Bulletin of

₹ 25/-

ISSN 2277-8950

THE INDIAN ASSOCIATION OF PHYSICS TEACHERS

A MONTHLY JOURNAL OF EDUCATION IN PHYSICS & RELATED AREAS

VOLUME 15 NUMBER 03 MARCH 2023

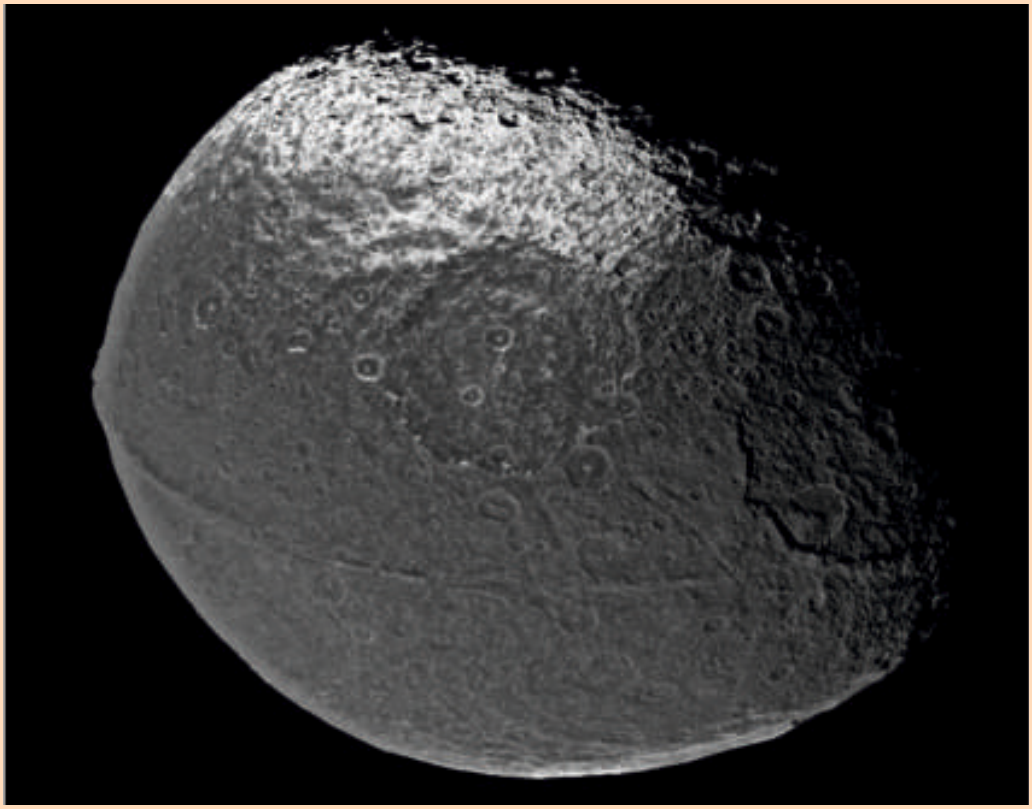


Figure 1: Saturn's Iapetus: Moon with a Strange Surface

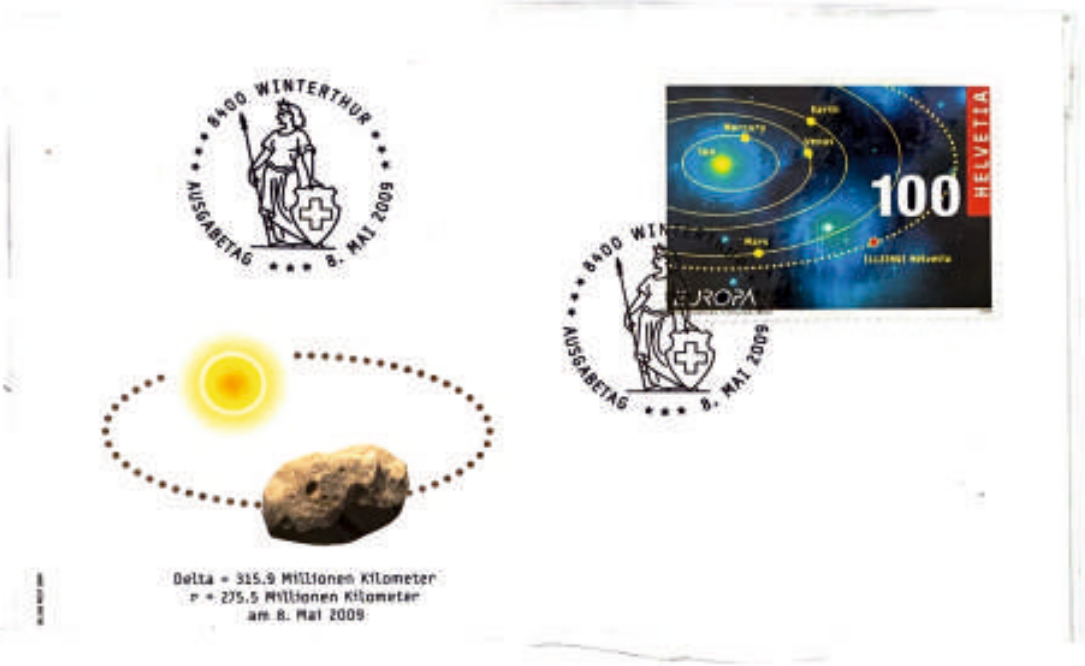
What would make a moon look like a walnut? A strange ridge that circles Saturn's moon Iapetus's equator, visible near the bottom of the featured image, makes it appear similar to a popular edible nut. The origin of the ridge remains unknown, though, with hypotheses including ice that welled up from below, a ring that crashed down from above, and structure left over from its formation perhaps 100 million years ago. Also strange is that about half of Iapetus is so dark that it can nearly disappear when viewed from Earth, while the rest is, reflectively, quite bright. Observations show that the degree of darkness of the terrain is strangely uniform, as if a dark coating was somehow recently applied to an ancient and highly cratered surface. Last, several large impact basins occur around Iapetus, with a 400kilometer wide crater visible near the image center, surrounded by deep cliffs that drop sharply to the crater floor. The featured image was taken by the Saturn-orbiting Cassini spacecraft during a flyby of Iapetus at the end of 2004.

The Story Of Cosmology Through Post Stamps 1

THE NEW VIEW OF THE SKY

SMALL SOLAR SYSTEM BODIES-ASTEROIDS

Asteroids are rocky, airless remnant leftover rubble about 4.6 billion years ago, orbiting the Sun between mars and Jupiter within main Asteroid belt there are millions of asteroids, the largest one is Ceres.940km across &smallest ever studied is 2m wide space rock. First asteroid Ceres was discovered in 1801 by Giuseppe Piazzi



FDC- **stamp depict asteroid *113390 Helvetia,* 2.2km in diameter, from the inner region of asteroid belt, discovered on 29 Sept.2002 by Swiss astronomer-Markus Griesser.This *Florian asteroid* named after swiss national symbol. Helvetia**

Se tenant pair **depicting an asteroid *Goborovo* discovered on April 1,1976. Named after Bulgarian town Goborovo, which is known as city of humour (as April 1st is also linked with fun and humour)**

Carl friedrich Gauss-first to calculate the orbit of asteroids

Unperforated stamp-depict Pluto and its orbital plane-it is a Dwarf planet in the Kuiper belt. In 2006 Pluto had been excluded from the list of planets of solar system by IAU and classified as dwarf planet or plutoid

Asteroid 2867*Steins* (diamond in the sky) discovered in 1969 named due to its diamond like shape.5 km in diameter, discovered by Nikolo Chernykh

Ceres -roman Goddess of crop- also name of first discovered asteroid

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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Hands on Minds on Spaces of IAPT& Tasks Ahead

When IAPT was founded, it was with a vision which was dreamt by the founders after identifying the ills of the system prevailing at that time. In March issue of IAPT bulletin in 1984, Prof. DP Khandelwal wrote:

"… the base of science education has failed to show any improvement…"

"…About laboratories situation is worse. At a recent Conference, during discussions on the laboratory, a senior physicist of a neighboring country commented- Why laboratory at all…"

I don't need to comment, our teachers in schools, colleges and universities can testify the truth of the statements.Unfortunately, situation has gone from bad to worse with covid giving a push down the hill. In the past 40 years, IAPT has shown the waywith its resolve both in terms of knowledge, human and networked resources,but it has yet to create an impact as a most sought after forum for physics teaching, learning and creating.This needs introspection.

- National standard examinations in Secondary Schools and Colleges;
- NANI network;
- National Competitions in innovative experiments in physics,
- Essay writing in physics, and computational physics;
- Innovation Hubs;
- Students Journal of Physics;
- National Competition of Photo Essay on Physics;
- Facebook page: Let us Solve It (Lusi);
- Conduct of Asian Physics Olympiad, Junior Science Olympiad and International Physics Olympiad;

- Annual IAPT Symposium and Convention;
- Annual National Student Symposium in Physics;
- Centre of Science Culture, Midnapur;
- Prof. Babu Lal Saraf Annual Workshop on Experimental Physics;
- Nagpur IAPT Centre (In limbo);
- Asian Physics Olympiad Laboratory at GEHU, Dehradun;
- Incentivization of best performing RCs;
- IAPT DSM best teacher award;
- Regional activities generated by RCs.

Besides these all-regional councils and sub regional councils organize their programs and carry forward the mission and objectives of IAPT.Celebration of Birth centenary of Prof. DP Khandelwal has shown us how a sustained program can initiate dialogue to give a relook to our achievements and approaches to generate new ideas. These all constitute our hands on minds on spaces and need to be more aspirational, innovative and handholding in nature. This also require identifying talent around us among, our young colleagues and nurture them further to comeforward to take on responsibilities.

A week ago there was a very interesting and uplifting news from Innovation Hub at Vaishnav Vidyapeeth Vishwavidyalaya Indore where it has been established as one of the 42 hubs around the country. Students in the hub were drawn from rural hinterland of Madhya Pradesh, Gram Baroli. In the hub 50 students accompanied by 4 teachers were seen fully involved in exploring and enjoying experiments led by Prof. Uttam Sharma, indeed an Uttam act. Thanks to Prof. YK Vijay who has carried Prof. Babu Lal Saraf's legacy out in the hands of teachers and students.

Recently some steps have been initiated to document our work and to make it available to its stake holders on day today basis. Prof. Santosh Joshi has done a commendable job in e-publishing awarded essays under the theseries title An *Ensemble of Surround Physics*, a valuable resource for the students' teachers and general readers. Prof. Ananth Krishnan, Dr. Rekha Ghorpade, Dr. Vijay Somen and Dr. Geetha Subbaiya have taken upon them the task of publishing awarded innovative experiments in the form of another e-book, which is likely to provide us a relook at our efforts. Maybe we need to do the same for computational physics at the earliest and initiate a journal on *Computational Thinking, Modelling and Computer Simulations*. Under the banner of NANI IAPT,mentored by Prof. HC Verma a very large number of *Anveshikas* are functioning. Acommendable documentation of the NANI resources is also available which needs to be made available after compilation as e-publications on the IAPT website. *Student Journal of Physics* being run from Institute of Physics, Bhuwaneshwar is an underutilized platform and is not known to even IAPT community as a journal for students where results of students' projects can be published as their first research communication after peer review. Physics Education is in dormancy and despite our best efforts has not resumed its e-publication, IAPT is after them to start publishing again. In the case of these journals a revamp in attracting young readers is desirable,bybringing exposure through review articles and theme based special issues particularly on Physics Education Research.

