KMVPHY-SPECTRUM

WE LEAD OTHERS FOLLOW

A PHYSICS NEWS LINE

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"Protons and neutrons in a nucleus decide atom's identity and electrons revolving around it gives its personality." — **Ashish Kumar**

Visionary Physicist

Woman IN STEM: SHOBHANA NARASIMHAN

For all young women looking for role models in STEM, here's one to be really proud of. Indian professor Shobhana Narasimhan has carved her place in the list of International Honorary member to the American Academy of Arts and Sciences which also included scholars and leaders like Charles Darwin, Albert Einstein and Nelson Mandela. STEM stands for science, technology, engineering and mathematics and refers to any subjects that fall under these four disciplines. The acronym originates from discussions about the lack of qualified graduates to work in high-tech jobs in the US. Since its creation, governments and universities around the world have made attracting students to STEM courses a priority, in order to address this shortfall.

STEM subjects, historically, have been very male-dominated, with young girls often discouraged from pursuing such a technical career path. While 12% of women in bachelor programs will graduate with a STEM degree each year, only 3% go on to work in the STEM field. This lack of gender balance has also led to a pay gap between men and women in STEM. Dr Narasimhan is from the Theoretical Sciences Unit (TSU) of the Jawaharlal Nehru Center for Advanced Scientific Research (JNCASR). A recipient of Stree Shakti Samman Science Award, Narasimhan heads the Computational Nanoscience Group at JNCASR.

Born on August 16, 1963, Prof. Narasimhan is a B.Sc graduate from St. Xaviers College, University of Bombay. She completed her master's degree in Physics from the Indian Institute of Technology, Bombay. At Harvard University, she pursued her PhD in Physics under the supervision of Prof. David Vanderbilt. Later, she worked as a postdoctoral researcher, first at Brookhaven National Lab in New York, USA and then at the Fritz Haber Institute of the Max Planck Society in Berlin, Germany. Prof. Narasimhan joined the JNCASR in 1996. She was formerly the chair of Theoretical Sciences Unit and the Dean of the Academic Affairs at JNCASR. Shobhana Narasimhan's group primarily focuses on exploring the novel physics and chemistry of materials at nanoscale. The group uses this nanoscale understanding to design materials with novel functionalities by using quantum mechanical density functional theory. The group uses theoretical first principles without any empirical input (apart from atomic numbers and masses) to derive information about the material structure and its functional properties. While the nature of research of highly fundamental, the results have been applied to developing nanocatalysts for clean energy and designing magnetic materials for data storage . The research falls under the category of computational nanotechnology in the field of condensed matter physics. The group is currently aiming to develop microscopic descriptors that can be correlated with the macroscopic properties of the material as an alternative to performing density functional theory calculations or conducting empirical studies and supplement these descriptors by using machine learning approaches. She formed a network of women who can support and cheer each other in low times. She also became the member of two committees set up by Government of India – the National Task Force on Women in Science, and the Standing Committee on Women in Science and advised the government on how it can support the cause of women Scientists.

AN INDO-AMERICAN EXPERIMENTAL PLASMA PHYSICIST: CHANDRASHEKHAR "CHAN" JANARDAN JOSHI

Chan Joshi is a Distinguished Professor of electrical engineering with the University of California, Los Angeles. He started the first research group on Plasma Acceleration at UCLA in 1982. This work has now spread worldwide; yet after three decades, his group continues to make breakthrough contributions to this grand challenge in engineering. He has made many fundamental contributions to our understanding of extremely nonlinear optical effects in plasmas. Notably, his first experimental demonstrations are in plasmas of four-wave mixing, stimulated Raman forward instability, stimulated Compton scattering, resonant self-focusing, quasi-resonant modes, and frequency up shifting by ionization fronts and nonlinear coupling between electron and plasma waves.

His research group is best known for its involvement in the field of ultrahigh gradient acceleration of charged particles using space charge density waves in plasmas using a laser or a particle beam pulse. Such wakes are being considered as accelerating structures for the next generation of particle colliders and compact light sources to make these critical instruments of scientific discovery compact and affordable. His current research interests include plasma physics, lasers, and electromagnetics, and particularly, laser fusion, laser acceleration of particles, nonlinear optics of plasmas, high-power lasers and particle beams, and basic plasma phenomena. He received the Maxwell prize in plasma physics in 2006 for leadership in plasma-based acceleration techniques. He's additionally the recipient of the 1996 John Dawson Award for Excellence in Plasma Physics Analysis in addition to the 1997 USPAS Prize for Achievement in Accelerator Physics and Expertise. He was the APS Centennial Speaker (1999) and a Distinguished Lecturer in Plasma Physics (2001). He was elected to the Nationwide Academy of Engineering in 2014.

