



DEPARTMENT OF PHYSICS
MAITREYI COLLEGE
UNIVERSITY OF DELHI

BHAUTIK KSHITIJ

THE ANNUAL MAGAZINE

Issue 2

Principal's Message



Prof. Haritma Chopra

Greetings from Maitreyi College!

Dear Readers,

I am delighted to know that the Department of Physics is bringing out the second annual edition of *Bhautik Kshitij*, The Physics Magazine 2024. We, at Maitreyi college emphasize at escalating the students' potential with indispensable support, guidance and encouragement from our committed faculty. Our endeavor has been to contribute to Higher Education not only by enabling the students to get a degree in Science, Commerce or Humanities but also by developing in them the aptitude to think imaginatively and articulate their views with confidence and conviction. This issue is a promising platform to encourage the students to display their subject specific expertise, creativity and innovative ideas. I congratulate and acknowledge the teamwork of editorial team and the students who have utilized their time in a positive ingenious manner through the creation of the second edition of this bulletin.

Best Wishes

Prof. Haritma Chopra
Principal (Officiating)

Teacher-convener



Dr Poonam Juneja



Dr Prajwalit Shikha

Welcome to the second edition of *BHAUTIK KSHITI*. In this edition, we aim to showcase the incredible work being done within our physics department and highlight the diverse talents and achievements of our students and alumni. From showcasing artistic representations of scientific concepts to highlighting unique approaches in problem-solving, we want to demonstrate that creativity is an integral aspect of successful scientific endeavors. Through interviews with alumni who have made significant contributions in various fields or profiles on current students engaged in extracurricular activities related to art or community service, we aim to showcase the well-rounded nature of those involved in studying physics.

This second edition aims not only to be informative but also inspiring and thought-provoking. We hope it will spark conversations about new ideas within the field while promoting interdisciplinary thinking that extends beyond traditional boundaries. Thank you for joining us on this journey as we explore different domains of our students' creativity that make up the vibrant world of our department!

Best Wishes

Editorial Team



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CONTENTS

About the Department	5
News Section	6
Departmental Activities	9
Student Section	17
Summer Internship Projects 2023	22
Articles	25
Career Prospects	34
Know our Alumnae	36
Recharge Zone	39



DEPARTMENT OF PHYSICS

The Department of Physics at Maitreyi College is not just a place where students learn physics; it is a place where values are instilled, motivation is fostered, and excellence is encouraged. The department's commitment to creating an inclusive environment, providing hands-on experience through well-equipped laboratories, organizing workshops and conferences, and promoting ethical practices sets it apart from other institutions. By emphasizing values such as compassion, social responsibility, and ethics in scientific research, the department ensures that its students graduate not only as knowledgeable physicists but also as responsible citizens who understand the impact of their work on society. The faculty members act as mentors who guide students in their academic journey and encourage them to think critically and explore new ideas.



1. The Nobel Prize in Physics 2023

Pierre Agostini



Ferenc Krausz



Anne L'Huillier



“for experimental methods that generate attosecond pulses of light for the study of electron dynamics in matter”

The three Nobel Prize laureates in physics 2023 are being recognised for their experiments, which have given humanity new tools for exploring the world of electrons inside atoms and molecules. They have demonstrated a way to create extremely short pulses of light that can be used to measure the rapid processes in which electrons move or change energy.

2. Electronics can now be done inside a living tissue not just at Lab!



Investigating the intricate electrical signaling properties of the nervous system is made easier by the ability to perform electronics within a neural tissue. In order to prevent or treat disorders, electronic devices can also be implanted to monitor brain circuits. Using the body's molecules as triggers, Swedish researchers have devised a way to directly create soft, substrate-free conducting materials inside live tissue. The findings provide entirely new perspectives on electronics and biology.