Strengthening and expanding the network of regional councils is need of the hour. Is one regional council enough for big states like Uttar Pradesh, Bihar, Orissa, Tamil Nādu, Madhya Pradesh, west Bengal, Rajasthan, Gujrat and Telangana? Sub regional councils must be created in these states. Their creation can help us reach out to the unreached. May be Delhi and Haryana need to have separate regional Councils.

Lately work has been initiated by Prof. K.N. Joshipura to go deeper into secondary school level Physics Curriculum (class 11 and 12), which is being revamped and needs to be at par with the futuristic needs of students of physics and allied sciences.Can we do without curtailing its content in the name of load shedding?

We propose to conduct a country wide *Force Concept Inventory Survey* to know the reality on ground about efficacy of our teaching learning processes prevailing in a very heterogeneous mix of our schools and first year college students. Prof Vijay Singh and Dr. Himanshu Pandey have alreadytranslated this survey in Hindi and translation in other languages is in progress. IAPT is in touch with very distinguished resource persons to complete this work at the earliest so that next phase of validating each translated work may be accomplished soon.

Survey done by DP Khandelwal committee, headed by Prof. SC Samantha, regarding status of physics lab practices has reported a very depressing outlook. It is being given a closer look to write a white paper for the concerned authorities who are supposed to look into the decline of lab practices over the last three decades and provide scaffolding for their resurrection. Assessment is the biggest issue there and giving 100 percent marks to students is the biggest embarrassment for the education system in the country. Some ethical issues are involved besides infrastructural constraints, for which teachers need to be more sensitized than students.Can IAPT rise to this to show the path ahead paved with difficulties and reluctances all the way?

Through this edit I have tried to raise some green flags and some red flags. Green flags give us courage to go ahead and red flags should make us resolve to find workable solutions to the problems. After all as physics students we are trained in problem solving acts through critical thinking, mathematical thinking, computational thinking and thinking out of the box. I hope these solemn issues will bring out your thoughts offering solutions, which we would like to publish in our future issues of IAPT Bulletin. Come forward and share. Now we are 24X7 ready with IAPT's own zoom license, covid has made us learn the benefit of online reach out. It can be a game changer, RC's must plan activities, webinars, workshops, panel discussions. Let us shake hands virtually and identify young faculty from schools, colleges, universities and Higher Education Institutions. Professor Akhilesh Tiwari from IIIT Pryagraj has been instrumental in making this happen along with members of the IAPT web team. Work is in Progress on the dynamic website of IAPT, which is expected to improve our connectivity with the members in a big way. We need to ideate, innovate and implement. No doubt silence is gold, but let us also remember speech is silver and writing is the silver lining. A body of ten thousand members with huge experience and fortitude can indeed make a difference. We have no dearth of inspiration, Birth Centenary Celebrations of Prof. BL Saraf and Prof. HS Hans is the best way to keep feeling inspired.

PK Ahluwalia
President IAPT

PHYSICS NEWS

Neutrons reveal key to extraordinary heat transport

Warming a crystal of the mineral fresnoite, Oak Ridge National Laboratory scientists discovered that excitations called phasons carried heat three times farther and faster than phonons, the excitations that usually carry heat through a material. In most crystals, atomic vibrations propagate excited waves through the lattice as phonons. However, in certain crystals, atomic rearrangements also propagate excited waves as phasons. Because phasons can move faster than sound, physicists anticipated they would excel at moving heat.

The team mapped paths of phasons and phonons and characterized their vibrations at ORNL's Spallation Neutron Source and measured the transport of heat through the lattice. The results may help theorists improve accuracy for heat transport simulations of energy materials.

Read more at:https://phys.org/news/2023-02-neutrons-reveal-key-extraordinary.html

Original paper: Physical Review Letters (2022). DOI: 10.1103/PhysRevLett.129.255901

When material goes quantum, electrons slow down and form a crystal

Interference effect occurs when scientists stack two-dimensional crystals with mismatched atomic spacings. Moiré superlattices display exotic physical properties that are absent in the layers that make up the patterns. These properties are rooted in the quantum nature of electrons. Researchers have discovered a new property in the moiré superlattices formed in crystals made of tungsten diselenide/tungsten disulfide($WSe_2/WS_{2)}$. In these two-dimensional crystals, the interactions between electrons become so strong that electrons "freeze" and form an ordered array.

In WSe_2/WS_2, electrons interact so strongly that they even avoid sitting on neighboring sites. This rare phenomenon is known as Wigner electron crystal.LBNL researchers also demonstrated that in WSe_2/WS_2, light with appropriate polarization interacts with spin-up and spin-down electrons separately, making it possible to selectively change the energy of electrons based on their spin. In doing so, they observed spin excitations persisting orders of magnitude longer than charge excitations. This opens the door for the future investigation of exotic spin states such as quantum spin liquidity.

Read more at:https://phys.org/news/2023-02-material-quantum-electrons-crystal.html

Original paper: Nature (2020)

Unusual atom helps in search for universe's building blocks

An unusual form of cesium atom is helping a University of Queensland-led research team unmask unknown particles that make up the universe. An unusual atommade up of an ordinary cesium atom and an elementary particle called a muonmay prove essential in better understanding the universe's fundamental building blocks.

Astrophysical and cosmological observations have shown that the matter we know about commonly referred to as 'Standard Model' particles in physics makes up only five percent of the matter and energy content of the universe. The search for dark matter particles lies at the forefront of particle physics research, and their work with cesium might prove essential in solving this mystery.Through theoretical research, Dr. Ginges and her team have improved the understanding of the magnetic structure of cesium's nucleus, its effects in atomic cesium and the effects of the weird and wonderful muon. The researchers said the new approach can offer greater sensitivity and an alternative technique to finding new particles, through the use of precision atomic measurements.This can be a more sensitive technique unveiling particles that particle colliders simply can't see.

Read more at:https://phys.org/news/2023-02-unusual-atom-universe-blocks.html

Original paper: Physical Review Letters (2023). DOI: 10.1103/PhysRevLett.130.053001

Soumya Sarkar
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Nanotechnology: A Multi-disciplinary technology of 21st Century

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Nanoscience is the study, and nanotechnology is the exploitation, of the strange properties of materials smaller than 100 nanometers to create new useful objects. Nanotechnology is also called Engineering at the molecular level. It is a multi-disciplinary area of applied science and engineering focused on the design, synthesis, characterization and application of materials and devices on the nanoscale, whose structures and components exhibit novel and significantly improved physical, chemical and biological properties, phenomena and processes due to their nanoscale size.

Nanomaterials have the structural features in between of those of atoms and the bulk materials. While most micro structured materials have similar properties to the corresponding bulk materials, the properties of materials with nanometer dimensions are significantly different from those of atoms and bulks materials. This is mainly due to the nanometer size of the materials which render them: (i) large fraction of surface atoms; (ii) high surface energy; (iii) spatial confinement; (iv) reduced imperfections, which do not exist in the corresponding bulk materials. Due to their small dimensions, nanomaterials have extremely large surface area to volume ratio, which makes a large fraction of atoms of the materials to be the surface or interfacial atoms, resulting in more "surface" dependent material properties. This in turn may enhance or modify the properties of the bulk materials. The nanometer feature sizes of nanomaterials also have spatial confinement effect on the materials, which bring the quantum effects. Nanoparticles can be viewed as a zero-dimension quantum dot while various nanowires and nanotubes can be viewed as quantum wires. The quantum confinement of nanomaterials has profound effects on the properties of nanomaterials. Reduced imperfections are also an important factor in determination of the properties of the nanomaterials. Nanostructures and nanomaterials favors of a self-purification process in that the impurities and intrinsic material defects will move to near the surface upon thermal annealing. This increased materials perfection affects the properties of nanomaterials.

During the real bursting of nanotechnology in the past decade, nanotechnology has become a real interdisciplinary research field in which many physicists, chemists, biologists, materials science and other specialists are involved. Nanoelectronics devices based on new nanomaterials systems and new device structures will contribute to the development of next generation of microelectronics. For example, single electron transistor and field effect transistor based on single wall carbon nanotubes are already on the way. Further, nanotechnology is also expanded extensively to other fields of interest due to the novel properties of nanomaterials discovered and to be discovered. For example, nanowires can be potentially used in nanophotonic, laser, nanoelectronics, solar cells, resonators and high sensitivity sensors. Nanoparticles can be potentially used in catalysts, functional coatings, nanoelectronics, energy storage, drug delivery and biomedicines. Nanostructured thin films can be used in light emitting devices, displays and high efficiency photovoltaics. Nano investigations, being widely interdisciplinary by their very nature, promote the joining and merging of the various science and technology fields such as powder technology, colloid chemistry, surface chemistry and physics, clusters and aerosols, tribology, catalysis, simulation and modeling, computer technique, etc. Due to size tunable photo-physical and photo-chemical properties, intrinsic and extrinsic semiconductor nanomaterials seem to be good candidates for next era optoelectronic industrial applications like fast & efficient phosphors.

Nanotechnology is likely to have a profound impact on our economy and society in the early twenty-first century, comparable to that of semiconductor technology, information technology, or cellular and

molecular biology. It is widely felt that nanotechnology will be the next industrial revolution.

Applications of Nanotechnology

With nanotechnology, a large set of materials and improved products rely on a change in the physical properties when the feature sizes are shrunk. Nanoparticles, for example, take advantage of their dramatically increased surface area to volume ratio. Their optical properties, e.g. fluorescence, become a function of the particle diameter. When brought into a bulk material, nanoparticles can strongly influence the mechanical properties of the material, like stiffness or elasticity. For example, traditional polymers can be reinforced by nanoparticles resulting in novel materials which can be used as lightweight replacements for metals. Therefore, an increasing societal benefit of such nanoparticles can be expected. Such nanotechnologically enhanced materials will enable a weight reduction accompanied by an increase in stability and improved functionality. Practical nanotechnology is essentially the increasing ability to manipulate (with precision) matter on previously impossible scales, presenting possibilities which many could never have imagined - it therefore seems unsurprising that few areas of human technology are exempt from the benefits which nanotechnology could potentially bring.

Medicine

The biological and medical research communities have exploited the unique properties of nanomaterials for various applications (e.g., contrast agents for cell imaging and therapeutics for treating cancer). Terms such as *biomedical nanotechnology*, *nanobiotechnology*, and *nanomedicine* are used to describe this hybrid field. Functionalities can be added to nanomaterials by interfacing them with biological molecules or structures. The size of nanomaterials is similar to that of most biological molecules and structures; therefore, nanomaterials can be useful for both in vivo and in vitro biomedical research and applications. Thus far, the integration of nanomaterials with biology has led to the development of diagnostic devices, contrast agents, analytical tools, physical therapy applications, and drug delivery vehicles.

Diagnostics

Nanotechnology-on-a-chip is one more dimension of lab-on-a-chip technology. Magnetic nanoparticles, bound to a suitable antibody, are used to label specific molecules, structures or microorganisms. Gold nanoparticles tagged with short segments of DNA can be used for detection of genetic sequence in a sample. Multicolor optical coding for biological assays has been achieved by embedding different-sized quantum dots into polymeric microbeads. Nanopore technology for analysis of nucleic acids converts strings of nucleotides directly into electronic signatures.

