the beam, that comes out of the sample, which contains all the structural information of the sample [Williams, 1996]. A sophisticated system of electromagnetic lenses focuses the scattered electrons into an image or a diffraction pattern, or a nano-analytical spectrum, depending on the mode of operation. Each of these modes offers a different insight about the specimen.

Two modes of specimen observation are offered by TEM, diffraction mode and image mode. Typical ray diagram of these two modes of TEM is shown in figure 5.

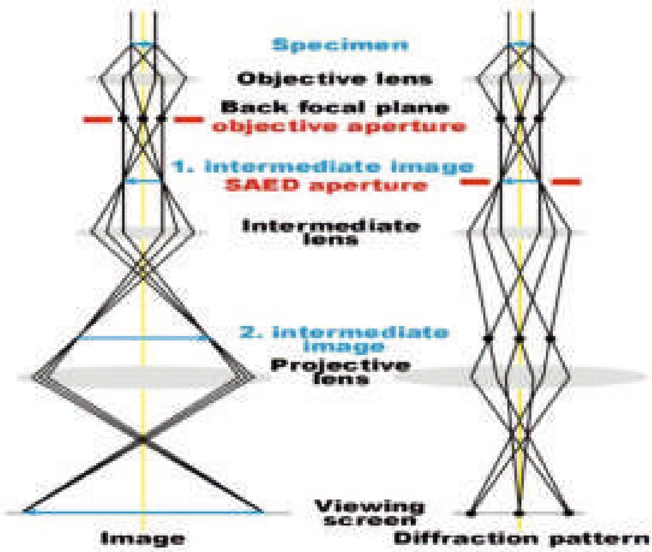

Figure 5. Schematic representations for the ray paths of electrons for imaging

To view the diffraction pattern from a sample, the imaging-system lenses of the microscope are adjusted such that the back focal plane of the objective lens acts as the object plane for the intermediate lens. This causes the diffraction pattern to be projected onto the viewing screen. SAED patterns can be obtained from localized regions of the sample by inserting a selected area diffraction aperture into the image plane of the objective lens. Diffraction patterns from small areas can also be obtained by converging the beam, but this destroys any coherence and broadens the diffraction spots into discs. SAED pattern can be used to determine whether a specimen is single crystal, polycrystalline, or amorphous; identify the crystallographic structure, symmetry, and orientation of samples; measures the lattice parameters; identify if more than one phase is present, etc. CBED allows diffraction patterns to be obtained from very small areas. It can be used to measure specimen thickness and lattice parameters, and to determine poin group and space group information.

The image mode produces an image of the illuminated area. This image can be contain contrast brought about by several mechanisms; **amplitude contrast imaging,** images are formed by inserting an "objective" aperture into the back focal plane of the objective lens that blocks most of the diffraction pattern that lies outside of the aperture. Bright-field images are formed with the use of small objective aperture to select only the directly transmitted beam of electrons. Dark-field images are formed, if such objective aperture is used which select electrons that have been scattered by the sample. **Diffraction contrast**, which in case of crystalline materials arises from coherent elastic scattering of electrons at special, Bragg angles. For good diffraction contrast, the sample is normally tilted such that only one diffracted beam is excited. This is referred to as a two-beam condition. **Phase contrast** occurs whenever more than one beam contributes to the image, and results in the formation of fringes. It arises from the difference in phase of the electron waves that occurs when these are scattered while passing through a thin sample. Frensel contrast at defects. High resolution TEM (HRTEM) imaging is the examples of phase contrast. In HREM imaging, a large diameter objective aperture is used to select multiple

beams to form an image containing lattice fringes that can reveal information about the atomic structure of the sample. The lattice fringes are not direct images of the atomic structure but can give information on the lattice spacing and structure of the crystal lattice on an atomic level [Heydenreich & Neumann, 1991].
Several lenses are used by imaging system to magnify the image or diffraction pattern produced by objective lens and to focus theses on the viewing screen or computer display via detector, CCD, or TV camera. One of the most important advantages of TEM over other characterization techniques is that information can be obtained both from the real and the reciprocal space.

2.3 Energy dispersive X-ray spectroscopy

Energy dispersive X-ray spectroscopy (EDS/ EDX or XEDS) is an analytical technique that can be coupled with several applications including SEM, TEM and STEM. EDS, when combined with these imaging tools, can provide elemental analysis. EDS is used to investigate the energy and number of X-rays that are given off by atoms in a material[Goldstein et al., 2003].

When the sample is bombarded by the high-energy electrons (as in case of an electron microscope), electrons are ejected from the atoms comprising the sample's surface. The resulting electron vacancies are filled by the electrons to from a higher energy state, and X-ray is emitted to balance the energy difference between the two energy states. The X-ray energy is characteristic of the element from which it is emitted.

The EDS X-ray detector measures the relative abundance of X-rays emitted from the sample versus their energy. Detector is based on a semiconductor device, typically lithium-drifted silicon, and solid-state device. When an incident X-ray hit the detector, it creates a charge pulse which is proportional to the energy of the X-ray. The charge pulse is then converted to a voltage pulse (which remains proportional to the X-ray energy) by charge sensitive pre-amplifier. The pulses are sorted by voltage, when signal sent to a multichannel analyzer. The energy determined from the voltage measurement, for each incident X-ray is sent to a computer for display and further data evaluation. The energy versus count spectrum is evaluated to determine thee elemental composition of the sample volume. EDS yields both qualitative and quantitative analytical information. Qualitative analysis involves the identification of the elements present in sample from their characteristic X-ray peaks, but does not determine their abundance. Elements with atomic numbers ranging from that of beryllium to uranium can be detected. The minimum detection limit varies from ~ 0.1 to a few atom percent, depending on the element and the sample matrix. In quantitative analysis the mass fractions or weight percents of the elements present in the sample are obtained from the relative X-ray counts at the characteristic energy levels Standard less or semi-quantitative results are readily available by using mathematical corrections based on the analysis parameters and the sample composition. Accuracy of semi-quantitative analysis depends on the sample composition. Greater accuracy is obtained using known standards with similar structure and composition to that of the unknown sample.