3. Now even cracks can be supersonic!



Researchers Jay Fineberg, Songlin Shi, and Meng Wang of the Hebrew University of Jerusalem in Israel have found that some materials can have cracks that propagate more quickly than sound. The outcome defies assumptions derived from classical theory and earlier experimental findings, which hold that supersonic fracture propagation shouldn't be conceivable since a material's sound speed indicates how rapidly mechanical energy can flow through it. The findings of the study could suggest the existence of dynamics referred to as "supershear," which are controlled by distinct principles from those governing classical cracks.

4. Evidence of how the Universe is transforming found in the form of a gun!

We are grateful to the EIGER Collaboration for utilizing the James Webb Space Telescope (JWST) to uncover strong evidence that the reionization of the early cosmos was caused by early galaxies. Approximately one billion years after the Big Bang, a process known as reionization took place in which hydrogen gas was ionized. This made it possible for light that would have been absorbed by hydrogen to reach modern telescopes. It appears that local bubbles that expanded and merged are where reionization started. Radiation sources could have produced these bubbles; one idea is that the radiation originated from galaxies' stars. The EIGER scientists examined light from old quasars that had made it through the ionized bubbles using the Near Infrared Camera on the JWST.

Celebrating

ISRO



Following the triumphant soft landing of Chandrayaan 3 on the Lunar south pole, ISRO is poised for many more monumental strides to come. Living up to its reputation of Leading cost-effective and successful missions, ISRO has contributed immensely in India becoming a global frontrunner in Space Technology.

It has paved the way for Solar and lunar studies. Part of the Experiments were to figure out the composition of the Moon's atmosphere whereas others looked at the composition of the Moon soil in the southern Hemisphere. Some tried to find the possible reasons behind Moonquakes!

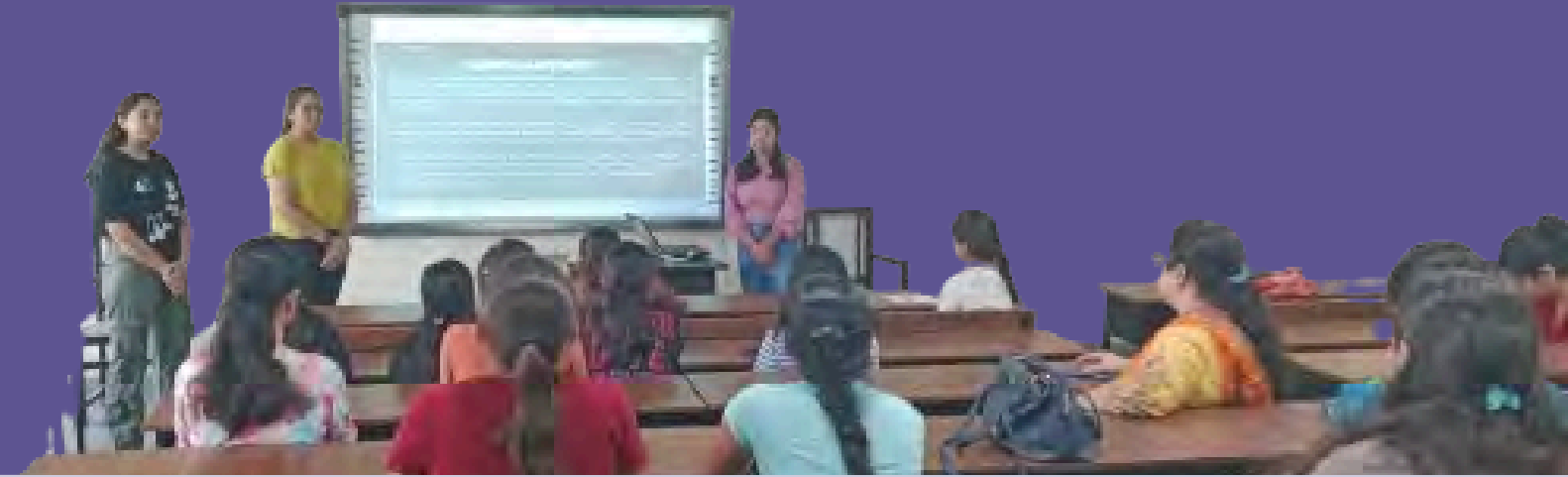
With India currently playing a small part in International Space Exploration, an Industry worth \$600 million we are the future who play a bigger role. As India's prospects in Space Exploration shine bright, we bring to you a glimpse of ISRO's Success timeline to introspect and who knows become a part of it in the long run!