Born on 22 July, 1953 in Wai, Maharashtra, Joshi had his major qualification at Dravid High school, Wai. Whereas in ninth grade, he was chosen by 'Pestalozzi Kids's village Belief' in England and went to England for his additional research. He acquired his B.Sc. (1974) in nuclear engineering from the College of London and Ph.D. (1978) in utilized physics from the College of Hull, that are each in the UK. Following a two-year stint as a analysis affiliate on the Nationwide Analysis Council of Canada, the place he labored on laser-plasma interactions, he joined University of California, Los Angeles (UCLA) first as a researcher and have become a college member since 1988. The initial experimental designs of Dr. Joshi for a "wakefield" accelerator were conceived at UCLA. Current experimental devices show accelerating gradients several orders of magnitude better than current particle accelerators over very short distances, and about one order of magnitude better (1 GeV/m vs 0.1 GeV/m for an RF accelerator) at the one meter scale.

Science News Section

Lithium-ion batteries made with recycled materials can outlast newer counterparts

Using shredded spent batteries, Wang and colleagues extracted the electrodes and dissolved the metals from those battery bits in an acidic solution. By tweaking the solution's pH, the team removed impurities such as iron and copper and recovered over 90 percent of three key metals: nickel, manganese and cobalt. The recovered metals formed the basis for the team's cathode material. In tests of how well batteries maintain their capacity to store energy after repeated use and recharging, batteries with recycled cathodes outperformed ones made with brand-new commercial materials of the same composition. It took 11,600 charging cycles for the batteries with recycled cathodes to lose 30 percent of their initial capacity.

Quantum particles can feel the influence of gravitational fields they never touch

particles can feel the influence of magnetic fields that they never come into direct contact with. Now scientists have shown that this eerie quantum effect holds not just for magnetic fields, but for gravity too — and it's no superstition. Usually, to feel the influence of a magnetic field, a particle would have to pass through it. But in 1959, physicists Yakir Aharonov and David Bohm predicted that, in a specific scenario, the conventional wisdom would fail. A magnetic field contained within a cylindrical region can affect particles — electrons, in their example — that never enter the cylinder. In this scenario, the electrons don't have well-defined locations, but are in "superpositions," quantum states described by the odds of a particle materializing in two different places. In the new experiment, Kasevich and colleagues launched rubidium atoms inside a 10-meter-tall vacuum chamber, hit them with lasers to put them in quantum superpositions tracing two different paths, and watched how the atoms fell. Notably, the particles weren't in a gravitational field–free zone. Instead, the experiment was designed so that the researchers could filter out the effects of gravitational forces, laying bare the eerie Aharonov-Bohm influence. The study not only reveals a famed physics effect in a new context, but also showcases the potential to study subtle effects in gravitational systems. For example, researchers aim to use this type of technique to better measure Newton's gravitational constant, G, which reveals the strength of gravity, and is currently known less precisely than other fundamental constants of nature

The only known pulsar duo sheds new light on general relativity and more

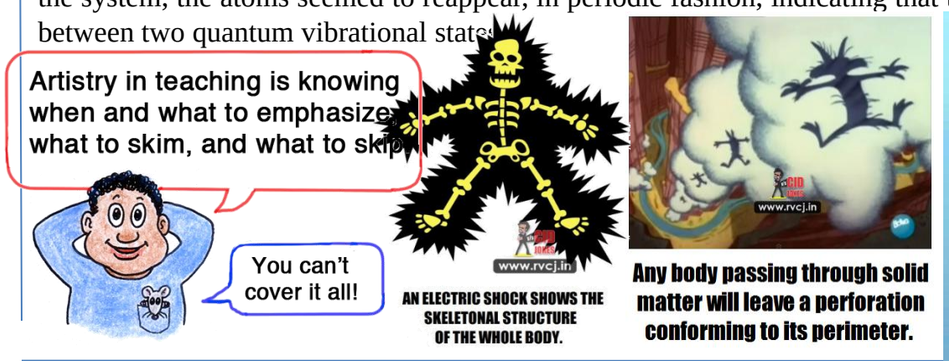
For over 16 years, scientists have been observing the pair of pulsars, neutron stars that appear to pulsate. The measurements confirm Einstein's theory of gravity, general relativity, to new levels of precision, and hint at subtle effects of the theory. Pulsars, spinning dead stars made of densely packed neutrons, appear to blink on and off due to their lighthouse-like beams of radiation that sweep past Earth at regular intervals. Variations in the timing of those pulses can expose pulsars' movements and effects of general relativity. While physicists have found plenty of individual pulsars, there's only one known pair orbiting one another. The 2003 discovery of the double-pulsar system, dubbed J0737-3039, opened up a new world of possible ways to test general relativity. One of the pulsars whirls around roughly 44 times per second while the other spins about once every 2.8 seconds. The slower pulsar went dark in 2008, due to a quirk of general relativity that rotated its beams out of view. But researchers kept monitoring the remaining visible pulsar, combining that new data with older observations to improve the precision of their measurements.the five highlights of the study includes: properties of the orbit match predictions of Einstein's theory, pulsars' orbit is shrinking resulting in sapping energy by Gravitational waves, the pulsar lose mass, direction of faster spinning motion can be determined. The pulsar drags the fabric of spacetime behind it as it spins, like a twirling dancer's twisting skirt, altering that precession. This dragging effect implies that the faster pulsar's radius must be less than 22 kilometers, an estimate that, if made more precise with future work, could help unveil the physics of the extremely dense neutron star matter that makes up pulsars