3. UV-Visible absorption spectroscopy

Ultraviolet- visible spectroscopy (UV-Vis) refers to absorption or reflectance spectroscopy in the ultra-violet visible spectral region. Ultraviolet and visible radiation comprise only a small part of electromagnetic spectrum (~190nm-900nm), which includes such other forms of radiation as radio, infrared (IR), cosmic, and X-rays. In this region of the electromagnetic spectrum, molecules undergo electronic transitions because ultraviolet and visible radiations are energetic enough to promote outer electrons to higher energy levels. There are three types of electronic transitions which can be considered;

- Transition involving π, σ, and n electrons
- Transition involving charge-transfer electrons
- Transition involving d and f electrons

When light passes through or is reflected from a sample, the amount of light absorbed is the difference between the incident radiation (I_o) and the transmitted radiation (I). The amount of light absorbed is expressed as either transmittance or absorbance. Transmittance usually is given in terms of a fraction of 1 or as a percentage and is defined as follows:

$$T = I/I_o \quad \text{or} \quad \%T = \left(I/I_o\right) \times 100$$

Absorbance is defined as follows:

$$A = -\log T$$

For most applications, absorbance values are used because the relationship between absorbance of a solution and both concentration of the absorbing species and the path length through the solution, normally is linear, and this relationship is called Beer-Lambert law [Owen, 1996]. A limitation of this law is that it is only linear for solution having an absorbance of about <1.5 AU (Absorbance Units). Hence with too high concentration there is no longer a linear relationship between the absorption and the concentration.

A "spectrophotometer" is an instrument for measuring the transmittance or absorbance of a sample as a function of the wavelength of electromagnetic radiation. The main components of a spectrophotometer are shown in Figure 6. Firstly, a source of electromagnetic radiations is needed. Two types of sources are generally used in UV-visible spectrophotometers. The first source, deuterium (D_2) arc lamp for ultraviolet light and second is tungsten (W) lamp for visible light. The deuterium lamp has a useful wavelength range of about 160-375 nm and the tungsten lamp a range of about 350-2500 nm. Most of the instruments are equipped with both of the lamps. The instrument automatically swaps lamps when scanning between UV and visible regions. After bouncing off a mirror (mirror1), the light beam passes through a slit and hits a grating. Depending on the wavelength, light falling on the grating is reflected at different angles. The grating can be rotated allowing for a specific wavelength to be selected. At any specific orientation of the grating, only monochromatic light successfully passes through a slit. A filter is used to remove unwanted higher order diffraction. Light then reaches the sample compartment. For UV-Vis absorption spectroscopy, the samples are most often liquids, and are analyzed in a cuvette. Cuvettes are rectangular in shape with a given path length (generally with an internal width of 1 cm) and volume. The sample container used must be made of material that allows radiation to pass over the spectral region of interest, and in the UV-visible spectral range. This is often quartz or fused silica.

Detection of the radiation passing through the sample o reference cell can be achieved by either photomultiplier or a photodiode, which converts the light signal into an electrical signal. The spectrum is produced by comparing the currents generated by sample and the reference beams.