Orientation

WELCOMING A NEW BATCH

A formal introduction of first-year students, providing a comprehensive understanding of the course dynamics and introducing departmental societies, duties, and mandatory events. It serves as an initial interaction between new students, the student body, and faculty members while facilitating invaluable encounters with distinguished alumni, enabling informed career decisions in physics.



Quest

ANNUAL DEPARTMENTAL FEST

An esteemed event that blends academia and leisure, featuring captivating guest lectures, a diverse array of academic and non-academic games, and vibrant kiosks offering delectable food and accessories. Proudly organized by the student body through sponsorships, Quest fosters holistic development and provides a platform for students to showcase their talents.



Freshers'

MAKING NEW FRIENDS

A warm welcome to incoming students, igniting their journey with a talent hunt to exhibit their skills, captivating performances by seniors, and a delightful dance party. Sponsored by the student body, this event nurtures camaraderie and personal growth, leaving lasting memories for the new batch.



Farewell

CELEBRATING AN ERA

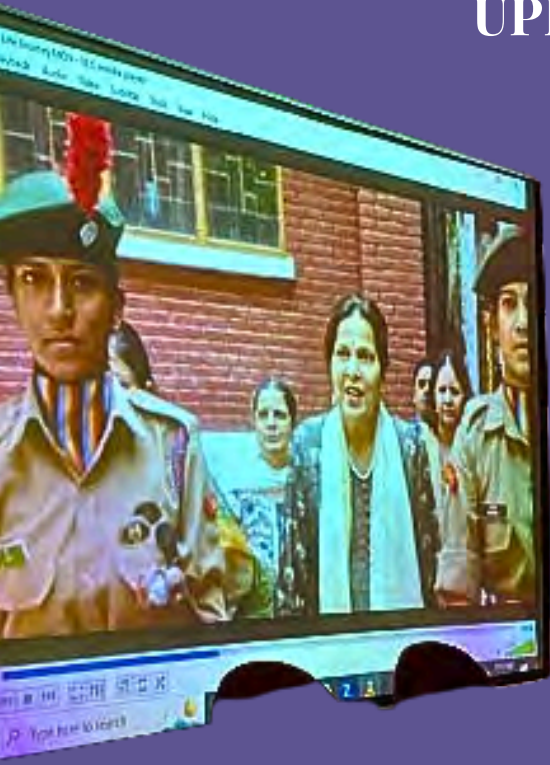
A heartfelt farewell to our esteemed seniors, featuring captivating performances by juniors, personalized gifts, and titles. Accompanied by a reflective recounting of each student's achievements by teachers, this event celebrates their accomplishments and concludes with a joyous dance party.