Scientists make a new type of optical device using alumina

Scientists from the Kavli Institute for the Physics and Mathematics of the Universe and the University of Minnesota, Tomotake Matsumura and Shaul Hanany, and their collaborators have made a new type of optical element that will improve the performance of telescopes studying radiation from the Big Bang. To study the cosmic microwave background (CMB), telescopes must be tuned to wavelengths in which it is most intense, about 1-3 mm, and they must separate out shorter wavelength radiation that the atmosphere and Milky Way emit. Matsumura and Hanany have now come up with a new way to fabricate an alumina short-wavelength absorber anti-reflective structures that reduce reflections fifty-fold. The MUSTANG2 instrument is now conducting sky observations with the new technology, demonstrating for the first time its success. The researchers patterned the alumina with small pyramidal structures, which are about one millimeter tall (0.04 inch) and repeat across the 30 cm (one foot) diameter with a periodicity of just less than one millimeter.

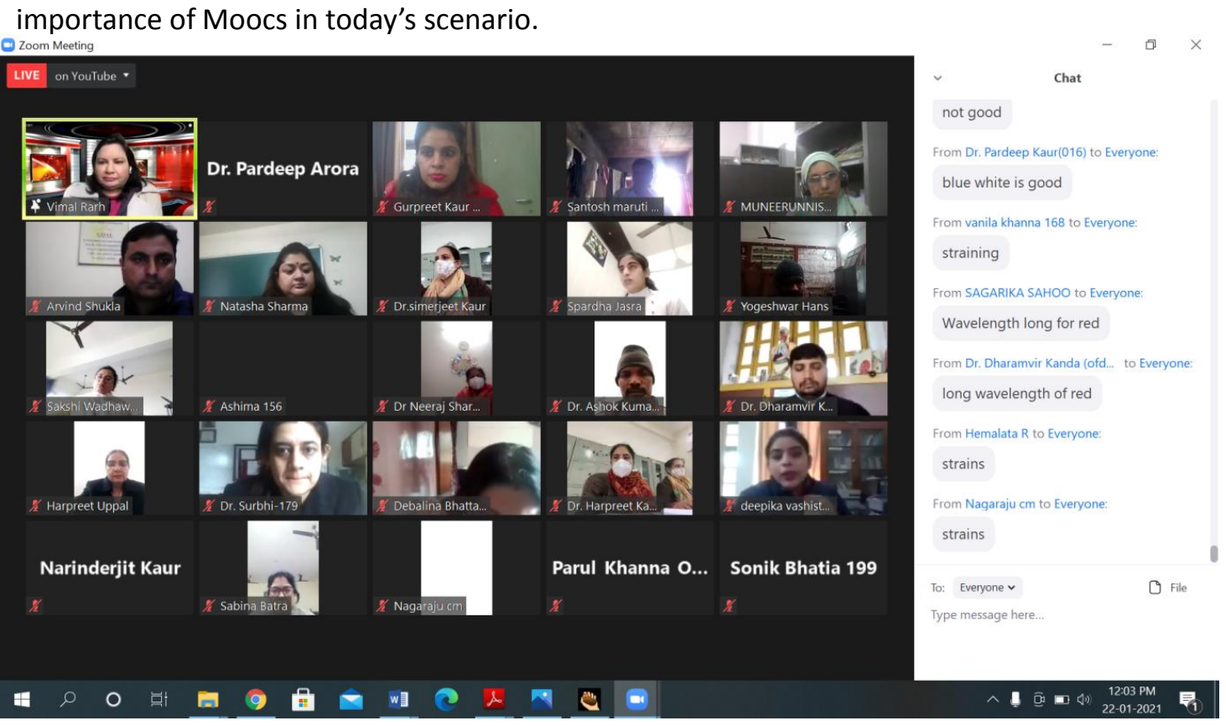
Quantum computing: Vibrating atoms make robust qubits, physicists find