Drug delivery

Nanotechnology has been a boon for the medical field by delivering drugs to specific cells using nanoparticles. The overall drug consumption and side-effects can be lowered significantly by depositing the active agent in the morbid region only and in no higher dose than needed. This highly selective approach reduces costs and human suffering. An example can be found in dendrimers and nanoporous materials. Another example is to use block co-polymers, which form micelles for drug encapsulation. They could hold small drug molecules transporting them to the desired location. Another vision is based on small electromechanical systems; NEMS are being investigated for the active release of drugs. Some potentially important applications include cancer treatment with iron nanoparticles or gold shells. A targeted or personalized medicine reduces the drug consumption and treatment expenses resulting in an overall societal benefit by reducing the costs to the public health system. Nanotechnology is also opening up new opportunities in implantable delivery systems, which are often preferable to the use of injectable drugs, because the latter frequently display first-order kinetics (the blood concentration goes up rapidly, but drops exponentially over time). This rapid rise may cause difficulties with toxicity, and drug efficacy can diminish as the drug concentration falls below the targeted range.

Buckyballs can "interrupt" the allergy/immune response by preventing mast cells (which cause allergic response) from releasing histamine into the blood and

tissues, by binding to free radicals "dramatically better than any anti-oxidant currently available, such as vitamin E".

Tissue engineering

Nanotechnology can help to reproduce or to repair damaged tissue. “Tissue engineering” makes use of artificially stimulated cell proliferation by using suitable nanomaterial-based scaffolds and growth factors. For example, bones can be regrown on carbon nanotube scaffolds. Tissue engineering might replace today's conventional treatments like organ transplants or artificial implants. Advanced forms of tissue engineering may lead to life extension.

Environment Filtration

A strong influence of photochemistry on waste-water treatment, air purification and energy storage devices is to be expected. Mechanical or chemical methods can be used for effective filtration techniques. One class of filtration techniques is based on the use of membranes with suitable hole sizes, whereby the liquid is pressed through the membrane. Nanoporous membranes are suitable for a mechanical filtration with extremely small pores smaller than 10 nm (“nanofiltration”) and may be composed of nanotubes. Nanofiltration is mainly used for the removal of ions or the separation of different fluids. On a larger scale, the membrane filtration technique is named ultrafiltration, which works down to between 10 and 100 nm. One important field of application for ultrafiltration is medical purposes as can be found in renal dialysis. Magnetic nanoparticles offer an effective and reliable method to remove heavy metal contaminants from waste water by making use of magnetic separation techniques. Using nanoscale particles increases the efficiency to absorb the contaminants and is comparatively inexpensive compared to traditional precipitation and filtration methods.

Some water-treatment devices incorporating nanotechnology are already on the market, with more in development. Low-cost nanostructured separation membranes methods have been shown to be effective in producing potable water in a recent study.

Energy

The most advanced nanotechnology projects related to energy are: storage, conversion, manufacturing improvements by reducing materials and process rates, energy saving (by better thermal insulation for example), and enhanced renewable energy sources.

Reduction of energy consumption

A reduction of energy consumption can be reached by better insulation systems, by the use of more efficient lighting or combustion systems, and by use of lighter and stronger materials in the transportation sector. Currently used light bulbs only convert approximately 5% of the electrical energy into light. Nanotechnological approaches like light-emitting diodes (LEDs) or quantum-caged atoms (QCAs) could lead to a strong reduction of energy consumption for illumination.

Increasing the efficiency of energy production

Today's best solar cells have layers of several different semiconductors stacked together to absorb light at different energies but they still only manage to use 40 percent of the Sun's energy. Commercially available solar cells have much lower efficiencies (15-20%). Nanotechnology could help increase the efficiency of light conversion by using nanostructures with a continuum of band gaps. The degree of efficiency of the internal combustion engine is about 30-40% at the moment. Nanotechnology could improve combustion by designing specific catalysts with maximized surface area. In 2005, scientists at the University of Toronto developed a spray-on nanoparticle substance that, when applied to a surface, instantly transforms it into a solar collector.

Information and communication

Current high-technology production processes are based on traditional top down strategies, where nanotechnology has already been introduced silently. The critical length scale of integrated circuits is already at the nanoscale (50 nm and below) regarding the gate length of transistors in CPUs or DRAM devices.

Memory Storage

Electronic memory designs in the past have largely

relied on the formation of transistors. However, research into crossbar switch based electronics have offered an alternative using reconfigurable interconnections between vertical and horizontal wiring arrays to create ultra high density memories. Two leaders in this area are Nantero which has developed a carbon nanotube based crossbar memory called Nano-RAM and Hewlett-Packard which has proposed the use of memristor material as a future replacement of Flash memory.

Novel semiconductor devices

An example of such novel devices is based on spintronics. The dependence of the resistance of a material (due to the spin of the electrons) on an external field is called magnetoresistance. This effect can be significantly amplified (GMR - Giant Magneto-Resistance) for nanosized objects, for example when two ferromagnetic layers are separated by a nonmagnetic layer, which is several nanometers thick (e.g. Co-Cu-Co). The GMR effect has led to a strong increase in the data storage density of hard disks and made the gigabyte range possible. The so called tunneling magnetoresistance (TMR) is very similar to GMR and based on the spin dependent tunneling of electrons through adjacent ferromagnetic layers. Both GMR and TMR effects can be used to create a non-volatile main memory for computers, such as the so called magnetic random access memory or MRAM.

In 1999, the ultimate CMOS transistor developed at the Laboratory for Electronics and Information Technology in Grenoble, France, tested the limits of the principles of the MOSFET transistor with a diameter of 18 nm (approximately 70 atoms placed side by side). This was almost one tenth the size of the smallest industrial transistor in 2003 (130 nm in 2003, 90 nm in 2004, 65 nm in 2005 and 45 nm in 2007). It enabled the theoretical integration of seven billion junctions on a €1 coin. However, the CMOS transistor, which was created in 1999, was not a simple research experiment to study how CMOS technology functions, but rather a demonstration of how this technology functions now that we ourselves are getting ever closer to working on a molecular scale. Today it would be impossible to master the coordinated assembly of a large number of these transistors on a circuit and it would also be impossible to create this on an industrial level.

Novel optoelectronic devices

In the modern communication technology traditional analog electrical devices are increasingly replaced by optical or optoelectronic devices due to their enormous bandwidth and capacity, respectively. Two promising examples are photonic crystals and quantum dots. Photonic crystals are materials with a periodic variation in the refractive index with a lattice constant that is half the wavelength of the light used. They offer a selectable band gap for the propagation of a certain wavelength, thus they resemble a semiconductor, but for light or photons instead of electrons. Quantum dots are nanoscaled objects, which can be used, among many other things, for the construction of lasers. The advantage of a quantum dot laser over the traditional semiconductor laser is that their emitted wavelength depends on the diameter of the dot. Quantum dot lasers are cheaper and offer a higher beam quality than conventional laser diodes.

Displays

The production of displays with low energy consumption could be accomplished using carbon nanotubes (CNT). Carbon nanotubes are electrically conductive and due to their small diameter of several nanometers, they can be used as field emitters with extremely high efficiency for field emission displays (FED). The principle of operation resembles that of the cathode ray tube, but on a much smaller length scale.

Quantum computers

Entirely new approaches for computing exploit the laws of quantum mechanics for novel quantum computers, which enable the use of fast quantum algorithms. The Quantum computer has quantum bit memory space termed "Qubit" for several computations at the same time. This facility may improve the performance of the older systems.

Heavy Industry

An inevitable use of nanotechnology will be in heavy industry.

Aerospace

Lighter and stronger materials will be of immense use to aircraft manufacturers, leading to increased performance. Spacecraft will also benefit, where weight is a major factor. Nanotechnology would help to reduce the size of equipment and there by decrease fuel-consumption required to get it airborne. Hang gliders may be able to halve their weight while increasing their strength and toughness through the use of nanotech materials. Nanotech is lowering the mass of supercapacitors that will increasingly be used to give power to assistive electrical motors for launching hang gliders off flatland to thermal-chasing altitudes.

Catalysis

Chemical catalysis benefits especially from nanoparticles, due to the extremely large surface to volume ratio. The application potential of nanoparticles in catalysis ranges from fuel cell to catalytic converters and photo catalytic devices. Catalysis is also important for the production of chemicals. The synthesis provides novel materials with tailored features and chemical properties: for example, nanoparticles with a distinct chemical surrounding (ligands), or specific optical properties. In this sense, chemistry is indeed a basic nanoscience. In a short-term perspective, chemistry will provide novel "nanomaterials" and in the long run, superior processes such as "self-assembly" will enable energy and time preserving strategies. In a sense, all chemical synthesis can be understood in terms of nanotechnology, because of its ability to manufacture certain molecules. Thus, chemistry forms a base for nanotechnology providing tailor-made molecules, polymers, etcetera, as well as clusters and nanoparticles. Platinum nanoparticles are now being considered in the next generation of automotive catalytic converters because the very high surface area of nanoparticles could reduce the amount of platinum required. However, some concerns have been raised due to experiments demonstrating that they will spontaneously combust if methane is mixed with the ambient air. Ongoing research at the Centre National de la Recherche Scientifique (CNRS) in France may resolve their true usefulness for catalytic applications. Nanofiltration may come to be an important application, although future research must be careful to investigate possible toxicity.

Construction

Nanotechnology has the potential to make construction faster, cheaper, safer, and more varied. Automation of nanotechnology construction can allow for the creation of structures from advanced homes to massive skyscrapers much more quickly and at much lower cost.

Nanotechnology and constructions

Nanotechnology is one of the most active research areas that encompass a number of disciplines Such as electronics, biomechanics and coatings including civil engineering and construction materials.

The use of nanotechnology in construction involves the development of new concept and understanding of the hydration of cement particles and the use of nano-size ingredients such as alumina and silica and other nanoparticles. The manufactures also investigating the methods of manufacturing of nano-cement. If cement with nano-size particles can be manufactured and processed, it will open up a large number of opportunities in the fields of ceramics, high strength composites and electronic applications. Since at the nanoscale the properties of the material are different from that of their bulk counter parts. When materials becomes nano-sized, the proportion of atoms on the surface increases relative to those inside and this leads to novel properties. Some applications of nanotechnology in construction are describe below.