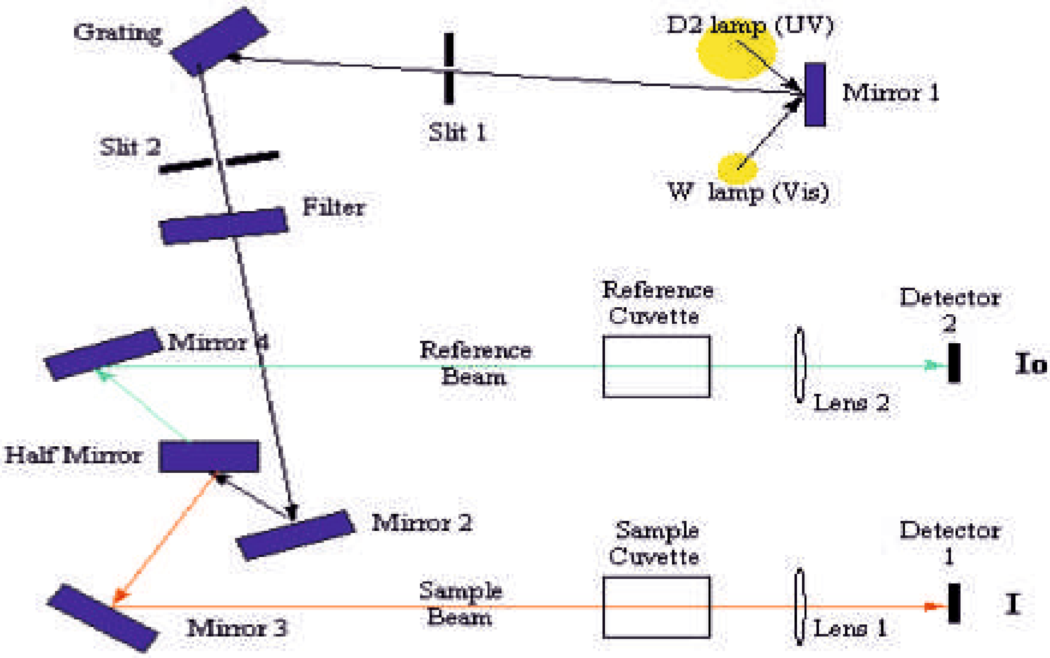

Figure 6. Diagram of the components of a typical double-beam spectrometer

Various configurations of UV-vis absorption spectrophotometers are available such as single or dual-beam spectrophotometers [Owen, 1996]. The conventional spectrophotometers and diode array spectrophotometers are generally single-beam instruments. To compensate the changes in lamp intensity between measurements on blank and sample, the dual-beam spectrophotometer was developed. They are however, more complicated with additional optical component and complex mechanical design that may result in the reduced sensitivity and sample throughput, and poor reliability. A variant of dual-beam instrument is the split-beam spectrophotometer that uses two detectors to analyze the sample and blank simultaneously. However, the use of two independent detectors is another source of drift [Owen, 1996].

4. Photoluminescence spectroscopy

In solids the phenomenon in which electronic states of solids are excited by photons from an external source and energy is released by these excited states as electromagnetic radiation is called luminescence. When a solid is illuminated by a short wavelength radiation and emits the radiation of higher wavelength, then the phenomenon is called photoluminescence (PL) [Vij, 1998]. These radiations can be collected and analyzed to yield a wealth of information about the photo excited material. The obtained PL spectrum provides the transition energies, which can be used to determine electronic energy levels. The relative rates of radiative and non-radiative recombination are measured by the PL intensity and the variation of the PL intensities with the parameters e.g. temperature and applied voltage can be used to characterize further the underlying electronic states and bands.

Depending on the nature of electronic transition producing the PL, it can be divided into two major: intrinsic and extrinsic photoluminescence. Further the intrinsic luminescence is of

three kinds Band to band luminescence, exciton luminescence, and cross luminescence. Luminescence owing to the recombination of an electron in the conduction band with a hole in the valence band can be observed in a pure crystal at relatively higher temperature is called band to band luminescence. In exciton luminescence the luminescence is produced by the exciton. An exciton is a composite particle of an excited electron and a hole interacting with one another. Exciton moves in a crystal transmitting energy and produces luminescence due to the recombination of electron and the hole. Two types of excitons are there: Wannier exciton and Frenkel exciton. The luminescence produced by the recombination of an electron in the valence band with a hole in the outermost core band is known as cross luminescence and is observed in most of alkali and alkaline earth halides and double halides. Luminescence produced by intentionally incorporated impurities is termed as extrinsic luminescence. The PL spectra for the liquid and powder samples are recorded using spectrofluorometer.
A typical PL set-up is shown in Figure 7.

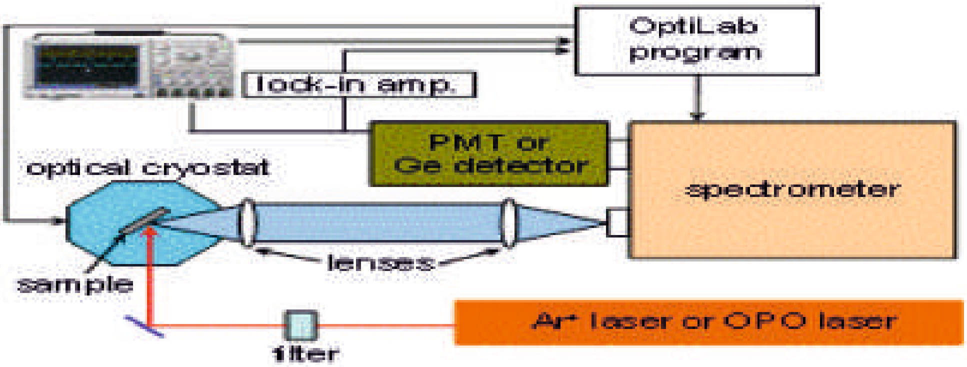

Figure 7. Experimental set-ups for the photoluminescence measurements

PL is a non-destructive, powerful, versatile, and simple technique to probe the electronic properties of semiconductors. Two types of PL spectra can be obtained: excitation spectra and emission spectra. The excitation spectrum gives the energy level position of the excited states and an emission spectrum yields information on the spectral distribution of the light emitted by the sample [Gfroerer, 2006].

5. Fourier Transform Infrared spectroscopy

Infrared (IR) spectroscopy has been a workhorse technique for materials analysis in the laboratory for over seventy years. The main goal of IR spectroscopic analysis is to determine the chemical functional groups in the sample. The range of infrared region is 12800 ~ 10 cm^{-1}. It can be divided into near-infrared region (12800 ~ 4000 cm^{-1}), mid-infrared region (4000 ~ 200 cm^{-1}) and far-infrared region (50 ~ 1000 cm^{-1}). The common used region for infrared absorption spectroscopy is 4000 ~ 400 cm^{-1}, because the absorption radiation of most organic compounds and inorganic ions is within this region. An infrared spectrum represents a fingerprint of sample with absorption peaks which correspond to the frequencies of vibrations between bonds of the atoms building up the material. No two compounds produce the exact same infrared spectrum, because each material is a matchless combination of atoms. This makes infrared spectroscopy useful for structural elucidation and compound identification [Banwell & McCash, 1994].