MIT physicists have discovered a new quantum bit, or "qubit," in the form of vibrating pairs of atoms known as fermions. They found that when pairs of fermions are chilled and trapped in an optical lattice, the particles can exist simultaneously in two states -- a weird quantum phenomenon known as superposition. In this case, the atoms held a superposition of two vibrational states, in which the pair wobbled against each other while also swinging in sync, at the same time. The team was able to maintain this state of superposition among hundreds of vibrating pairs of fermions. In so doing, they achieved a new "quantum register," or system of qubits, that appears to be robust over relatively long periods of time. There are many types of qubits, some of which are engineered and others that exist naturally. Most qubits are notoriously fickle, either unable to maintain their superposition or unwilling to communicate with other qubits. The MIT team's new qubit appears to be extremely robust, able to maintain a superposition between two vibrational states, even in the midst of environmental noise, for up to 10 seconds. The team believes the new vibrating qubits could be made to briefly interact, and potentially carry out tens of thousands of operations in the blink of an eye. The team's discovery initially happened by chance. Zwierlein's group studies the behavior of atoms at ultracold, super-low densities. When atoms are chilled to temperatures a millionth that of interstellar space, and isolated at densities a millionth that of air, quantum phenomena and novel states of matter can emerge. They cooled a cloud of fermions down to 100 nanokelvins and used a system of lasers to generate an optical lattice in which to trap the atoms. They tuned the conditions so that each well in the lattice trapped a pair of fermions. Initially, they observed that under certain conditions, each pair of fermions appeared to move in sync, like a single molecule.To probe this vibrational state further, they gave each fermion pair a kick, then took fluorescence images of the atoms in the lattice, and saw that every so often, most squares in the lattice went dark, reflecting pairs bound in a molecule. But as they continued imaging the system, the atoms seemed to reappear, in periodic fashion, indicating that the pairs were oscillating between two quantum vibrational stat



One Week Faculty Development Program

one-week online Faculty development program on “Development of e-content & MOOCS in Four Quadrants” in collaboration with Guru Angad Dev Teaching Learning center, University of Delhi was organized from January 18, 2021 to January 23, 2021. The event was started by lighting the lamp virtually for taking blessings of Almighty and attended by 200 faculty members of different institutions from 18 states of India. The inaugural address was presented by Dr. Vimal Rarh, Project Head and Joint Director, Guru Angad Dev Teaching Learning Center of MHRD. In her address Dr. Vimal Rarh explained ways of generating e-content at national level. She also elaborated that for upgrading a teacher: faculty empowering workshops, preparation of teacher’s e-kit and multi media enriched videos should be developed. The Program successfully run for seven days. The last day of the FDP, was graced by the presence of Dr. Nisha Singh, Deputy Director, Center for Online Education (COE), IGNOU, New Delhi. Dr. (Prof.) Jaswinder Singh in his address firstly congratulated KMV for organising this one week FDP on the topic “Development of e-content & MOOCS in Four Quadrants” in collaboration with Guru Angad Dev Teaching Learning Center, University of Delhi. Dr. Singh while addressing the participants congratulated all the participants for attending the FDP and learning the importance of Moocs in today’s scenario.



National Science Day was celebrated on February 28, 2021

National Science day was celebrated online on February 28, 2021 to bring awareness to people about the importance of science in our daily life and to encourage students to consider career in science. The webinar started at 10:00 A.M with the gracious presence of five special guests. Padma shri Pramod kale inaugurated the event by talking about the cause of blue color of sky, and more things about black holes. The workshop duration was of 6 hours where all the guests speak about different titles of Science. Dr. Arvind C. Ranade started with the biography of C. V RAMAN. He talked about sir C.V Raman’s life, his qualification, his achievement’s and many more. Dr. Hariom Vats started his talk with sun’s life, exploration of solar dynamics and energetic events on the sun.

Online quiz for Celebrating 142nd Birthday of Albert Einstein

राष्ट्र स्तरीय ऑनलाइन क्विज में हिस्सा लेते हुए विद्यालय प्रिंसीपल प्रो. अतिमा शर्मा द्विवेदी व छात्र। (संदीप)

An online quiz was organized on March 14, 2021, the birthday of Albert Einstein to stimulated the interest of faculty as well as students towards contribution of Albert Einstein in modern science. Quiz was conducted in the online mode in which 635 students as well as faculty members from our entire nation participated. In addition to the theory of relativity, Einstein is also known for his contributions to the development of quantum theory.

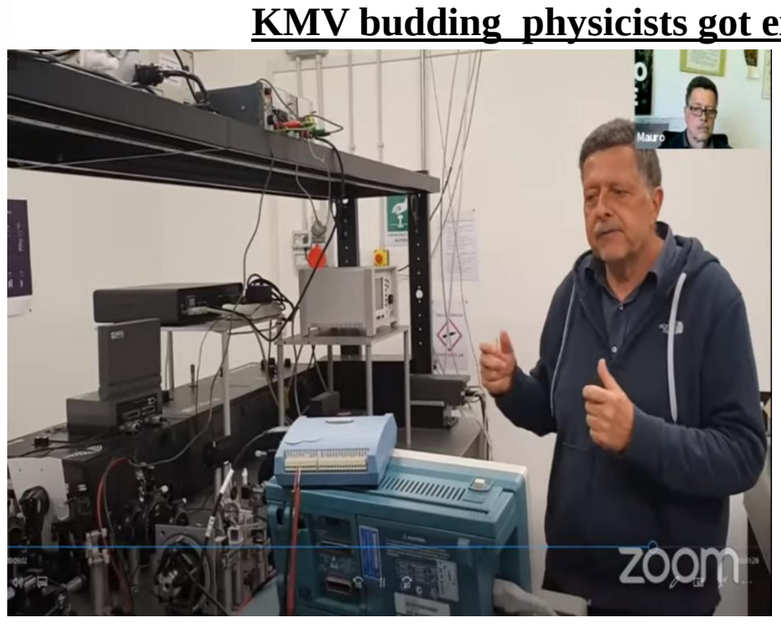
An online workshop for Budding Innovators