Nanoparticles and steel

Steel has been widely available material and has a major role in the construction industry. The use of nanotechnology in steel helps to improve the properties of steel. The fatigue, which led to the structural failure of steel due to cyclic loading, such as in bridges or towers. The current steel designs are based on the reduction in the allowable stress, service life or regular inspection regime. This has a significant impact on the life-cycle costs of structures and limits the effective use of resources. The Stress risers are responsible for initiating cracks from which fatigue failure results. The

addition of copper nanoparticles reduces the surface unevenness of steel which then limits the number of stress risers and hence fatigue cracking. Advancements in this technology using nanoparticles would lead to increased safety, less need for regular inspection regime and more efficient materials free from fatigue issues for construction. The nano-size steel produce stronger steel cables which can be in bridge construction. Also these stronger cable material would reduce the costs and period of construction, especially in suspension bridges as the cables are run from end to end of the span. This would require high strength joints which leads to the need for high strength bolts. The capacity of high strength bolts is obtained through quenching and tempering. The microstructures of such products consist of tempered martensite. When the tensile strength of tempered martensite steel exceeds 1,200 MPa even a very small amount of hydrogen embrittles the grain boundaries and the steel material may fail during use. This phenomenon, which is known as delayed fracture, which hindered the strengthening of steel bolts and their highest strength is limited to only around 1,000 to 1,200 MPa. The use of vanadium and molybdenum nanoparticles improves the delayed fracture problems associated with high strength bolts reducing the effects of hydrogen embitterment and improving the steel microstructure through reducing the effects of the inter-granular cementite phase. Welds and the Heat Affected Zone (HAZ) adjacent to welds can be brittle and fail without warning when subjected to sudden dynamic loading. The addition of nanoparticles of magnesium and calcium makes the HAZ grains finer in plate steel and this leads to an increase in weld toughness. The increase in toughness at would result in a smaller resource requirement because less material is required in order to keep stresses within allowable limits. The carbon nanotubes are exciting material with tremendous properties of strength and stiffness, they have found little application as compared to steel, because it is difficult to bind them with bulk material and they pull out easily, Which make them ineffective in construction materials.

Nanoparticles in glass

The glass is also an important material in construction. There is a lot of research being carried out on the application of nanotechnology to glass. Titanium dioxide (TiO_2) nanoparticles are used to coat glazing since it has sterilizing and anti-fouling properties. The particles catalyze powerful reactions which breakdown organic pollutants, volatile organic compounds and bacterial membranes.

The TiO_2 is hydrophilic (attraction to water) which can attract rain drops which then wash off the dirt particles. Thus the introduction of nanotechnology in the Glass industry incorporates the self-cleaning property of glass. Fire-protective glass is another application of nanotechnology. This is achieved by using a clear intumescent layer sandwiched between glass panels (an interlayer) formed of silica nanoparticles (SiO_2) which turns into a rigid and opaque fire shield when heated. Most of glass in construction is on the exterior surface of buildings .So the light and heat entering the building through glass has to be prevented. The nanotechnology can provide a better solution to block light and heat coming through windows.

Nanoparticles in coatings

Coatings is an important area in construction coatings are extensively use to paint the walls, doors, and windows. Coatings should provide a protective layer, which is bound to the base material to produce a surface of the desired protective or functional properties. The coatings should have self healing capabilities through a process of “self-assembly.” Nanotechnology is being applied to paints to obtain the coatings having self-healing capabilities and corrosion protection under insulation. Since these coatings are hydrophobic and repels water from the metal pipe and can also protect metal from salt-water attack. Nanoparticle based systems can provide better adhesion and transparency. The TiO_2 coating captures and breaks down organic and inorganic air pollutants by a photo catalytic process, which leads to putting roads to good environmental use.

Nanoparticles in fire protection and detection

A coating produced by a spray-on-cementitious process often provides fire resistance of steel structures. The nano-cement has the potential to create a new paradigm in this area of application because the resulting material

can be used as a tough, durable, high temperature coating. It provides a good method of increasing fire resistance and this is a cheaper option than conventional insulation.

Risks of using nanoparticles in construction

In building construction nanomaterials are widely used from self-cleaning windows to flexible solar panels to wi-fi blocking paint. The self-healing concrete, materials to block ultraviolet and infrared radiation, smog-eating coatings and light-emitting walls and ceilings are the new nanomaterials in construction. Nanotechnology is a promise for making the "smart home" a reality. Nanotech-enabled sensors can monitor temperature, humidity, and airborne toxins, which need nanotech, based improved batteries. The building components will be intelligent and interactive since the sensor uses wireless components, it can collect the wide range of data.

If the nanosensors and nanomaterials becomes a every day part of the buildings to make them intelligent, what are the consequences of these materials on human beings?

1. Effect of nanoparticles on health and environment: Nanoparticles may also enter the body if building water supplies are filtered through commercially available nanofilters. Airborne and waterborne nanoparticles enter from building ventilation and wastewater systems.

2. Effect of nanoparticles on societal issues: As sensors become more common place, a loss of privacy may result from users interacting with increasingly intelligent building components. The technology at one side has the advantages of new building material. The other side it has the fear of risk arises from these materials. However, the overall performance of nanomaterials to date, is that valuable opportunities to improve building performance, user health and environmental quality.

Vehicle manufacturers

Much like aerospace, lighter and stronger materials will be useful for creating vehicles that are both faster and safer. Combustion engines will also benefit from parts that are more hard-wearing and more heat-resistant.

Consumer goods

Nanotechnology is already impacting the field of consumer goods, providing products with novel functions ranging from easy-to-clean to scratch-resistant. Modern textiles are wrinkle-resistant and stain-repellent; in the mid-term clothes will become "smart", through embedded "wearable electronics". Already in use are different nanoparticle improved products. Especially in the field of cosmetics, such novel products have a promising potential.

Foods

Complex set of engineering and scientific challenges in the food and bioprocessing industry for manufacturing high quality and safe food through efficient and sustainable means can be solved through nanotechnology. Bacteria identification and food quality monitoring using biosensors; intelligent, active, and smart food packaging systems; nanoencapsulation of bioactive food compounds are few examples of emerging applications of nanotechnology for the food industry. Nanotechnology can be applied in the production, processing, safety and packaging of food. A nanocomposite coating process could improve food packaging by placing anti-microbial agents directly on the surface of the coated film. Nanocomposites could increase or decrease gas permeability of different fillers as is needed for different products. They can also improve the mechanical and heat-resistance properties and lower the oxygen transmission rate. Research is being performed to apply nanotechnology to the detection of chemical and biological substances for sensanges in foods.

Nano-foods

New foods are among the nanotechnology-created consumer products coming onto the market at the rate of 3 to 4 per week, according to the Project on Emerging Nanotechnologies (PEN), based on an inventory it has drawn up of 609 known or claimed nano-products.

On PEN's list are three foods—a brand of canola cooking oil called Canola Active Oil, a tea called Nanotea and a chocolate diet shake called Nanoceuticals Slim Shake Chocolate.

According to company information posted on PEN's Web site, the canola oil, by Shemen Industries of Israel, contains an additive called "nanodrops" designed to carry vitamins, minerals and photochemical through the digestive system and urea.

The shake, according to U.S. manufacturer RBC Life Sciences Inc., uses cocoa infused "NanoClusters" to enhance the taste and health benefits of cocoa without the need for extra sugar.

Household

The most prominent application of nanotechnology in the household is self-cleaning or “easy-to-clean” surfaces on ceramics or glasses. Nano ceramic particles have improved the smoothness and heat resistance of common household equipment such as the flat iron.

Optics

The first sunglasses using protective and anti-reflective ultrathin polymer coatings are on the market. For optics, nanotechnology also offers scratch resistant surface coatings based on nanocomposites. Nano-optics could allow for an increase in precision of pupil repair and other types of laser eye surgery.

Textiles

The use of engineered nanofibers already makes clothes water- and stain-repellent or wrinkle-free. Textiles with a nanotechnological finish can be washed less frequently and at lower temperatures. Nanotechnology has been used to integrate tiny carbon particles membrane and guarantee full-surface protection from electrostatic charges for the wearer. Many other applications have been developed by research institutions such as the Textiles Nanotechnology Laboratory at Cornell University, and the UK's Defence Science and Technology institute and its spin out company P2i.

Cosmetics

One field of application is in sunscreens. The traditional chemical UV protection approach suffers from its poor long-term stability. A sunscreen based on mineral nanoparticles such as titanium dioxide offer several advantages. Titanium oxide nanoparticles have a comparable UV protection property as the bulk material, but lose the cosmetically undesirable whitening as the particle size is decreased.

Agriculture

Applications of nanotechnology have the potential to change the entire agriculture sector and food industry chain from production to conservation, processing, packaging, transportation, and even waste treatment. NanoScience concepts and nanotechnology applications have the potential to redesign the production cycle, restructure the processing and conservation processes and redefine the food habits of the people.

Major challenges related to agriculture like low productivity in cultivable areas, large uncultivable areas, shrinkage of cultivable lands, wastage of inputs like water, fertilizers, pesticides, and wastage of products and of course Food security for growing numbers can be addressed through various applications of nanotechnology.

Sports

Nanotechnology may also play a role in sports such as soccer, football, and baseball. Materials for new athletic shoes may be made in order to make the shoe lighter (and the athlete faster). Baseball bats already on the market are made with carbon nanotubes, which reinforce the resin, which is said to improve its performance by making it lighter. Other items such as sport towels, yoga mats, exercise mats are on the market and used by players in the National Football League, which use antimicrobial nanotechnology to prevent illnesses, caused by bacteria such as Methicillin-resistant Staphylococcus aureus (commonly known as MRSA).

Thus, nanotechnology will radically transform the world and the people of 21st century with the next generation industrial revolution. Functional engineering on molecular scale will be used to develop smart materials. Nanosensors, Nanocomputers and Nanomechanics embedded in new generation smart materials will revolutionizes every aspect of life.

Tangent Law, Lami's Theorem And Tangent Galvanometer - An Interesting Exercise

J. Sethuraman[$]
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Madurai, 625002, Tamil Nadu

Introduction: Tangent galvanometer (TG) is an important instrument to measure current making use of crossed magnetic fields. TG and Ballistic galvanometers are the fundamental instruments in electricity and magnetism. It serves as a good application of Biot-Savart law of magnetic effect of steady current in a wire. But with the advent of AVO meter (Ampere Volt Ohm) these instruments are gathering dust in the shelves of many physics' laboratories. AVO meter contains inside the box quite a lot of physics! Physical balance is yet another instrument which has gone obsolete in the laboratory as digital weighing machines are available. In this paper I am posing an exercise with tangent galvanometer which links with law of parallelogram of forces/law of triangle of forces in statics.

Exercise*:* A student measures current with a tangent galvanometer. He is not aware of the fact that the wooden/ebonite frame on which the circular wires are wound is inclined at a certain angle θ_0 with respect to magnetic meridian. He has set the aluminum pointer correctly. After choosing the number of turns of coil and passing suitable current, he measures the deflection of aluminum pointer $\theta = 40^o$. Calculate the percentage error of measurement if $\theta_0 = 11^o$.

Solution: In statics, the law of parallelogram of forces, Lami's theorem and the law of triangle of forces are different approaches and the problem can be solved with anyone. The *tangent law of forces* is a particular case of Lami's theorem (Fig.1). This is also applied in the current measurement using tangentgalvanometer. This exercise is done in two different ways to show that any one method is suitable.