IR spectra are obtained by dispersive spectrometers or Fourier transform spectrometers by detecting changes in transmittance (or absorption) intensity as a function of frequency. Fourier transform spectrometers have replaced dispersive instruments for most applications due to their superior speed and sensitivity. They have greatly extended the capabilities of infrared spectroscopy and have been applied to many areas that are very difficult or nearly impossible to analyze by dispersive instruments. Instead of viewing each component frequency sequentially, as in a dispersive IR spectrometer, all frequencies are examined simultaneously in Fourier transform infrared (FT-IR)spectroscopy.

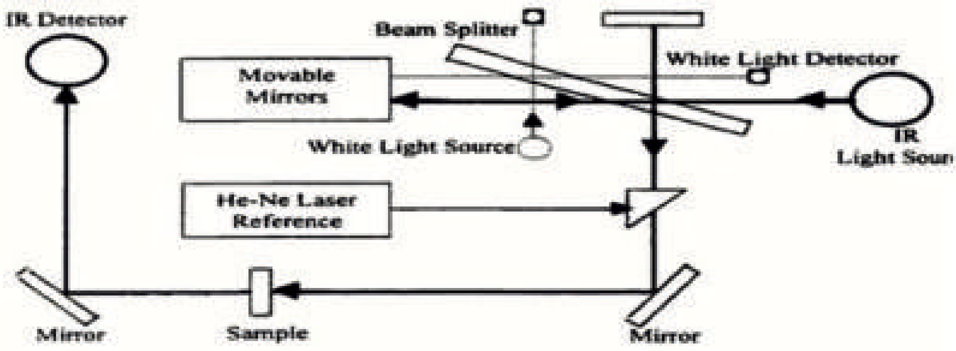

Figure 8. Schematic diagram of FTIR spectrometer

A common FTIR spectrometer consists of a source, interferometer, sample compartment, detector, amplifier, A/D convertor, and a computer. The core of the FTIR spectrometer is Michelson interferometer, is a device that splits a beam of infrared light into two parts so that the path of these two beams are different. The difference between these paths is called the optical path difference. Therefore, the beam splitter is the heart of the interferometer. The beam splitter is made up of a thin germanium plate coated with potassium bromide (KBr). Potassium bromide is a substrate that protects the germanium layer from the environment, and does not split the IR light. The germanium splitter reflects about half of an incident light beam while simultaneously transmitting the remaining half. One half of this split beam travels to the interferometer's moving mirror while the other half travels to the stationary mirror. The two mirrors reflect both beams back to the beam splitter and recombine. If the distance travelled by the two beams i.e. the distance between two mirrors and beam splitter are same then it is defined as zero path difference (ZPD). Constructive and destructive interference will occur, when these beams are in phase and out of phase respectively. Thus an interference pattern or interferogram is generated. The interference pattern varies with the displacement of the moving mirror. The specific frequencies of energy are absorbed by the sample due to the excited vibration of functional groups in molecules, when the interferogram signal is transmitted through or reflected off of the sample surface. After interaction with the sample the infrared signal is unique characteristic of the sample. Finally the focusing mirror in the path of light beam, from source to detector, focuses the beam on the detector and detector routes the information to computer. This information is decoded by Fourier transform and decoded spectrum is directed to read out device.

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ANNOUNCEMENT

Indian Delegation To International Physics Olympiad 2023

The following team will represent India at the 53rd International Physics Olympiad 2023 to be held at Tokyo, Japan from July 10 to July 17, 2023.

Name	Place
Aditya	**Pitampura, Delhi**
Dhruv Shah	**Aundh, Maharashtra**
Mehul Borad	**Kachiguda, Telangana**
Raghav Goyal	**Chandigarh**
Rhythm Kedia	**Raipur, Chhattisgarh**

The team will be accompanied by the following two Leaders and two Scientific Observers:

1) Prof. Arun V. Kulkarni, BITS Pilani, Goa — Delegation Leader
2) Dr Shirish Pathare, HBCSE, Mumbai — Delegation Leader
3) Prof. Anwesh Mazumdar, HBCSE, Mumbai — Scientific Observer
4) Dr Leena Joshi, St Xaviers' College, Mumbai — Scientific Observer

Prof. B. P. Tyagi
Chief Coordinator (Examination)

REPORT(RC-15)

Experimental Physics for PG Students

The Workshop on "Experimental Physics for PG Students" was organized by IAPT-Midnapore College-CSC at CSC on 08.04.2023 and 09.04.2023 in collaboration with RC- 15. Twenty-nine Physics (PG) students participated in this workshop. Among them, 18 students were from Midnapore College (Autonomous), six (06) from different colleges under Calcutta University, one (01) from the University of Burdwan, three (03) from Prabhat Kumar College, Contai, and one (01) from Bajkul Milani Mahavidyalaya.

All the participants were divided into fourteen groups. All the groups set their experiments, took data, analysed it, and completed calculations, including error estimation. The participants were instructed to join a Google Classroom for future communication. All of them were also instructed to make a project report in all respects and submit it in the Classroom. They were advised to suggest extending the works and any other innovative ideas for a new experiment. The enthusiasm among the participants is worth mentioning. Dr. Syed Minhaz Hossain, IIEST, Shibpur, Dr. Subhas Chandra Samanta, Midnapore College, Dr. Subhrajyoti Biswas, and Dr. Prasun Kr. Majumdar, Rishi Bankim Chandra College, Naihati, Dr. Pradipta Panchadhyayee, Prabhat Kumar College, Contai, Sanjoy Pal, Soumen Sarkar, Anirban Samanta, Dr.Makhanlal N. Goswami, Dr. AbhijitBera, Midnapore College (Autonomous), Dr.Sisir Choudhury, Midnapore College (Autonomous) were actively involved in the workshop as the resource persons. Dr. PuspenduKuila, Coordinator, IAPT-Midnapore College Centre for Scientific Culture, coordinated this workshop.