A special mentoring lecture on May 3, 2021 has been organized to realize the Innovative Ideas of some brilliant students. Er. Vishal Sharma, Scientist cum Chief Mentor of Innovation Hub, Pushpa Gujral Science City, Kapurthala was invited to mentor students on making innovative projects. During the interaction, students shared their innovative ideas as remedy to the existing problems in society like road accidents due to recklessness of driver, stagnated water on roads, spreading of virus etc. Er. Vishal guided students to make a prototype project. He gave suggestions to improvise student’s projects. He suggested that dispensers of sanitizers can be installed outside classes so that everyone before going into rooms can be sanitized. He added that IR Sensor, Motion sensor PIR passive response sensor (shower), Pumps, nozzles can be used for the actualization of the project.

Live Interaction and online ENEA Lab Visit

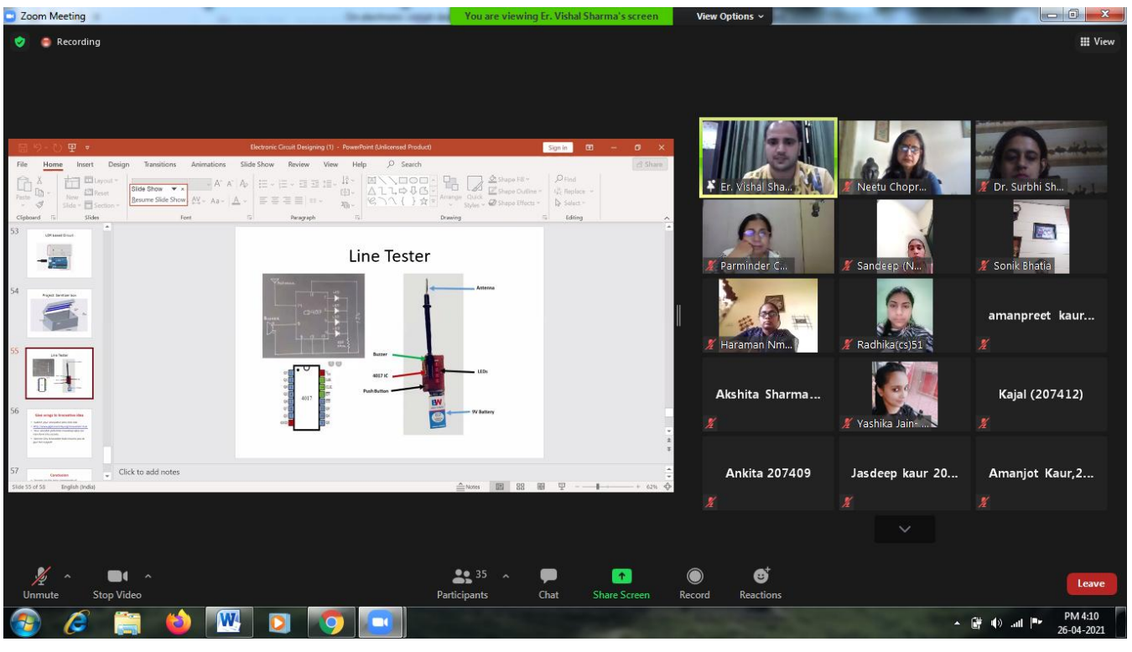
To start a new venture PG Department of Physics, initiated online visit of international research institutes. Under this innovations 100 students were taken to world’s renowned research laboratories ENEA virtually on May 10, 2021. Dr. Alessia Cemmi gave an overview of her research laboratory ENEA, Italy. She described ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development) as an Italian Government-sponsored research and development agency. The agency undertakes research in areas which will help to develop and enhance Italian competitiveness and employment, while protecting the environment. Dr. Cemmi introduced the Calliope gamma irradiation facility at ENEA, Casaccia R.C. and organized a virtual visit to 60-Cobalt irradiation plant, research laboratories. She showed a Pool-type irradiation facility equipped with a 60Co gamma source in a high volume shielded cell. She also showed videos based on external view of the laboratory, internal view of the irradiation cell, control room and up-down source operation. She then presented the Dosimetric and characterization laboratory of 60Co Calliope facility at ENEA, Casaccia R.C. where Optical and Spectroscopic characterization facility and Accelerated ageing test facility were showcased.