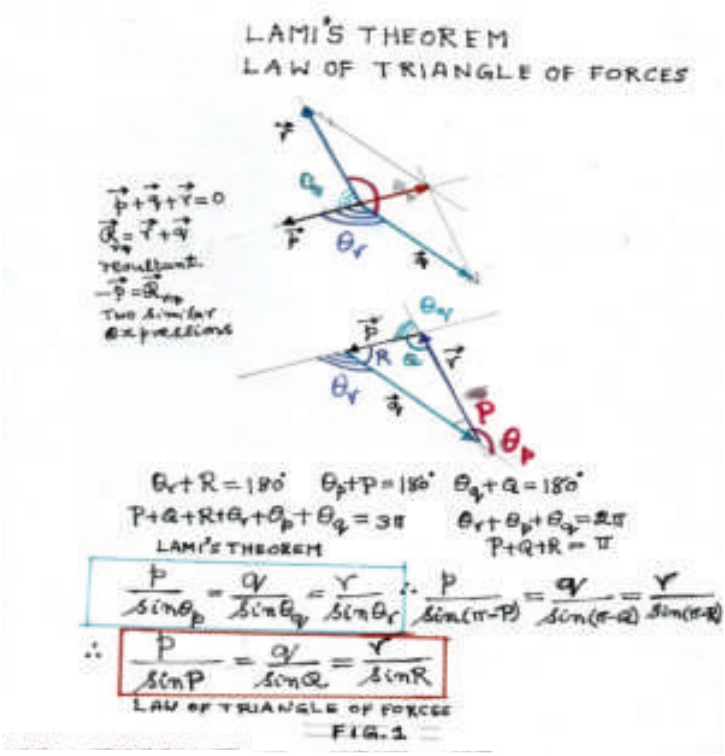


FIG. 1

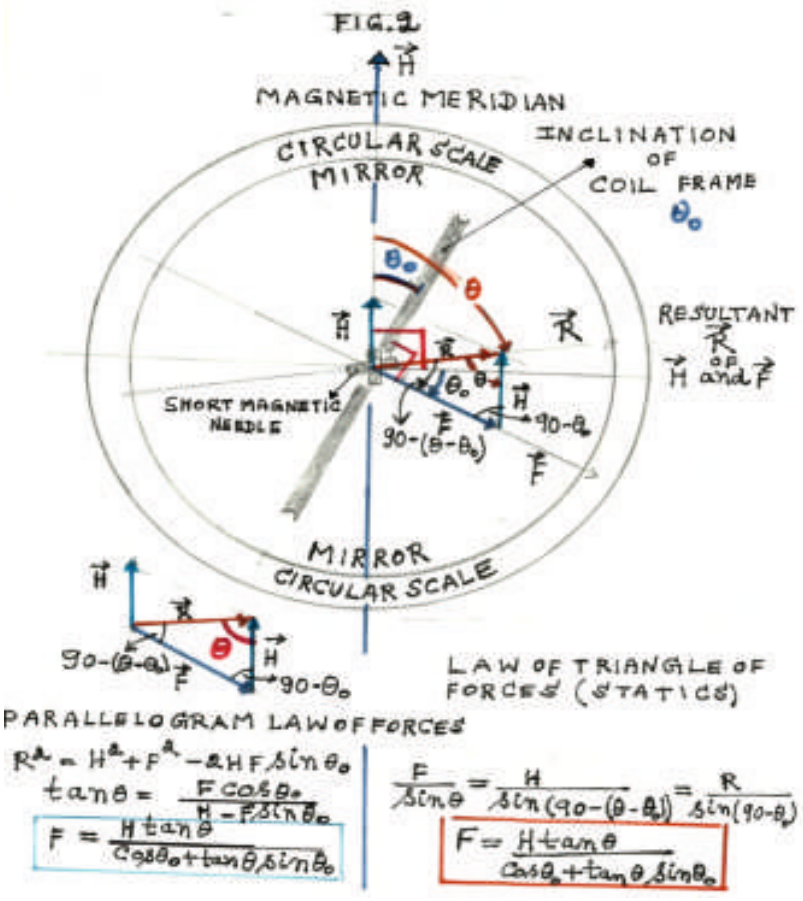
Any text book on Electricity and Magnetism describes a TG. A detailed description is not given in this paper. In Tangent galvanometer, the plane of vertical circular non-conducting (usually wooden) frame of the coils is set in the magnetic meridian and so the magnetic field $\vec{F}$ generated by the steady current is in the horizontal plane perpendicular to the horizontal magnetic field $\vec{H}$ of the earth [1]. Applying Lami's theorem or tangent law, we get $F = Htan\theta$, neglecting the direction, where θ is the deflection of the magnet (and of the aluminum pointer) from the meridian. The resultant $\vec{R}$, $\vec{F}$ and $\vec{H}$ form a right-angled triangle. If the frame is tilted at some angle $\theta_0$with respect to $\vec{H}$ as shown in Fig.2, then $\vec{F}$ makes an obtuse angle with respect to $\vec{H}$. This angle is $90 + \theta_o$.

$\vec{H}$ and $\vec{F}$ form the adjacent sides of a parallelogram giving rise to a resultant $\vec{R}$. Since the vector sum $\vec{R}$, $\vec{H}$ and $\vec{F}$ is zero, we can also apply the law of triangle of forces [2]. Both approaches are clearly discussed in Fig.2. The result is the same:

$$F = \frac{Htan\theta}{cos\theta_o + tan\theta sin\theta_o}. \qquad (1)$$

Thus an exercise in the magnetic effect of steady current carrying coil is an extended exercise of similar exercise in statics. The student having no knowledge of the frame is inclined to the meridian, calculates F using the formula: $F_{ac} = Htan\theta$. But in reality, the true F is F_{tr}, given by eq.(1).

$$F_{tr} = \frac{F_{ac}}{cos\theta_o + tan\theta sin\theta_o} \qquad (2)$$



Using the property of "ratio and proportion",viz, $\frac{a}{b} = \frac{c}{d}$ giving

$$\frac{a-b}{b} = \frac{c-d}{d},$$

$\frac{\Delta F}{F_{tr}} = \frac{F_{ac}-F_{tr}}{F_{tr}} = cos\theta_o + tan\theta sin\theta_o - 1.(3)$

Substituting $\theta_o = 11^o$ and $\theta = 40^o$, $\frac{\Delta F}{F_{tr}} = 0.1417$. **The percentage fractional error is 14.2%.**

When $\theta_o$iszero, $F_{tr} = F_{ac}$, hence $\Delta F = 0$ as expected.

Conclusions: The theory of Galvanometer is important in the study of electricity and magnetism, as it brings many concepts of mechanics, particularly statics of forces when current carrying wire produces a magnetic field. At least one or two experiments with TG can be performed to in the under-graduate laboratory to feel the working of Biot-Savart law. In IIT JEE and other entrance examinations, there are

many questions on the effect of magnetic fieldsand forces of current carrying conductors in multiple choice/objective items. It is hoped that this exercise unifying two branches of physics will be beneficial to the students.

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2. S. L. Loney, "Elements of Statics and Dynamics"5th Ed. Cambridge University Press(1932).

REPORT (RC-06)

Workshop on "Physics Learning Through Experiments -2023 (WPLE-2023)

A two days workshop on "Physics Learning through Experiments -2023 (WPLE-2023)" was organized jointly by Department of Physics, University Maharani College, Jaipur and RC-06,on January, 30 - 31,2023. The workshop was inaugurated with floralworship of Goddess Sarswati in the presence of Prof. Y K Vijay (Retd.), President IAPT- Rajasthan Chapter (Chief guest), Prof. Mukta Agrawal (Principal), Prof. Sangeeta Bhargava (Vice principal), Dr. SaritaKumari(Local head), Dr. PuraRam (Convener), departmental faculty members and studentson 30th January 2023 at 10:30am.

The inaugural talk "Joy with Science" was delivered by Prof. Y.K.Vijay who explained the various fundamental conceptsofPhysics with low cost innovative experiments namely- Coupled Oscillator, Atomic arrangement with balls and magnets, harmonic and an-harmonic oscillations, science with Joy of Moods, etc. After the lectures, a documentary on Prof. BabulalSaraf was shown to the audience which elaborated that how does an experimental skill play an important role into realization of the concept. The efforts made by Prof. Saraf to develop the Beta decay spectrum was explained by Prof. Vijay. Later on, a science gallery was inaugurated,which includes- Sir, CV Raman, Dr. Homi Jahangir Bhabha, Dr. Vikram Sarabhai, Dr. SubramanayamChandershekhar, Dr. MeghnathSaha, Dr. SatyendraNath Bose, and Prof. BabulalSaraf. The purpose of gallery is to show the contribution of the great Indian scientist/Physicists at international and national level.

After the poster session inauguration, hands on experimental sessions was conducted. In which 10-12 experiments and demonstration were set up namely- Linear Air track-to study elastic andinelastic collisions, Coupled oscillator – to understand the mechanism of energy transfer from one oscillator to other oscillator, the torsion oscillator, Newton Ring, air damping effect on compound oscillator, eddy current set up, air arc discharge, etc.

On the second day, a lecture was been delivered by Prof. Sanjeev Kumar Sharma, Deptt. of Physics, CCU, Meerut, UP. Prof. Sharma elaborated on "Need of Chemo-sensorsfor recognition of Hazardous ions/Molecules in food" and

precaution during COVID-19. After lecture the hand on experimental sessions was held. The next session was poster session. The various experimental posters were presented by undergraduate students.

At the end of second day, the valedictory session was organized in the presence of Prof. Anjali Krishnamurthy (Chief Guest), Prof. Mukta Agrawal and other dignitaries of workshop, faculty members, Students. The workshop ended with vote of thanks delivered by Dr. SunitaMahavar.

Pura Ram
University Maharani College,
Jaipur

Report (RC-12A)

NCIEP Prize-Winning Experiment Demonstration

Date: 26 Jan 2022 **Time**: 3.30 to 5 pm **No of participants :** 22 IAPT members

Resource Persons : Master Tanay Pradeep Prof Manjula SNDr Manu S

Online Google meet Organiser : RC12A

National Competition of Innovative Experiment in Physics- NCIEP 2022 was held during the 36th IAPT convention at Patna, Bihar from 2nd -4th December, 2022. From RC12A, five teams participated in this competition out of which three teams received 1st, 2nd and 3rd prizes in student and teachers categories respectively.The prize-winning experiment demonstration and interaction session with the winners was organised in the virtual mode for popularization and motivation of all other members of IAPT.

The session commenced with the welcome address and a brief note about RCIEP and NCIEP by Dr. Shanthala Sastry, Treasurer, RC12A. Other EC members of RC12A participated along with the EC meeting simultaneously.

The winners were encouraged to share their experiments with the gathering.

The first prize winner of the student group, Master Tanay Pradeep (co-author Prof Sarmistha Sahu) explained “The visualisation of Linear expansion” with a novel set-up.We essentially saw the expansion of steel (a miniscule change in the length) within a rise of only one or two degrees of temperature! Striking feature in a simple home-made set up.

The second prize was bagged by Dr Manu S (co-author Sarmistha Sahu), who elaborated on the experiment “Energy gap of a semiconductor”. Though the equipment was a standard dark room kit available in all degree labs, the theme and ease of identification of energy gap of CdS was rather interesting.

Creative thinking and sincere efforts always pay! Prof Manjula S N (Co-author Sarmistha Sahu) demonstrated that the “relation between the physical quantities from first principles” is possible with keen observation and perseverance. Simple indigenous gadgets can give great consequences.

There were 22- IAPT members from across the country who participated in the interaction session. Prof. P K Ahluwalia, President, IAPT appreciated the experimental methods used and the session ended with constructive comments and suggestions about 'uncertainty in measurement' by the participants.

Shanthala Sastry

Celebration of National Science Day - 2023

Every year 28th February is celebrated as National Science Day to mark the discovery of the Raman effect in 1928 by Indian Physicist Sir.C.V.Raman. As a part of National Science Week Celebrations various activities in Science were performed by teachers and students of Atomic Energy centre School (AECS-1), Kalpakkam on 25th February' 2023.

Vice-Principal Shri. S. Seshan not only emphasized our role in widely spreading the significance of scientific application in our daily life but also came forward and demonstrated some experiments setting an example for everyone. One of the significant one was "Why the sky is blue".