Savita Datta Memorial Lecture

UPLIFTING MEMORIES

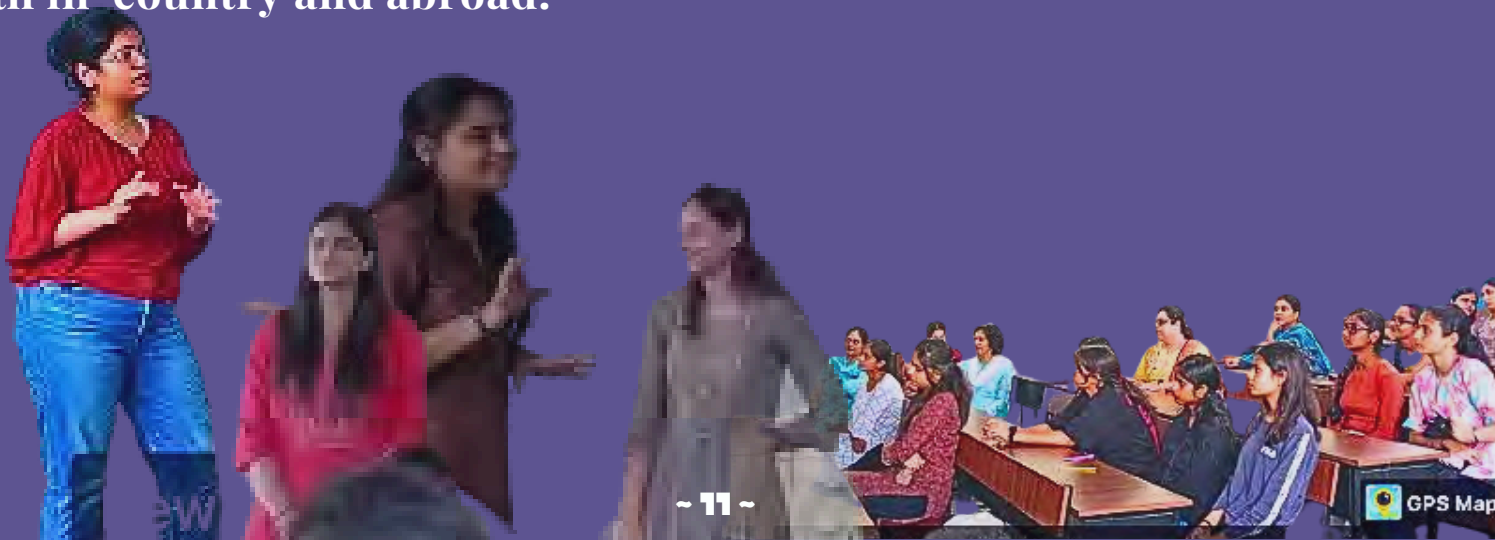
Annually organized on 30th September marking Savita Datta's birth anniversary, this event commences with a dignified lamp lighting ceremony by the respected Principal and a guest speaker. Students gain insights into the remarkable life of Savita Datta, as throughout her life she encouraged students to follow their dreams and looked out for them at a personal level.



Alumni Meet

BRIDGING HISTORY WITH PRESENT

Throughout the year, esteemed alumni deliver enlightening lectures covering their ongoing research topics. These sessions provide students with the opportunity to interact with accomplished seniors, hear inspiring stories, and receive guidance regarding further studies both in-country and abroad.



Eco Club

SHIFTING THE PERSPECTIVE

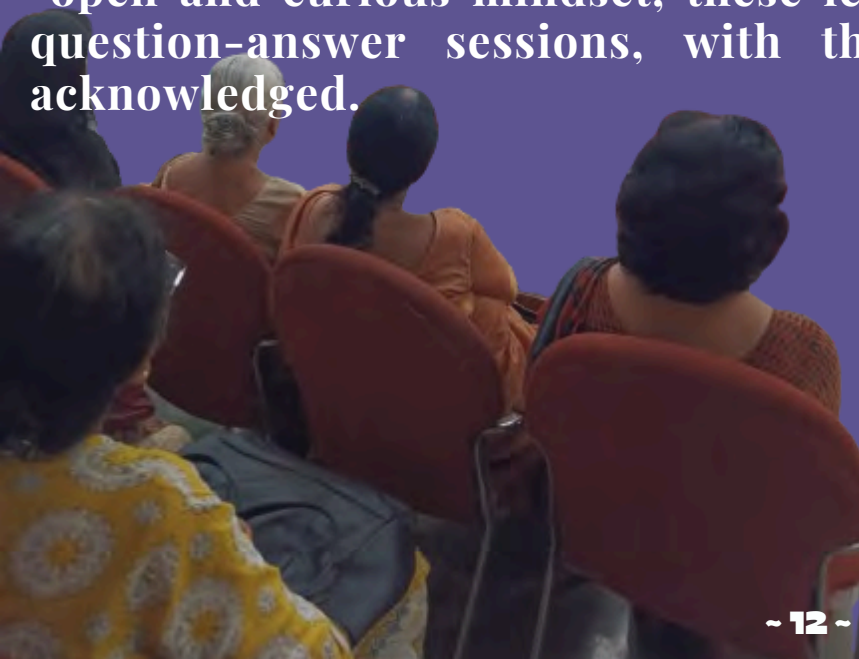
A collaborative effort by the physics, zoology, botany, and chemistry departments, the Eco-Club aims to raise ecological and environmental awareness among college students. Led by the passionate first-year batch of the physics department in 2023, the club organised engaging activities and initiatives to address pressing ecological issues.