KMV budding physicists got exposure to Italian Labs

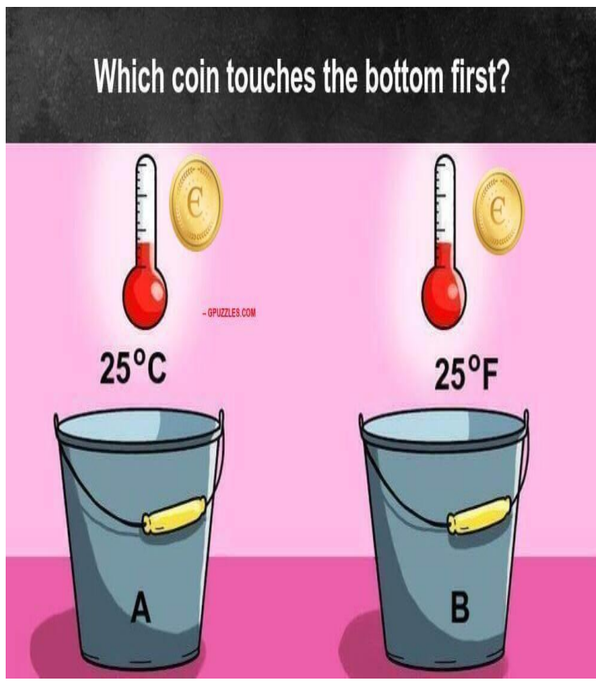


Second episode of KMV International series was held on May 17, 2021 and was attended by 100 participants through Zoom platform and many more joined the virtual event through other social medias like Youtube and Facebook. Dr. Mauro Falconieri from ENEA, Italian Agency for New Technologies, Energy and Sustainable Economic Development (Italy) was invited as the key speaker of the second episode of KMV International series. Dr.Falconieri presented the virtual tour of “Ultrafast Spectroscopy Laboratory” at ENEA, Italy. During his presentation he gave an overview of Molecular mechanisms of Raman scattering, Raman spectroscopy instrumentation and their applications. He acknowledged the contribution of the great Indian physicist Dr. C. V. Raman in the study of spectroscopy.

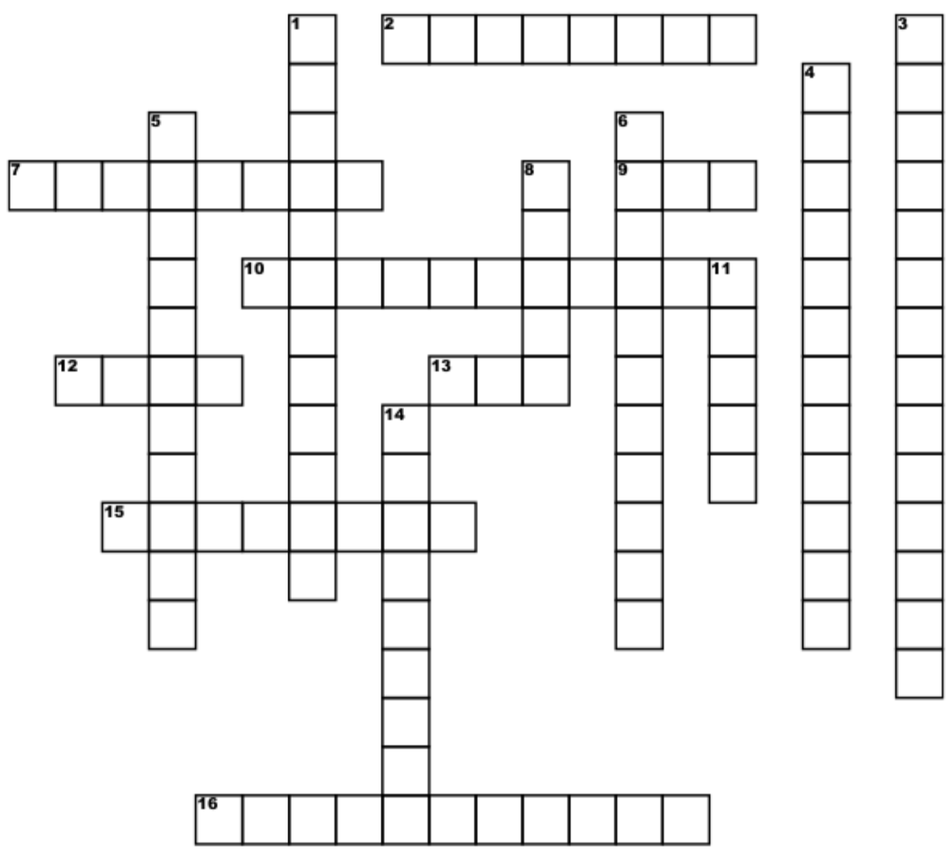
A workshop on Electronic Circuit Designing and Innovative Practices



An online workshop on electronic circuit designing and innovative practices was organized on april 26, 2021 in collaboration with Pushpa Gujraj Science city. Er. Vishal Sharma, Scientist cum Chief Mentor of Innovation Hub, Pushpa Gujral Science City, Kapurthala hosted this workshop. Event was attended by about 115 participants including students and faculty members. Er Vishal Sharma started the workshop by explaining the concept of Alternative current, Direct current, voltage, resistance and electromotive forces. He also explained the importance of Series and parallel connections in electronic circuits used in our home, schools and college. Students also participated in the event by answering an open quiz by Er. Vishal Sharma. Further Tinkercad app was introduced to create 3D electronic designs. Students created their own circuits live in the workshop. Various unique project ideas were also discussed with students like Automatic hand sanitizers, Line testers, LDR based circuits etc.