The staff and students of the school also shared their knowledge of science through their demonstrations which are detailed here:

STAFF:

1) Shri. S. Seshan, VP - Surface Tension, Bernoulli's' Principle, Why the Sky is Blue

2) Shri. K. S. Suresh Kumar, HM – Air Pressure

3) Smt. P. Latha, TGT (SS) – Boiling water in paper cup

4) Shri. Ajit Shankar Madhale, TGT – Chromatography

5) Smt. Ahila C. Kamraj, PRT (SS) – Centre of gravity

STUDENTS:

Class	Students Name	Experiment Name
6A	Subhalekha. E Divyasaasha. R	Floating House
6B	M. Venumadhav S. Vishnu	Prism – Separation of light into colour
7A	Madhukrishna	DNA Extraction
7A	PoorviVarshitha	Refraction of Light
7A	Hansika. S	Making of Hydrogen
8A	Sasmitashri	Centre of Gravity
8B	Benita Angel. J Sangeetha. D	How do submarines work?
8B	Santhosh Sarma. S. V. Krishwar. P	Series Circuit
9A	Atchaya. K Anitha. R	Density of Liquid
9B	Santosh. P. M. Adityan. S	Total Internal Reflection Tensigrity

The Chief Guest of the occasion was Mr. Ravichandran Shivanna, Asst. Professor of Physics, IIT Madras .

The Chief Guest and his team enlightened the students with their experiments and demonstration. Highlight of the whole programme was the experiments done with **Liquid Nitrogen.**






S. Seshan

Announcement

National competition for innovative experiments in Physics (NCIEP)is being held since 2003, to encourage Physics Teachers, Students and Physics educators to conceive and set up original innovative experiments in Physics. The Competition is held every year at the venue of the Annual Convention of IAPT. Innovation rather than sophistication is the main theme and therefore the use of computers for data acquisition and display is not allowed.

1. The following categories are included:

   (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. He/she need not be an IAPT member.

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

   (C) The participant can be a High School student Studying in 9-12 standard.

   For all categories participants themselves have to demonstrate the experiment.

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

   For category B and C students can work under the guidance of a **mentor**.

3. Top 3 experiments from each category A, B and Care awarded cash 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/-
C	Students studying from 9 -12 standard	Rs 7000/-	Rs 5000/-	Rs 4000/-

4. More Details will be provided in the coming months.

   Selected entries from each category will be invited for demonstration at the 37th IAPT convention. The dates and venue will be notified later. Convention is likely to be held during the last week of October 2023. The invited participants will be paid railway fare from the workplace to the convention place as per IAPT rules. In case of joint authors, only one of the participants is eligible to receive TA (as per IAPT rules). Top ten student participant entries (for category B and C) may be given an amount of Rs 1000/- each towards expenditure

incurred in setting up the experiment. The selected participant must come with his/her own setup for final demonstration.

Please feel free to contact for any query at e- mail: **nciepiapt03@gmail.com**

Decision of the judges will be final.

Closing date to receive the entries is :31st July, 2023.

Geetha R S
National Coordinator,NCIEP
(mobile and WhatsApp) 7975183449
E mail: nciepiapt03@gmail.com

IAPT Life Member wins INSA Teacher Award

Dr. Ananda Dasgupta, an Associate Professor and a distinguished teacher of Physics at the IISER, Kolkata,has been conferred with the INSA Teachers Award for the year 2022 for his outstanding contribution as a teacher. Apart from his excellent discussions (videos uploaded on YouTube) in various topics of Physics at UG & PG levels he is associated with the creation of a very special YouTube video series in Bangla. It is known as 'Padarthabidyar E-school' (E School for Physics) and is playing a significant role in building basic concepts among school children particularly those located in different small towns and villages.

Dr. Dasgupta is a renowned theoretical physicist and has made significant contributions to different fields of physics research. His research interest lies in Lie - algebraic techniques in the field of Quantum Optics, especially in squeezed states and matter radiation interaction, and in the fundamental quantum mechanical and statistical issues involved. He has also worked extensively on the development of numerical methods and computer simulations in physics. He has been associated with IISER Kolkata since 2007 and serving as an Associate Professor since 2013 to date. Earlier he was a Lecturer at St. Xavier's College, Kolkata (1999 - 2005) and a Senior Lecturer at Jadavpur University (2005-2007).

Dr. Dasgupta has made significant contributions in the activities of the RC-15, particularly for the conduction of its annual flagship programme, C K Majumdar Memorial Workshop in Physics. He is well known as an outstanding speaker and has delivered numerous lectures in different schools and colleges for the benefit of the students. He is associated with the Physics Olympiad activities. He is connected to many institutions and scholarly societies for sharing his views on academics.

IAPT Community extends its heartiest congratulations to Dr. Dasgupta.

Pradipta Panchadhyayee,

Secretary, RC 15

A Tribute to Prof. Yashwant Waghmare

The sad demise of Prof. Y. R.Waghmare on 27th Jan.2023 is a great loss to IAPT fraternity. Personally I have lost a close friend, a well wisher as well as an adviser. My close association with Prof Waghmare started soon after he settled in Pune in 1997 after his retirement from IIT Kanpur. We were together working on a Pune University Committee on an autonomous course on " scientific computing and modelling ". Day by day our attachment built stronger and stronger. Prof. Waghmare came to my house at least 8 to 10 times, in some cases without prior intimation. I have gone to his house at least 50 times. He was my family friend. Twice Prof.Waghmare and his wife Anjali bhabhi visited the house of my daughter Vaishali Pande, in USA- once in Pleasonton CA and once in Princeton NJ. Both of them were very friendly with my grandsonAryak and granddaughter Sanika. Several times we moved together in Pune city on my scooter. In about 8 to 10 IAPT conventions we travelled together and stayed together in the same room. He had a good study of homeopathy. Once l informed him on telephone that I am suffering from some sickness. Next day, in the morning, he came to my house with some homeopathic medicine.

Prof. Waghmare and others in a programme of Pune sub RC

For three years, Prof. Waghmare organized counseling and guidance programme for Pune students appearing to IIT JEE. I was actively involved in this programme.About 50 students trained by us have been successful in securing admissions to different IITs. A number of science activities were conducted for rotary club, Pune by Prof. Waghmare and myself. In fact Prof. Waghmare always assumed my involvement in every activity planned by him. In the same way Prof.Waghmare actively supported every programme organized by me. He taught a course on nuclear physics to M.Sc. students of Garware College, as a visiting professor, when I was the HOD.

Prof. Waghmare has written several books on physics/science. For five of these books, he had given me the draft of each chapter for my comments time to time. Similarly he used to give me the draft of the contents of his important lectures/talks for my comments and su

ggestions. Prof.Waghmare was an all-round personality. He had a lot of interest and love towards cricket, homeopathy, classical music etc.

Prof.Waghmare had a wonderful nack of making friendship with persons in his contact even for a short period. Great personalities such as Kasturirangan, Yashpal, Kakodkar, Naralikar, Kamble, Kaw, Narayan Murthi, Nigavekar, V.G.Bhide, Arvind Gupta, H.C.Verma, Govind Swarup and many others were in the list of his close friends. In addition, he could easily make friendship with any common man such as postman, auto-rikshawwala etc.

All of us know the lion's share of Prof.Waghmare in enrichment of our organization- IAPT. He was the president of IAPT for two consecutive terms-1998 to 2002. Using his personal contacts with great scientists of the country, he pulled IAPT out of financial crisis within few months. A very popular and ambitious programme of IAPT-National Competition of Innovative Experiments in Physics (NCIEP) was initiated by Prof.Waghmare. Also he thought of starting a journal for students and "Prayas" was the outcome of his efforts. Prof.Waghmare motivated a large number of physics teachers in Pune to join IAPT as life member. Pune sub RC was established by him which is well functioning till this date.

I am sure, thousands of students as well as teachers all over the country have mourned deeply on sad demise of Prof. Waghmare. My thousands of salutes to the memories of this extraordinary grand personality.

M.L. Ogalapurkar

TRIBUTE TO PROF. Y.R. WAGHMARE

It was very unpleasant news that Prof. Y.R. Waghmare is no more with us physically but his thoughts will always be there in our hearts and minds. This is inevitable and this happens. He had very long persistent academic inning.

I knew Prof. Waghmare since the days he was faculty member at IIT Kanpur and I was working for my D.Phil. thesis. He was a pleasant teacher and while talking to him you always feel at home. I had many opportunities to meet him and always found in him a very loving and affectionate person.

He had lifelong intense association with IAPT, with very successful tenure as its President. He encouraged each member to contribute for the growth of IAPT and continued the same spirit and enthusiasm when I was given this responsibility. He was very positive and appreciative.

When I was compiling the essays for the volume "Vision for Science Education", he volunteered himself and wrote a very illustrative article "Necessity of Paradigm in Indian Science Education." While receiving this volume in his hands he again wrote a very encouraging letter for IAPT activities.

Last time I met him, was in 2018 in NSSP program in Chandigarh. He was here with his wife for three days and stayed in the university guest house. He delivered a very interesting lecture in the conference, moved around in Chandigarh and then we gave him a very pleasant farewell to his hometown Pune with all memories of working together for IAPT.

May this noble soul rest in peace and have again a very pleasant life in some noble environment. My condolences are for his family members and Prayer to Almighty to give them the strength to bear this irreparable loss.

Satya Prakash
Ex-President, IAPT

List of New Member From 01.01.2022 To 31.12.2022
Member from 13700 - L8699 To 14021 - *2212 (14023 - L9005)