Lectures

ROUSING TALKS

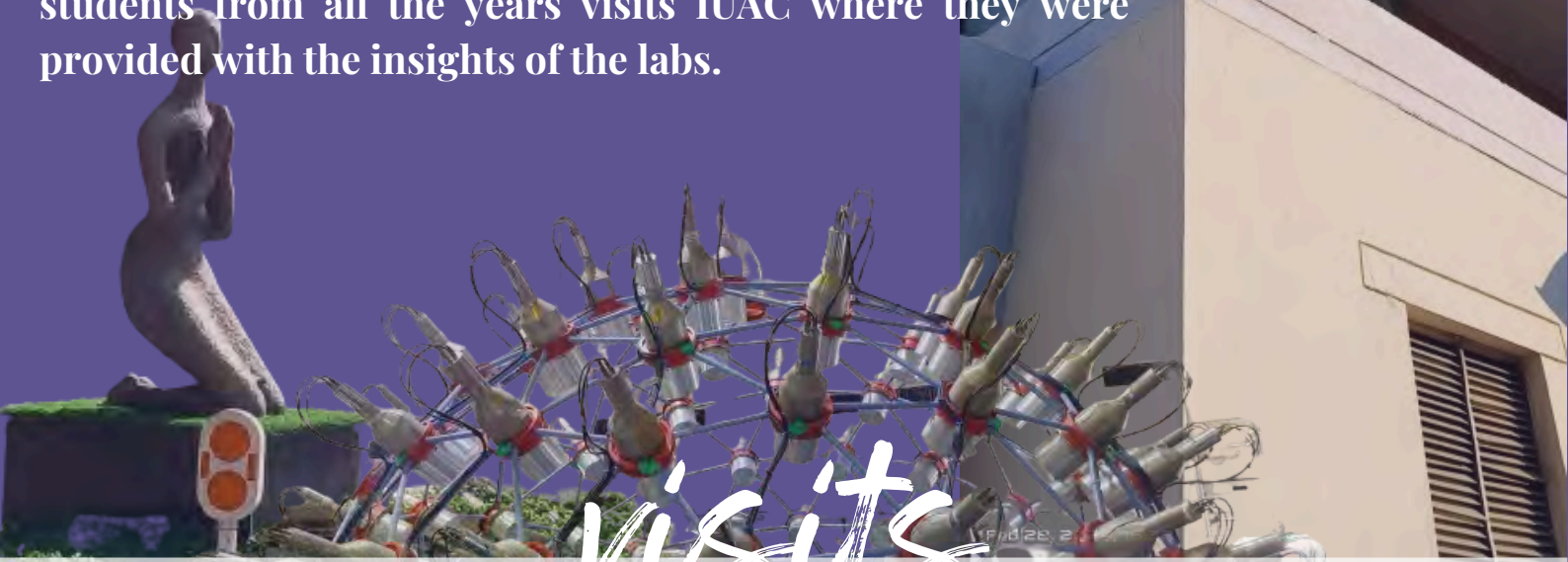
Enriching lectures by guest speakers encompass a wide range of academic and non-academic subjects, including entrance exam coaching, career prospects in UPSC, and more. Encouraging an open and curious mindset, these lectures culminate in interactive question-answer sessions, with the best question often being acknowledged.