Science Crossword Puzzles



Across

2. What type of system that allows no energy and mass to cross boundary ?

7. Separates the system from its surrounding.

9. How many properties are needed to specified the simple compressible system ?

10. Path of the system close to equilibrium.

12. A system that allows the mass and energy to flow outside of the boundary.

13. Unity conversion ratios always equal to

15. SI unit for mass.

16. A condition of balance characterized by the absence of driving potential.

Down

1. Everything outside of system.

3. Characteristic of closed system.

4. What pressure do you get by subtracting P atmospheric from P absolute ?

5. What do you call property of a system that is independent of mass ?

6. What type of thermodynamics approach that study the average behaviour of individual particles ?

8. What is the SI unit for length ?

11. A process during which the initial and final states are identical.

14. This type thermodynamics use macroscopic approach.

Fun Times with Physics

KMV students en-route to lean start-up through innovations

P.G. Department of Physics has organized a special mentoring lecture on Lean Start-up and minimum viable product for budding scientists of its department. Lecture was organized in sequence with the previous mentoring session held on May 03, 2021 to explore ideas for the construction of and then commercializing innovative projects. He gave suggestions to improvise student's projects. Er. Vishal helped students to trace different components like sensors, transistors, batteries, pumps, motors, breadboard , Cd ejectors etc required for the construction of projects and thus opening the door of their innovative projects to the commercial market. During the interaction, students designed a blueprint of their projects like road water manager, automatic slider etc. Overall the session was very interactive and students learnt various innovative methods.

KMViets interacts with renowned Physicist from London

The third episode of KMV International series was held on May 24, 2021. Dr. Michael Ojovan, Professor, Department of Materials, Imperial College, London UK and former nuclear engineer at IAEA, was invited as the key speaker of the third episode of KMV International series. The topic of Dr. Ojovan was the role of IAEA in the peaceful use of nuclear energy and radioactive waste materials. He presented a comprehensive overview of various aspects relating to the application of cogeneration with nuclear energy. He also shared comprehensive data focusing on nuclear power plants worldwide. Dr.Ojowan answered queries of faculty as well as students. He shared his knowledge about radioactive materials and their disposal protocols.

Story time

There Will Come Soft Rains

In the last instant under the fire avalanche, other choruses, oblivious, could be heard announcing the time, cutting the lawn by remote-control mower, or setting an umbrella frantically out and in, the slamming and opening front door, a thousand things happening, like a clock shop when each clock strikes the hour insanely before or after the other, a scene of maniac confusion, yet unity; singing, screaming, a few last cleaning mice darting bravely out to carry the horrid ashes away! And one voice, with sublime disregard for the situation, read poetry aloud in the fiery study, until all the film spools burned, until all the wires withered and the circuits cracked.

The fire burst the house and let it slam flat down, puffing out skirts ofspark and smoke.

In the kitchen, an instant before the rain of fire and timber, the stove could be seen making

breakfasts at a psychopathic rate, ten dozen eggs, six loaves of toast, twenty dozen bacon strips, which, eaten by fire, started the stove working again, hysterically hissing!

The crash. The attic smashing into kitchen and parlour. The parlour into cellar, cellar into sub-cellar.

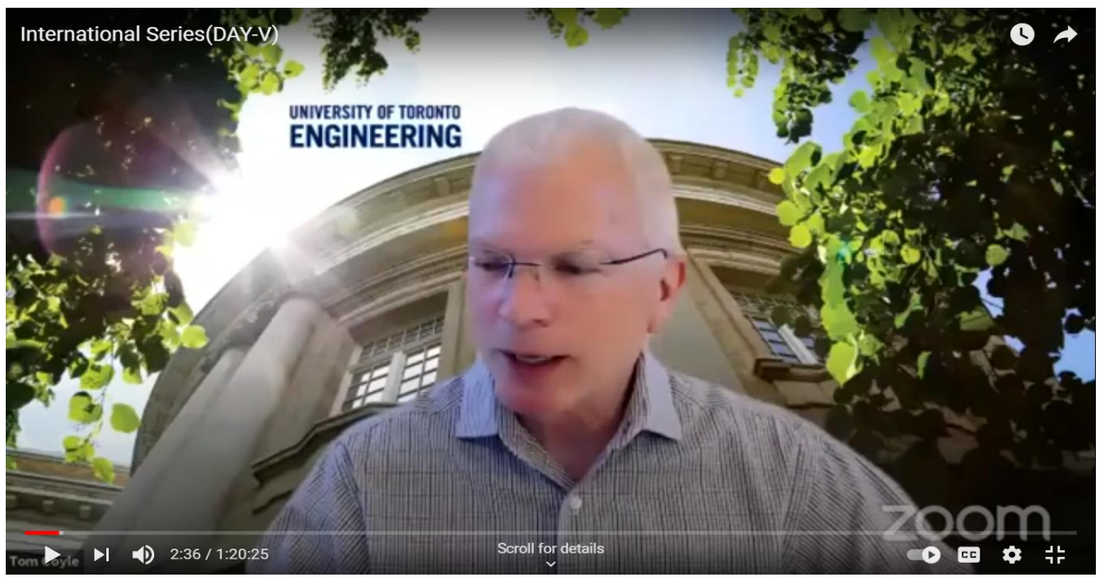
Deep freeze, armchair, film tapes, circuits, beds, and all like skeletons thrown in a cluttered mound deep under.