Pradipta Panchadhyayee

REPORT(RC-02)

Two Days Workshop On "Python"

Activity: Two Days Workshop
Topic: Python: Computer Language
Resource Persons: Dr. Anil K Verma (Professor-CSED, TIET) and Mr. Sanjeev Rao (Assistant Professor-CSED, TIET)
Schedule: March 17 & 18, 2023
Venue: Library Reading Hall and Computer Lab No. 1 of DAV College Bathinda
Sponsored by: Punjab State Council for Science & Technology, Chandigarh, DBT-SCS and (RC-02)
Activity Incharge: Dr Vandana Jindal
Beneficiaries: 120 participants of BCA, PGDCA, B.Sc., B.A. and B.Com attended the workshop.
Activity Report Author: Dr. KulwinderSingh Mann

The Department of Computer Science, DAV College Bathinda organized two days workshop on "Python" on March 17 & 18, 2023. The resource persons on the occasion were Dr. Anil K Verma (Professor-CSED, TIET) and Mr. Sanjeev Rao (Assistant Professor-CSED, TIET). The guests were welcomed by the Principal Dr. Rajeev Kumar Sharma, Head, Department of Computer Science Dr. Vandana Jindal and the faculty members of the Department of Computer Science. Dr. Anil K Verma explained about the advanced features of Python, like, functions, inheritance, function overloading, operator overloading and many others. Mr. Sanjeev Rao related the real life applications of Python language and gave practical demonstrations. He also answered queries of the participants patiently.

The students expressed immense satisfaction at attending the workshop. They stated that the workshop was very informative. It is very useful in today's times, when everything is technology driven. Principal Dr. Rajeev Kumar Sharma at the valedictory session thanked the resource persons for sparing time off their busy schedule and helping students explore various applications of Python, their practical application in various spheres, be it in academics, designing or their profession. He exhorted the students to make the best use of such workshops and enhance their knowledge and skills. He also appreciated the HOD, the faculty members and the technical staff members of the Department of Computer Science. Certificates were distributed to the participants at the valedictory session. More than 120 participants of varied disciplines like BCA, PGDCA, B.SC, B.A. with Computer Science and B.Com attended the workshop.Dr. Vandana Jindal thanked the participants for enthusiastic participation and overwhelming response. The stage was conducted by Prof. Ramil Gupta and the vote of thanks was delivered by Prof. Anuja Puri.

K.S. Mann

REPORT(RC-03)

Hands on Workshops

1. Hands-on Workshop on 'Computer Interfacing Experiments using ExpEYES'

Organized by: Department of Physics, SGGS College

Venue: SGGS College, Sector 26, Chandigarh

Resource Persons: Dr Ajith Kumar B P, Scientist H, IUAC, New Delhi

Date: 03 April, 2023

Activity Incharge: Dr. Saroj Bala

Program Coordinator: Dr. Amit Goyal

Sri Guru Gobind Singh College, Chandigarh organized a One Day Hands-on Workshop on 'Computer Interfacing Experiments using ExpEYES' in collaboration with Indian Association of Physics Teachers, Regional Council-3. It provides an opportunity to the students to learn and gain practical experience in Computer Interface

Experiments and develop skills in the area. Dr Ajith Kumar BP, Scientist H, IUAC, New Delhi was the Resource Person. He highlighted the functions of expEyes as a test equipment. Students received hands-on training to perform science and technology experiments using SEElab 3.0 and ExpEyes 17 under his guidance. He demonstrated the use of various portable tests and measurement tools which can be connected to modular communication buses to perform lab experiments. The Workshop was also attended by Faculty members from other institutions of the Tricity.

Dr Navjot Kaur, Principal thanked the Resource Person for his valuable insights. She urged the participants to apply the knowledge and skills gained at the Workshop in their future endeavours. She commended the efforts of PG Department of Physics and Institution Innovation Council for organising the event.

Saroj Bala
Member
IAPT-RC-03

2. Hands-on Workshop on LATEX Software

Organized by: Department of Physics, GGDSD College

Venue: GGDSD College, Sector 32C, Chandigarh

Date: 03 April, 2023

Number of participant: 48

Activity Incharge: Dr. Neelu Mahajan

BOSONS Club, Department of Physics, Goswami Ganesh Dutta Sanatan Dharma College in collaboration with *Indian Association of Physics Teachers - Regional Council 3,* organized a DBT Sponsored Hands on Workshop on LATEX Software on 3rd April, 2023. Dr. Amit Goyal, Assistant Professor in Physics, acted as the resource person for the workshop. The workshop aimed at imparting an elementary training in the working of LATEX software to the students of post graduate classes. LATEX is open source free software, which is widely used in writing scientific articles, presentation preparation and theses. Beginning with the basics of the software, students were encouraged to learn the type setting and most of the essential commands in LATEX, using which they were able to write a sample paper on their own. Around 40 post graduate students and 2 research scholars along with 6 faculty members attended the workshop. Principal, Dr. Ajay Sharma, appreciated the efforts of the department for organizing the workshop and encouraged the students to get the maximum benefit out of such activities.