IUAC

INTER UNIVERSITY ACCELARATOR CENTRE

To keep students abreast of ongoing research, the department arranges regular visits to esteemed educational institutions, industrial complexes, and academic laboratories. On the occasion of National Science Day students from all the years visits IUAC where they were provided with the insights of the labs.

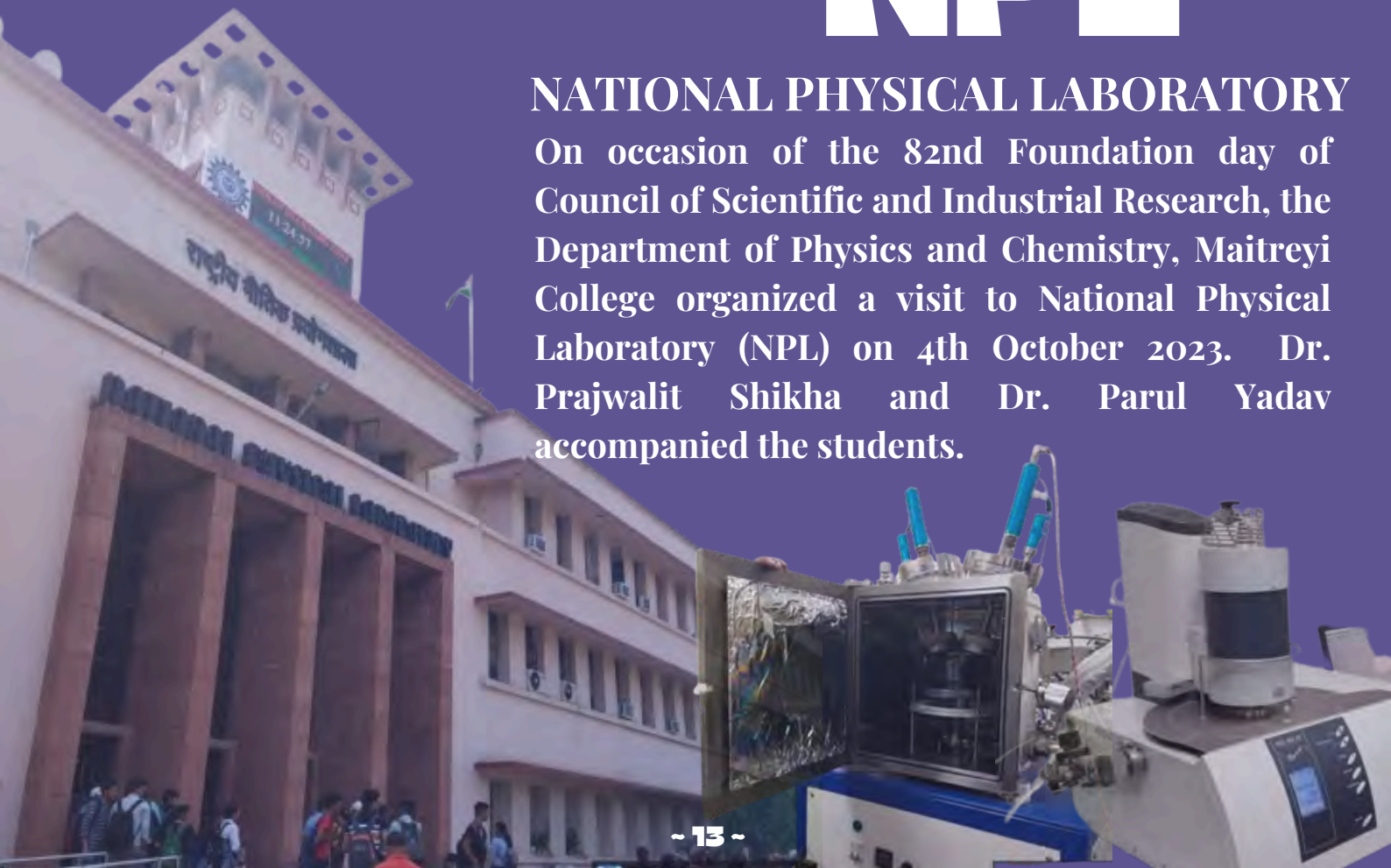


visits

NPL

NATIONAL PHYSICAL LABORATORY

On occasion of the 82nd Foundation day of Council of Scientific and Industrial Research, the Department of Physics and Chemistry, Maitreyi College organized a visit to National Physical Laboratory (NPL) on 4th October 2023. Dr. Prajwalit Shikha and Dr. Parul Yadav accompanied the students.



Hands-on fun

PCB Designing & Fabrication

The Physics department's newly introduced PCB Designing and Fabrication course has quickly become a valuable addition to the curriculum. This