OMNO	Membership No.	Name	City	Pincode
		DELHI		
13422	L8463	Rakesh Kumar Meena	New Delhi	110019
13761	L8760	Ashish Kumar Srivastava	New Delhi	110016
13980	L8962	Dr. Amodini Mishra	New Delhi	110016
13792	L8791	Prateek Arora	Delhi	110017
13888	*2206	Shivali Gahlot	New Delhi	110017
13914	L8907	Charu Gaur	New Delhi	110022
13731	L8730	Vani Ranga	New Delhi	110027
13768	L8767	Bhawendra Kumar	Delhi	110030
13734	L8733	Dr. Omwati Rana	Delhi	110036
13952	L8939	Dr. Charu Verma	Delhi	110052
13911	L8904	Aavishkar Katti	New Delhi	110070
13741	L8740	Dr. Neeru Sahdev	New Delhi	110087
13714	L8713	Dr. Alka Gupta	Delhi	110096
13849	L8846	Deekshant Awasthi	Delhi	110096
		HARYANA		
13873	L8867	Vipul Jain	Faridabad	121004
13948	L8935	Bharti Biwakar	Faridabad	121005
13723	L8722	Tanya Gera	Gurugaon	122001
13970	L8954	Mukta Hans	Gurugram	122001
13997	L8980	Dr. Meenu Thakur	Mahendrgarh	123031
13793	L8792	Dr. Hardev Singh	Hisar	125001
13715	L8714	Sanjeev Thakur Kumar	Fateh Bad	125050
13708	L8707	Ms. Ankur	Yamuna Nagar	135001
13862	L8857	Vikram Verma	Jagadhri	135003
13736	L8735	Anand Kumar	Kurukshetra	136119
		PUNJAB		
13732	L8731	Heena Verma	Ludhiana	141001
14022	L9004	Dr. Atul Khanna	Amritsar	143005
13890	L8883	Sukhpal Singh	Patiala	147002
13971	L8955	Ajeet Kumar	Patiala	147004
13936	L8923	Ankit Kumar	Barnala	148101
13744	L8743	Dr. Gagan Gupta	Bhathinda	151001
13745	L8744	Dr. Veena Sharma	Bathinda	151001
14000	L8983	Dr. Ashok Kumar	Bathinda	151401
		CHANDIGARH		
13759	L8758	Dr. Lokesh kumar	Chandigarh	160014
13853	L8850	Dr. Arun Kumar Grover	Chandigarh	160015
13998	L8981	Renu Bala	Chandigarh	160030
		HIMACHAL PRADESH		
13907	L8900	Shri Sidharth	Rehan	176022
13826	L8824	Satish Dhiman	Kangra	176033
13827	L8825	Sanjeev Rana	Kangra	176057
13828	L8826	Milant Dogra	Dharamshala	176057
13844	L8842	Jayant Kumar Sharma	Kangra	176067
13802	L8800	Dr. Anjna Devi	Kangra	176210
13829	L8827	Meenakshi Kantgwal	Dharamshala	176215
13906	L8899	Dr. Akash Deep Sharma	Chamba	176302
13969	L8953	Vishal Singh	Hamirpur	177005
13950	L8937	Shammi Kumar	Hamirpur	177033
		JAMMU & KASHMIR		
13724	L8723	Puneet Thukral	Jammu	180005
13801	L8799	Rajinder Kumar	Bishnah	181132
13726	L8725	Ram Kumar Khajuria	Rajouri	185153
13727	L8726	Dr. Dushyant Praeep	Rajouri	185153
13932	L8919	Khurshid Ahmad Shah	Cherosso	192122
14003	*2212	Mandeep Singh	Awantipora	192122
13728	L8727	Shaja Rasool Wani	Bijbehare	192124
		UTTAR PRADESH		
13984	L8966	Naresh kumar	Bulandshahr	203406
13889	L8882	Dr. Prem Prakash Singh	Pryagraj	211002
13927	L8914	Srijit Bhattacharjee	Prayagraj	211015

OMNO	Membership No.	Name	City	Pincode
13725	L8724	Dr. Shishu Pal Singh	Varanasi	221011
13824	L8822	Punit Kumar Dhawan	Jaunpur	222003
13931	L8918	Gaurav Singh Yadav	Ayodhya	224001
13904	L8897	Dr. Sushant Gupta	Lucknow	226016
13905	L8898	Dr. Reetika Singh	Lucknow	226016
13739	L8738	Dr. Satyendra Singh	Hardoi	241001
13767	L8766	Anurag Chitra	Bareilly	243003
13842	L8840	Mani Sahni	Bareilly	243003
13943	L8930	Dr. Deependra Singh Rawat	U S Nagar	244713
13946	L8933	Dr. Anju Garg	Meerut	250001
13748	L8747	Ruchira Chandel	Meerut	250004
13945	L8932	Dr. Neeraj Kumar	Muzaffar Nagar	251001
13712	L8711	Avadhesh Kumar Yadav	Sitapur	261203
13770	L8769	Savyasanchi Ghosh	Vrindavan	281121
		UTTARAKHAND		
13929	L8916	Dr. Devendra Singh Chauhan	Kotdwar	246149
13803	L8801	Dr. Jyotika	Roorkee	247667
13947	L8934	Akshay Kumar	Shamli	247776
13953	L8940	Rishi Kumar	Shamli	247776
13938	L8925	Dr. Pankaj Singh Rawat	Dehradun	248001
13949	L8936	Dr. Mehul Menu	Nainital	248002
13847	L8844	Pawan Kumar Bijalwan	Uttarkashi	249193
13799	L8797	Suman Garia	Almora`	263653
		RAJASTHAN		
13972	L8956	Govind Kumar Agarwal	Jaipur	302016
13966	L8950	Mahesh Kumar Jangid	jaipur	302017
13988	L8970	Chetanya Jain	Jaipur	302021
14008	L8990	Dr. Sayed Faheen Naqvi	Jaipur	302002
14009	L8991	Dr. Narendra Jakhar	Jaipur	302004
14012	L8995	Anil Dhawan	Jaipur	302004
14011	L8994	Farah Deeba	Jaipur	302007
14006	L8988	Dr. Rashmi Saxena	Jaipur	302020
14007	L8989	Neha Sain	Jaipur	302031
14005	L8987	Abhinandan Agarwal	Malpura	304502
13730	L8729	Sanjay Kumar Behety	Kota	324005
13922	L8910	Amit Verma	Kota	324009
14023	L9005	Dr. Giriraj Chayal	Jodhpur	342011
13937	L8924	Prithvi Raj	Jodhpur	342307
		GUJARAT		
13795	*2201	Mihir Mahabhai Vora	Bhuj	370001
13955	L8942	Goswami Amitgiri . N	Bhuj	370001
13956	L8943	Maulik Kumar Zala	Bhuj	370001
13800	L8798	Abhishek Atulbhai Gor	Ahmedabad	380015
13791	L8790	Virendrakumar Narendrakumar Patil	Gandhi Nagar	382022
13716	L8715	Alpeshkumar Rameshchandra Bhatt	Anand	388130
13898	L8891	Manauti Bharatkumar Chaudhari	Anand	388315
13864	L8858	Aashana Tripathi	Vadodara	390021
14018	L9001	Sunilbhai B Patel	Vadodara	390025
14017	L9000	Dr. Sohan M Chauhan	Dabhoi	391110
14019	L9002	Pushparaj Pradyuman Singh Zala	Chotaudepur	391165
13991	L8972	Dr. Jenish Kumar Patel	Surat	395001
14004	L8986	Muskan Samriya	Bhilwara	311001
14010	L8993	Ashish Kumar Tiwari	Ballabhgarh	321409
13733	L8732	Mohammad Behzad	Surat	395005
13934	L8921	Himanshu Pandey	Surat	395007
13855	L8852	Shubham Sharma	Surat	395009
13999	L8982	Roopa J. Kutty	Surat	395009
13764	L8763	Priyanka Fatesinh Desai	Valsad	396125
13830	L8828	Aakash Narendrabhai Patel	Navsari	396450
		GOA		
13822	L8820	Divya Sunil Phutane	Mapusa	403507
		MAHARASTRA		
13819	L8817	Suresh Namdevrao Kadam	Mumbai	400081
14002	L8985	Dr. Mashood K.K.	Mumbai	400088
13961	L8945	Archana Uttamrao Chavan	Navi Mumbai	400703
13962	l8946	Bharati Balasaheb Patil	Navi Mumbai	400703
13798	L8796	Sonali Gunavant Kathle	Pune	411007
13995	L8978	Pratik B Bhagwat	Pune City	411037
13854	L8851	Dr. Sachin A Kulkarni	Pune	411038
13860	L8855	Dr. Shital .V. Kahane	Pune	411038
13861	L8856	Dr. Jitendra Kumar Behera	Pune	411038

OMNO	Membership No.	Name	City	Pincode
13865	L8859	Dr. Deobrat Singh	Pune	411038
13866	L8860	Dr. Prasad Vivek Joglekar	Pune	411038
13872	L8866	Dr. Jagadish Naik	Pune	411038
13874	L8868	Ajit Baburao Deore	Pune	411038
13915	L8908	Prasnta Kumar Ghosh	Pune	411038
13717	L8716	Uma Rakesh Thakur	Pune	411052
13704	L8703	Bhushan Baburao Dhale	Ratanagiri	412516
13891	L8884	Maheshkumar Lahu Mane	Barshi	413411
13711	L8710	Vaishali Suryakant Chandek	Latur	413512
13797	L8795	Ashok Arjun Jadhavar	Ahmed Nagar	414003
13705	L8704	Sarfraj Hisamuddin Mujawar	Satara	415001
13703	L8702	Dhanaji Suresh Dalavi	Satara	415108
13809	L8807	Dr. Vaishali Vinod Mane	Sangli	415319
13808	L8806	Tanuja Shrikant Bhakte	Sangli	415403
13807	L8805	Jyoti Madhav Mahadik	Sangli	415409
13810	L8808	Prajakta Madhukar Vibhute	Sangli	415409
13737	L8736	Vijay Paman Kothavale	Kolhapur	416001
13740	L8739	Vibhavari Prakash Malekar	Kurukali	416001
13762	L8761	Dr. Patankar Ketaki Ketan	Kolhapur	416004
13850	L8847	Chavan Navnath Kashinath	Kolhapur	416004
13763	L8762	Raju Shankar Bansode	Kolhapur	416101
13700	L8699	Jayshri Lalaso Patil	Khochi	416110
13701	L8700	Avdhut Shivaji Sutar	Ghunaki	416112
13702	L8701	Bhagyasree Avdhut Sutar	Ghunaki	416112
13811	L8809	Chinmayee Chittranjan Ukidave	Ichalkaranji	416115
13899	L8892	Yugen Atul Kulkarni	Sangali	416415
13923	L8911	Mayapa Dattu Patade	Kolhapur	416508
13718	L8717	Rupali Nagnath Hatte	Mumbai	421201
13794	L8793	Prachi Hemant Jadhav	Thane	421301
13897	L8890	Snehal Yashwant Mulay	Nashik	422005
13707	L8706	Pavan Karbhari Pagare	Nashik	423301
13958	*2210	Kalpana Joshi	Kopargaon	423601
13944	L8931	Premjeet Gajanan Jadhav	Jalgaon	425001
13951	L8939	Bhawana Ashokrao Manekar	Jalgaon	425002
13928	L8915	Dr. S. Govindrao Badhe	Aurangabad	431003
13851	L8848	Dr. Patil Manisha Rajendra	Aurangabad	431005
13901	L8894	Dr. Pradeep Devendra Gaikwad	Georai	431127
13903	L8896	Dr. Santosh Shivajirao Deshpande	Jalna	431203
13747	L8746	Vijayanand Govindrao Kalamse	Nanded	431602
13910	L8903	Dr. Susan John	Nagpur	440006
13869	L8863	Dr. Shahin Anjum Kumar Ali Sayyad	Nagpur	440012
13870	L8864	Bhupendra Tikaram Kumbhare	Nagpur	440012
13729	L8728	Upendra Babarao Malekar	Hatloni	442916
13974	L8957	Niraj Sawala	Amravati	444601
14001	L8984	Avinash Khanderao	Achalpur	444806
		MADHYA PRADESH		
13912	L8905	Paresh Vasantlal Dalal	Burhanpur	450331
13835	L8833	Arup Benerjee	Indore	451010
13834	L8832	Khushboo Purohiot	Indore	452001
13840	L8838	Manish Joshi	Indore	452001
13841	L8839	Dinesh Jajoo	Indore	452001
13838	L8836	Dr. Rashmikant Sanghvi	Indore	452005
13839	L8837	Abbas Ali Kosar	Indore	452014
13832	L8830	Rajesh Kumar	Indore	452020
13994	L8977	Dr. Vijay Bhat	Indore	452020
13837	L8835	Amit Saxena	Indore	453111
13836	L8834	Dr. Nitu. R. Katariya	Ujjain	456010
13959	S2310	Vinay Shrivastava	Bhopal	462016
13812	L8810	Jayshree Indoria	Bopal	462024
13833	L8831	Sweta Jain	Biora	465674
13760	L8759	Gurram Chitra	Tumkur	472103
13979	S2311	Mantasha Ansari	Shahdol	484001
		CHATTISGARH		
13719	L8718	Prashant Kumar Sahu	Dhamtari	493773
13765	L8764	Navin Kumar Khare	Dhamtari	493773
		TELANGANA		
13926	*2207	Kanchana Latha Chitturi	Hyderabad	500004
13976	L8959	Maringanti Subhadra	Hyderabad	500013
13895	L8888	Dr. Usha Praveena	Hyderabad	500016
13968	L8952	Dr. Kodumuri Veerabhadra Rao	Hyderabad	500068
13709	L8708	Paleena Thulimilli	Hyderabad	500076