Neelu Mahajan
Member
IAPT-RC-03

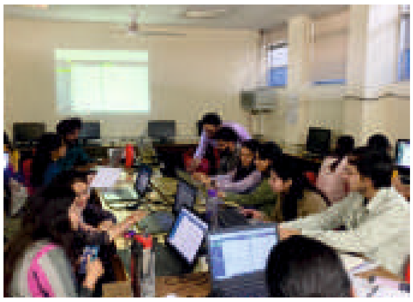


Photo Essay in Physics

National competition on photo essays in physics was organised by the autonomous colleges Bajaj College of Science (Wardha, Maharashtra) and Fergusson College (Pune, Maharashtra) in association with RC-08 as a part of the celebration of National science day 2023. This competition was open for undergraduate students and above. 59 entries were received as a form of power point presentation out of which 41 entries were evaluated online by the team of experts from IAPT.

Dr. Santosh Joshi from Ratlam, Miss Gauri Waghmare and Mr. Kapil Sati from Bajaj College of Science, Wardha were amongst the top three and were given cash prizes of Rs. 5000/-, Rs. 3000/- and Rs. 2000/- respectively by the organizers. Top 10 photo essays will be displayed on the IAPT website and will be invited to present the poster in the next IAPT convention.

Miss Vaibhavi Gulvani, research scholar from Fergusson college took efforts for the coordination of the event along with the faculty co-coordinators Dr. Ashish Yengantiwar (Fergusson College, Pune) and Dr. Govinda Lakhotiya (Bajaj College of Science, Wardha).

Govinda Lakhotiya
Bajaj College of Science (Autonomous)

Activities

Activity- 1
Date - 28th Jan 2023
Platform- Zoom
No of registered participants- 377
Resource Person – Prof Samit. K. Mandal
Title of the Talk – "Femto Physics and It's Applications"
You tube Link-
https://www.youtube.com/live/XL94TuWHqi8?feature=share

The talk was focussed on the nuclear physics as the size of the nucleus is of the order of fermi. Prof. Mandal, introduced various areas where we can apply femto physics and its applications like industry, military, research, medical science, archaeology, geology and astrophysics to the audience. He showed the different techniques for inducing the nuclear beam in human body at the designated target without affecting the neighbouring tissues. He also discussed how nuclear astrophysics is helpful in understanding the death and birth of stars, understanding the energy that power the stars, how elements are formed. He also discussed the upcoming nuclear facility FAIR 2025 and how India is contributing in it and University of Delhi is also a collaborator of the FAIR facility. He also discussed the future scope for the students from career point of view. The whole program was coordinated by Dr. Poonam Jain, Yogesh kumar and all other EC Members of IAPT RC-1. Prof. P. K. Ahluwalia, President IAPT graced the audience with his presence as chief guest.

Activity-2
Celebration of National Science Day 28th Feb 2023, Tuesday
Mode: offline
Venue: Department of Physics andAstrophysics, University of Delhi
No of registered Participants: 180
No of posters: 30
Title of poster: 'Physics concepts and its Application in Forensic Sciences'
Title of Lecture: "An Exploration of the Quantum Treasure Island"

The Regional Council (Delhi & Haryana) of IAPT celebrated National Science Day 2023 in collaboration with the Department of Physics & Astrophysics, University of Delhi. The Chief Guest was **Prof Brajesh. C. Choudhary, Head of the Department,** Department of Physics & Astrophysics, University of Delhi and eminent Speaker was **Prof Patrick Das Gupta**, Department of Physics & Astrophysics, University of Delhi There were about 30 entries from different schools of Delhi and

Haryana, UG,PG students and Research scholar for poster competition. The top three winners were awarded certificates and cash prizes of Rs. 3000/-, 2000/- and 1000/- respectively and two consolation prizes of Rs. 500/- each. It was also decided to showcase the top five posters presentation entries in the regularIAPT Bulletin.The programme was attended by more than 180 students, research scholar, and teachers from different schools and colleges of Delhi, Haryana, and NCR region.

Prof. Samit K. Mandal, Senior Professor Department of Physics and Astrophysics, University of Delhi and Prof. H. K. Sehjwani Former Dean(Academics), IEC College of Engineering and Technology, Greater Noida were judges for the poster session. The whole Team of IAPT RC1 Dr Yogesh Kumar, Dr Poonam Jain, Dr S.K. Singhal, Dr M.S. Bhandari, Dr Manoj Kaushik, Dr Vikas Mittal and Dr Seema Vats coordinated the event very well under the supervision of Dr O.P. Sharma and Prof V.P. Srivastava.

Activity-3

Date: 24th March 2023
No of Students : 25 (MLNC), 25 (ANDC)
Faculty: 5(MLNC), 5(ANDC)
Visit to BIS Lab

Bureau of Indian Standards Delhi Branch Office-II, planned an exposure visit in collaboration with RC- 1, for science students and Mentor Teacher of **Motilal Nehru College(MLNC) and Acharya Narendra Dev College(ANDC), University of Delhi** for BIS Central Laboratory,(20/9, Maharajpur, Sahibabad Industrial Area Site 4, Sahibabad, Ghaziabad, Uttar Pradesh 201010. This is an excellent outreach initiative which give exposure to the students about the BIS working and the certification process.

Activity-4

Date: 15th April 2023, Saturday
Mode: Hybrid (online as well as offline)
Venue: Amity International School, Mayur Vihar, New Delhi
Resource Person: Prof Raghunath Sahoo, IIT Indore (online mode)
Title: "Journey of Subatomic Particles from Laboratory to Daily Life"
Resource Person: Prof Avinash. C. Pandey, Director, IUAC Delhi (offline& online)
School Activity: Hands on Training program on Aerospace
No of students: 100

RC-1 organised 11th Prof Ved Ratna National Memorial Lecture Series in collaboration with Amity International School Mayur Vihar and also organised ATL Community Day on 15 April 2023 in the school auditorium.