Skill Enhancement Course aims to provide students with hands-on experience in circuitry, technical development, and efficient software design, equipping them with the necessary skills to excel in the field of electronics.

The overwhelmingly positive response from students, who even encourage their peers to enroll, highlights the course's significance in terms of career prospects and overall understanding of electric circuits. With its blend of theoretical knowledge and hands-on experiences, the PCB Designing and Fabrication course has proven to be an invaluable asset for the Physics department, empowering students with the essential skills and knowledge required to thrive in the dynamic field of electronics.

Let's have Fun for a while!!

Across

[1] I am the Biggest Asteroid

[4] During the period between 1979 and 1998,

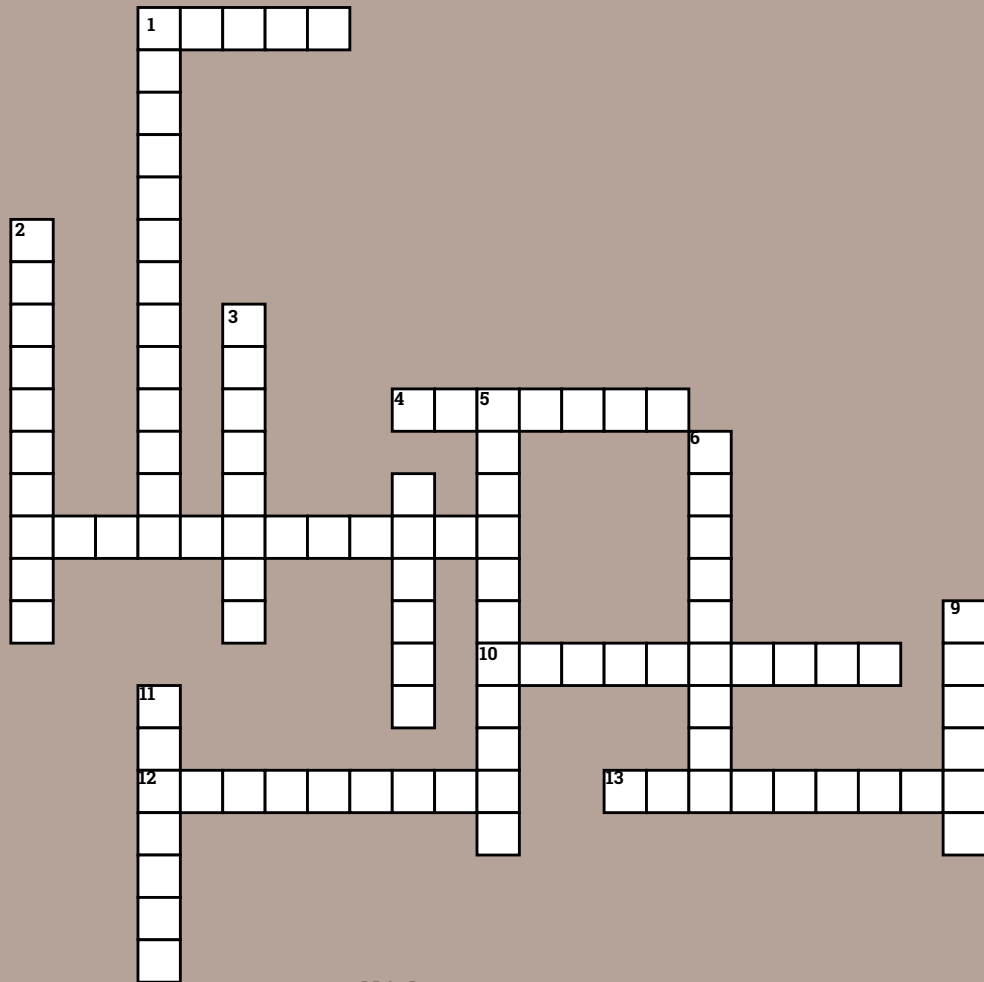
what is the farthest planet from the Sun?