Smoke and silence. A great quantity of smoke. Dawn showed faintly in the east. Among the ruins, one wallstood alone. Within the wall, a last voice said, over and over again and again, even as the sun rose to shine upon the heaped rubble and steam:

"Today is August 5, 2026, today is August 5, 2026, today is..."

KMV Students Interacted with Renowned Physicist from New Jersey

Dr. Ashutosh Goel, Associate Professor, Department of Material Science and Engineering, Rutgers, The state of University of New Jersey, was invited as the key speaker of the fourth episode of KMV International series. The topic of Dr. Goel was "Turning Nuclear Waste into Glass". Before starting his talk, Dr. Goel gave the virtual tour to department of Material Science and Engineering, Rutgers. During the virtual tour students as well as faculty was amazed by witnessing the preparation of Gorilla Glass employed by Samsung Galaxy phone. Later Dr. Goel introduced the concept of nuclear energy and waste associated with it. He said that "We live our lives surrounded by naturally-radioactive materials, and are constantly bathed in radiation originating from rocks and soil, building materials, the sky (space), food, and one another".

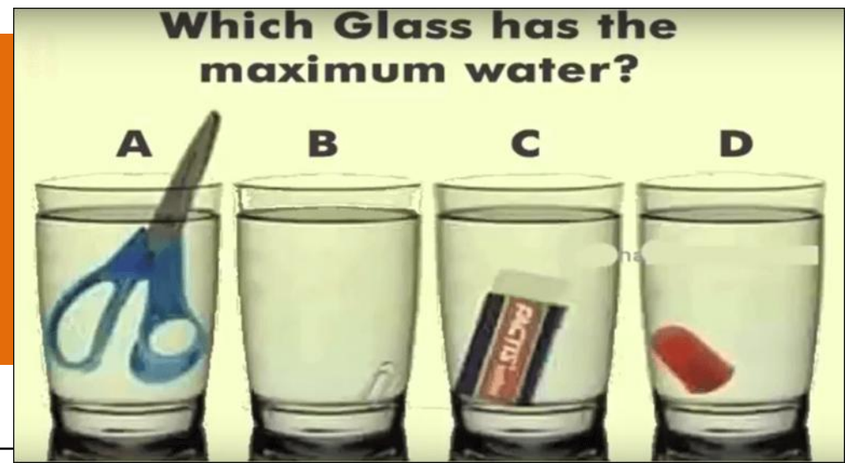


Kmviets Learnt Amazing Facts about Ceramics from Canadian Professor

Fifth episode of the KMV International series (Physics chapter) was conducted on June23, 2021. The event was graced by the presence of Dr. Thomas W. Coyle, Vice Dean of Undergraduate Studies, Faculty of Applied Science & Engineering, University of Toronto, Canada. Dr. Coyle has explained the concept of Defects and Conductivity in Oxide Ceramics in a very easy manner. He discussed the structure and defects of Titanium oxide in his talk. In order to make the lecture easier for undergraduate students to understand, Dr. Coyle included very basic concepts of types of defects in ceramics viz. Schotky defects, Frenkel defects etc. in his talk. It was very interesting to know about applications of Titanium oxide based detectors in varieties of sensors. Students got an opportunity to interact and thus to learn from the renowned professor from University of Toronto, Canada. Dr. Coyle answered queries of students as well as faculty members.

A SCIENCE PUZZLE

A science teacher told his after school class, "Whoever can get this egg into this smaller glass bottle will win no homework for a week! The rules are: the egg has to go into the bottle in one piece, and you can't break the bottle. You can also use anything in the science lab. So, do we have any volunteers? A boy raised his hand and the teacher pointed at him. The boy took the egg and looked around the science lab for the things he could use. He saw some writing paper, a pack of matches, some vinegar, a sink, and the glass bottle. By the end of the after school class, the boy had gotten the egg into the smaller bottle.



Science Crossword Puzzles Across: 2. Periodic Table 5. Proton 7. Carbon
Down: 1. Neutron 3. Electron 4. Lithium 6. Nucleus