The programme was graced by distinguished luminaries from the field of science, and Shri Shruti Bodh Agarwal, Retd. Deputy Director, DOE, Mr Suman Pandit, Niti Ayog and Dr Lalit Mittal, Advisor, Amity Children Science Foundation. It was graced by the esteemed members of the IAPT family namely, Dr. Seema Vats, Physics Department, Delhi University, President, IAPT, Dr. O. P. Sharma, Director, Innovation Cell, IGNOU, Dr.Yogesh Kumar, Physics Department, Delhi University, Secretary , IAPT, Shri Surjan Singh, Principal, ITBP Public School, Dwarka, Vice President, IAPT and all EC Members, Prof. H.K Sahjwani, Shri R.K Tiwari, Principal, DAV School , Daryaganj, Dr. Poonam Jain, Physics Department, Delhi University, Dr. M.S. Bhandari, and Dr. S.K. Singhal, Senior Coordinator, AISMV, Treasurer, IAPT.

The programme began with the auspicious lighting of the lamp followed by Ganesh Vandana to invoke the blessings of the Almighty. The Principal, Mrs. Meenu Kanwar addressed the august gathering and presented the Welcome Address wherein she highlighted the inspiring initiatives at Amity to kindle spirit of inquiry and scientific temperament in every child from their early years. This was followed by the felicitation of the guests and members of the IAPT. Senior Co-ordinator Dr. S.K. Singhal, enumerated the achievements of the students in science and other domains, in his address to the gathering. The participating teams were taken on a visit to the ATL lab to showcase the working of the lab after the registration. Dr. Raghunath Sahoo, Professor Department of Physics, IIT Indore presented an online lecture followed by Prof. A. C. Pandey, Director, IUAC who presented his lecture in offline mode to the gathering. More than 100 students from 16 schools all over Delhi and

NCR participated in the Hands-on Training program showcasing their innovative ideas and scientific thinking. The participants had to design the model of an airplane that would fly using the laws of science as a part of the aerospace activity and showcase it in front of the judges.

Finally, the much-awaited prize distribution ceremony began, and the judges announced the result. The First Prize with a cash prize of Rs 1500 was won by Team Kalam represented by Vivekanand School followed by the Second prize with a cash prize of Rs 1100 which was bagged by Team Tesla represented by Gaur International School and the Third Prize with a cash prize of Rs 500 was awarded to Team Ampere represented by Amity International School, Saket.

Seema Vats
President

Understanding The Working Of The Atl Lab

REPORT(RC-13)

Learning by Doing

Activity : Teacher Training Workshop
Topic : Learning by Doing
Resource Persons : Dr.T.S.Natrajan (Retd.Prof. IITMadras) and Dr. D.Uthra (DDGD Vaishnav College, Chennai)
Organized by: RC-13, Tamilnadu and Pondicherry
Venue: Vidya Mandir Senior Secondary School, Mylapore, Chennai
Date: 19.04. 2023
Number of Participants: 50 Science Teachers from different schools
Program Coordinator : Ms. Juno Thangakumar

With experiential learning being one of the most successful pedagogical tools, this workshop was organized with the focus on training how teachers can design and deliver Physics concepts through simple activities in their classrooms. More than 50 Science Teachers handling classes from 6 to 10 on 19th April 2023 benefitted through this activity based workshop. Mrs. Shoba Raman, Principal, Vidya Mandir Senior Secondary School welcomed the gathering. Ms Juno T, EC Member IAPT RC-13 introduced the resource persons and threw light on the need for such a training to the teachers through hands-on activities. Dr Nirmal Thyagu, MCC who has been a catalyst for the workshop enthusiastically joined the team for this workshop.

Prof. T.S. Natarajan, President IAPT RC-13 showed the way to captivate attention of a class through his demonstrations of many physicsconcepts viz, Bernoulli theorem, forming virtual images, electromagnetism.Every teacher participant could learn from his demos with floating bulb, Tesla coil on how to teach students how to design and conduct experiments and were enlightened to visualize the concept. Physics activity kits were distributed to the teacher participants from various schools. A few enthusiastic students of class 9 from the host school took over the second session with their working models to explain the concepts of convection current, air pressure and the function of lungsand they made session more interesting.

Through her interactive session, Dr. Uthra helped the teacher participants from different streams, viz., Physics, Chemistry and Biology appreciate the trans-disciplinary approach each of us need to adopt while designing activities. She gave an overview on resource materials available to teachers at Vigyan Prtaibha learning units, for planning their activity based classes and portals like Vigyan Prasar to update themselves. All the participants felt energized and promised to make their classes more hands-on and interactive.

Juno. T
Secretary

Announcement

XXXVII Annual Convention: 2023

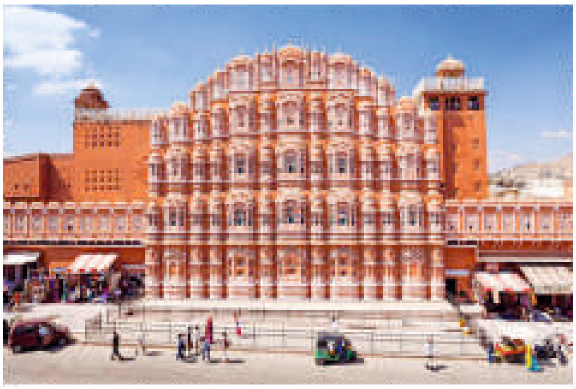
Organized by:

IAPT-RC06, Rajasthan

Babu Lal Saraf Centenary year celebration

Date: 7-10 October, 2023

Venue: IIS (deemed to be University), Jaipur



Chairman: Prof. Y K Vijay, President, IAPT RC06, 9461302757

Convener: Prof. Y C Sharma, Vice President, IAPT RC06, 9664075093

Organising Secretary: Mr. Ashish Arora, Secretary, IAPT RC06, 9829019124

Note: Theme and Registration details to follow.