OMNO	Membership No.	Name	City	Pincode
13930	L8917	Surasi Kiran	Hyderabad	500088
13710	L8709	Radhika Simhadri	Hyderabad	500096
13771	L8770	Indira Lingampally	Nirmal	504101
13773	L8772	Dr. Kandala Vinod Kumar	Nirmal	504101
13786	L8785	Kandela Kashiram	Nirmal	504102
13788	L8787	Ravula Ramu	Nirmal	504102
13772	L8771	Chilimker Vandana Kumari	Bhainsa	504103
13774	L8773	Bachu Srinivas	Nirmal	504106
13775	L8774	Kuna Ramesh	Nirmal	504106
13776	L8775	Polakonda Narayana Verma	Nirmal	504106
13777	L8776	Palepu Nagesh	Nirmal	504106
13778	L8777	Burry Chandra Nagakanthi	Nirmal	504106
13779	L8778	Gangadhar Ankam	Nirmal	504106
13780	L8779	Mohammad Imtiaz Ahmed	Nirmal	504106
13781	L8780	Nampally Raghavender	Nirmal	504106
13784	L8783	Pentu Ramadevi	Nirmal	504106
13785	L8784	Dyaga Radhika	Nirmal	504106
13787	L8786	Yamsani Lavanya	Nirmal	504106
13789	L8788	Tirunagari Premala	Nirmal	504106
13783	L8782	Bonagiri Kumar	Nirmal	504202
13782	L8781	Ameda Narsavva	Nirmal	504306
13935	L8922	Dr. Kethireddy Narendar	Hanamkonda	506001
13933	L8920	Chitla Snehlatha Reddy	Hanamkonda	506002
13977	L8960	Dr. Nagandla Anitha	Khammam	507003
		ANDHRA PRADESH		
13975	L8958	Dr. L. Siva Sankara Reddy	Anantapur	515003
13924	L8912	Thoti Chandra Mohan	Punganur	517247
13902	L8895	Tallapaneni Bala Narendra Prasad	Guntur	522006
13769	L8768	Dr. Ayachithula Nagarajuna	Guntur	522503
13887	L8881	G. Shailaja	Ranga Reddy	529325
13996	L8979	Inkollu Chandra Sekhar	Rajahmundry	533103
13796	L8794	Lokeshwara Rao Koneti	West Godavari	534301
		KARNATAKA		
13894	L8887	Chinagudi Jayanna Jagadeesha	Bangalore	560076
13713	L8712	Poornima .B.L	Tumkur	572106
13720	L8719	Atul Bhat	Udupi	576101
13814	L8812	Prathibha C. Acharya	Udupi	576101
13848	L8845	Akshay Prabhu	Shivamogga	577201
13722	L8721	Dr. Divyamani B. G	Bhadravathi	577245
13706	L8705	Preeti M Patil	Dharwad	580001
13852	L8849	Dr. Aravind . S. Bennal	Dharwad	580003
13964	L8948	Venugopal H.R	Dharwad	580031
13806	L8804	Manjunath . M . Malipatil	Kalaburagi	585102
13804	L8802	Bhoodevi Parvaiah Bhandare	Kalaburagi	585103
13805	L8803	Triveni V . Biradar	Kalaburagi	585105
13886	L8880	Dr. Basavaraja Sannakki	Kalaburagi	585106
13735	L8734	Chidanand Murageepa Kanamodi	Aryunnagar	591237
		TAMIL NADU		
13940	L8927	Dr. K. Annapoorani	Chennai	600019
13957	L8944	Dr. Padmavathy Venkatachalam	Chennai	600064
13863	*2205	M . Manjula	Chennai	600127
13963	L8947	Rajendran Ganapathi Raman	Chennai	602105
13749	L8748	Tejaswi Ashok Hegde	Chennai	603103
13750	L8749	Dr. Ponmudi Selvan T	Chennai	603103
13846	*2204	Dr. A Mohamed Haroon Basha	Chennai	603112
13857	*2204	S . Arjunan	Chennai	603112
13973	S2310	Shibar Rafiq	Chengalpattu	603202
13738	L8737	Selva Kumar .S	Vandavari	604408
13954	L8941	Dr. R. Radha	Kumbakonam	612001
13893	L8886	K. Nithyadevi	Thanjavur	613007
13916	*2207	Dr. Sethuraman . B	Tiruchirappalli	621105
13917	*2207	Dr. Joseph Sagayakennedy . A	Tiruchirappalli	621105
13918	*2207	Purushothaman. G	Tiruchirappalli	621105
13919	*2207	Dr. Venkatesan.K	Tiruchirappalli	621105
13920	*2207	Mary Margaret. S	Tiruchirappalli	621105
13721	L8720	Dr. C. Saravanan	Namakkal	637001
13882	L8876	Dr. Karuppusamy Shanmugam	Erode	638458
13913	L8906	Rahul Pancholi	Coimbatore	641004
13876	L8870	Dr. Janarthanan Balasundram	Coimbatore	641021
13877	L8871	Dr. S . Saira Banu	Coimbatore	641021
13878	L8872	Dr. Sharmila Saminathan	Coimbatore	641021
13879	L8873	Dr. E. Sivasenthil	Coimbatore	641021
13880	L8874	Dr. Mohan Rangam Kadiresan	Coimbatore	641021

OMNO	Membership No.	Name	City	Pincode
13881	L8875	Dr. S. Esakki mathu	Coimbatore	641021
13883	L8877	Dr. J. Thirupathy	Coimbatore	641021
13884	L8878	Dr. A . Nagamani Prabu	Coimbatore	641021
13885	L8879	Dr. Siva. V	Coimbatore	641021
		KERALA		
13868	L8862	Dr. Sujatha .N.V	Aluva	683101
13871	L8865	Vimala George	Aluva	683101
13843	L8841	Priya . S.	Ernakulam	683574
13858	L8853	Titu Thomas	Muvattupuzha	686661
13867	L8861	Dr. Bindhu Christopher	Kolam	691601
		WEST BENGAL		
13821	L8819	Gayatri Pal	Kolkata	700009
13813	L8811	Kathakali Biswas	Kolkata	700009
13751	L8750	Subhendu Chandra	Kolkata	700099
13755	L8754	Swarnalekha Bandyopadhyay	Kolkata	700108
13925	L8913	Sudipta Chakrabarty	Barasat	711103
13875	L8869	Subhomoy Adhikary	Howrah	711104
13978	L8961	Mukesh Kumar Pradhan	Howrah	711110
13921	L8909	Dr. Ajay Kumar Sharma	Paschim Burdwan	713304
13845	L8843	Dr. Sandip Kumar Giri	Midnapore Town	721102
13823	L8821	Bibek Parui	Paschim Medinipur	721127
13990	S2311	Debabrata Chine	Paschim Medinipur	721144
13818	L8816	Anirban Samanta	Paschim Medinipur	721147
13752	L8751	Sangeeta Das	Purba Mednipur	721401
13756	L8755	Goutam Manna	Purba Medinipur	721404
13753	L8752	Abhirup Das	Purba Medinipur	721429
13831	L8829	Dr. Rajesh Mukherjee	Bishnupur	722122
13758	L8757	Biplab Pal	Bankura	722138
13757	L8756	Rangeet Bhattacharyya	Mohanpur	741246
		ORISSA		
13992	L8973	Rajesh Kumar Padhy	Bhubaneswar	751016
14015	L8998	Chinmayee Dash	Khurda	752101
13908	L8901	Dr. Biswambhar Mohanty	Cuttack	753012
13909	L8902	Bipin Kumar Sethy	Jagat Singh Pur	754135
13746	L8745	Bibekananda Nayak	Balasore	756019
13967	L8951	Rajat Kumar Pradhan	Bhadrak	756100
13790	L8789	Dr. Alaka Panda	Gajapati	761200
14013	L8996	Sidhartha S Jena	Rourkela	769008
14014	L8997	Dr. Subhash Chandra Mahapatra	Rourkela	769008
14016	L8999	Susanta Kumar Bisoi	Rourkela	769008
14020	L9003	Sidhartha Ratha	Rourkela	769015
		ASSAM		
13766	L8765	Rangaraj Bhattacharjee	Kamrup	781007
13985	L8967	Dr. Ranjan Kalita	Guwahati	781009
13986	L8968	Dr. Pranab Jyoti Bhuyan	Guwahati	781009
13859	L8854	Dr. Nabajyoti Das	Mirza	781125
14021	*2212	Dhanjit Talukdar	Pathsala	781325
13892	L8885	Pulama Talukdar	Nalbari	781335
13900	L8893	Pulama Talukdar	Nalbari	781335
13754	L8753	Deepjyoti Mahanta	Dudhnoi	783124
13982	L8964	Dr. Mausumi Das	Darrang	784145
13983	L8965	Nayan Mani Das	Darrang	784145
13987	L8969	Dr. Tonuj Deka	Darrang	784145
		NORTH EAST		
13896	L8889	Dr. N . Brojendra Singh	Imphal West	795001
13981	L8963	Dr. Rajkumar Kamaljit Singh	Imphal West	795001
		BIHAR		
13816	L8814	Dr. Ayan Mukherjee	Patna	800020
13817	L8815	Dr. Rajnish Kumar	Patna	800020
13965	L8949	Naveen Kumar Nishchal	Patna	801106
13993	L8974	Gopal Kumar Mishra	Bhojpur	802210
13820	L8818	Dr. Madhav Kumar Singh	Jehanabad	804408
13939	L8926	Dr. Mahendra Singh	Chapra	841301
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THE NEW VIEW OF THE SKY

METEOROITE

It is a small rocky body in outer space, fragment of comet or asteroids collision impact debris. When they enter Earth's atmosphere, produce streak of light due to aerodynamic heating, called meteor or shooting star.

Sighting of Meteor as streak of light

Tunguska Meteor (1908) and Explorer Leonid Kul. It is a largest impact event of meteor on Earth in recorded history

A Meteor and observatory

FDC commemorate the 50th anniversary of world most scientifically acclaimed meteorites (1969), ***Murchison Meteorite,*** Australia. This was a primitive -*Carbonaceous Chondrite* class meteorite.

Meteora- rock formation hosting a monastery on the top, in Greece

A meteoroid in asteroid belt

Impact crater on Mars due to hit of meteorite

Postal Regd. No. Kanpur City-28/2021-23 Date of printing 01-02-2023 Date of posting 08-02-2023 RNI No. UPENG/2009/29982

BULLETIN OF INDIAN ASSOCIATION OF PHYSICS TEACHERS

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

VOLUME 15 NUMBER 03 MARCH 2023

IN THIS ISSUE

If underlivered please return to :
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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