Prof. Samit Kumar Ray elected a Fellow of the Indian Academy of Science

Life member, Prof. Samit Kumar Ray, a distinguished Professor of the Department of Physics and Meteorology, IIT Kharagpur, has been elected as the Fellow of Indian Academy of Science, Bangalore, 2023. He was the founder Head of the School of Nanoscience and Technology (2014-2016) and the Former Director of S N Bose National Centre for Basic Sciences. Prof. Ray is involved in the research and development of semiconductor quantum heterostructures nano scale electronic and photonic devices. He is currently involved in integrating 2D materials (graphene, MoS_2, and WS_2) on Si platforms for large-area photonic devices and CMOS-compatible gas sensing devices operated at room temperature using semiconductor nanostructures.

Prof. Ray is a recipient of the INSA Young Scientist Award (1993), Homi J. Bhabha Award (2001), MRSI-ICSC Superconductivity & Materials Science award (2015), MRSI medal lecture award (2007) and CDIL award of IETE (1997). He is a fellow of the National Academy of Sciences (NASI), Indian Nation Academy of Engineering (INAE), and West Bengal Academy of Science & Technology. Prof Ray has published more than 300 research papers in peer-reviewed journals, one US patent, and six book chapters. Moreover, he co-authored a book on "Strained Silicon Heterostructures: Materials and Devices," published by IEE, UK.

He serves in several National committees that include the Nano Science Advisory Group of DST, DST PAC member on Condensed Matter Physics & Materials Science and International bilateral projects, PRSG member, Deity Centers of Excellence in Nanoelectronics, and projects approved by the office of the Principal Scientific Adviser to the Government of India.

An Appeal

We have rolled out a beta version of our dynamic website www.indapt.org.in and have now launched its new IAPT Members Portal powered by Alma Shine. All members are requested to update their profile on the portal. Alternately please send following information to email: connect@iapt.mails.org.in or iaptknp@rediffmail.com

Name: ……..

Membership No. ……..

Address: ……..

Mobile No. ……...

Email. ……..

P K Ahluwalia
President

The Story Of Cosmology Through Post Stamps 6

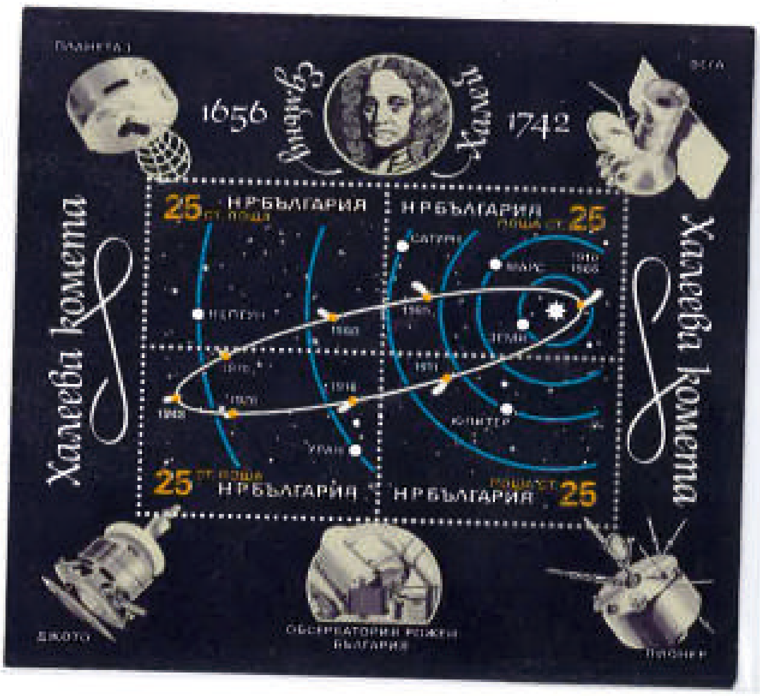
COMET

HALLEY COMET -THE DIRTY SNOW BALL

Five robotic probes were sent for close flyby to study the nucleus of the Halley Comet during its visit in 1986. Two were of USSR- Vega-1 and Vega -2, which took first image of the nucleus, third was of European Space Agency, Giotto Remaining two were Japanese- Suisei and Sakigake. From the data send by these probes it is found that nucleus of comet consists of mixture of water and other volatile ice and rocky and carbon rich dust.70% of the surface is covered with dark insulating crust and 30% is active and provide huge bright jet of gas and dust.

FDC – ***Stamp*** depict highly elliptical orbit of the comet through solar system. ***Vignette*** -depict the orbital path of probe Giotto cutting the orbit of comet. ***Cancellation*** – depict probe Giotto

Orbital Path and Inclination of the Plane of comet. Also depict retrograde motion of the comet in orbit



Souvenir sheet - Setanent block- depict the elliptical orbit of comet Halley and its location in different years with respect to solar system

Margin of the sheet depict different probe launched to study the comet

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BULLETIN OF INDIAN ASSOCIATION OF PHYSICS TEACHERS

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Dr. Sanjay Kr. Sharma

Managing Editor

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