[8] The region between the orbits of Mars and Jupiter

[10] A huge reddish loop erupting from the sun's surface **8**

[12] A contracting cloud of gas and dust with enough mass to form a star

[13] An object whose gravity is so strong that nothing, not even light can escape



Down

[1] What gas is the main component of the atmosphere of Mars?

[2] An eruption of gas from the sun's surface when two sunspots collide

[3] A dark area on the sun's surface that is cooler than the surrounding areas

[5] A star's outer shell from which light is radiated

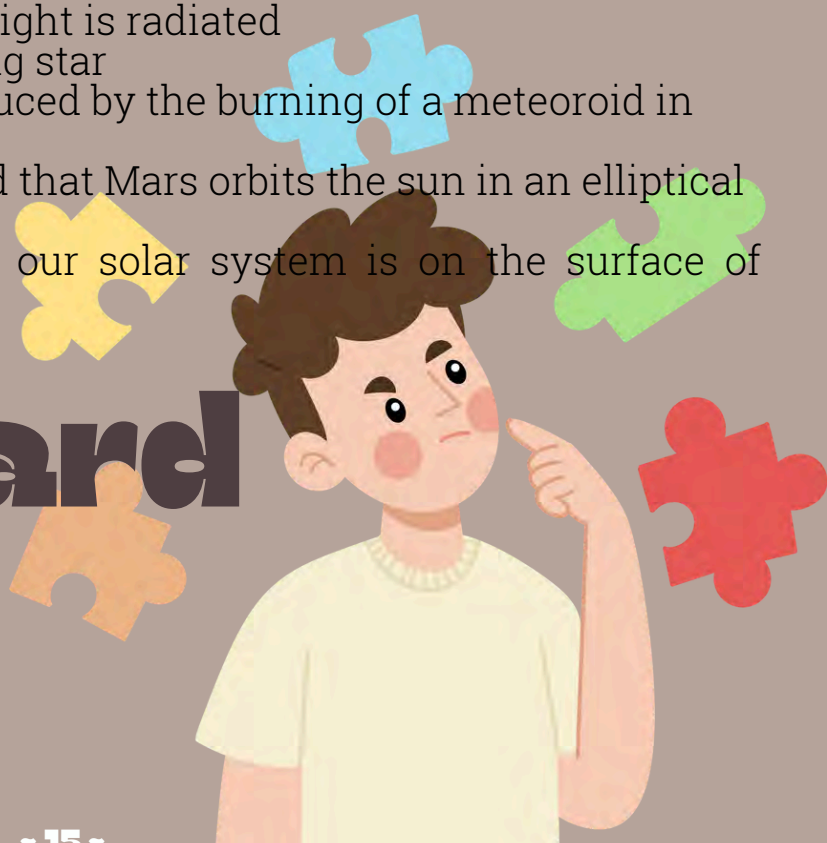
[6] The Brilliant explosion of a dying star

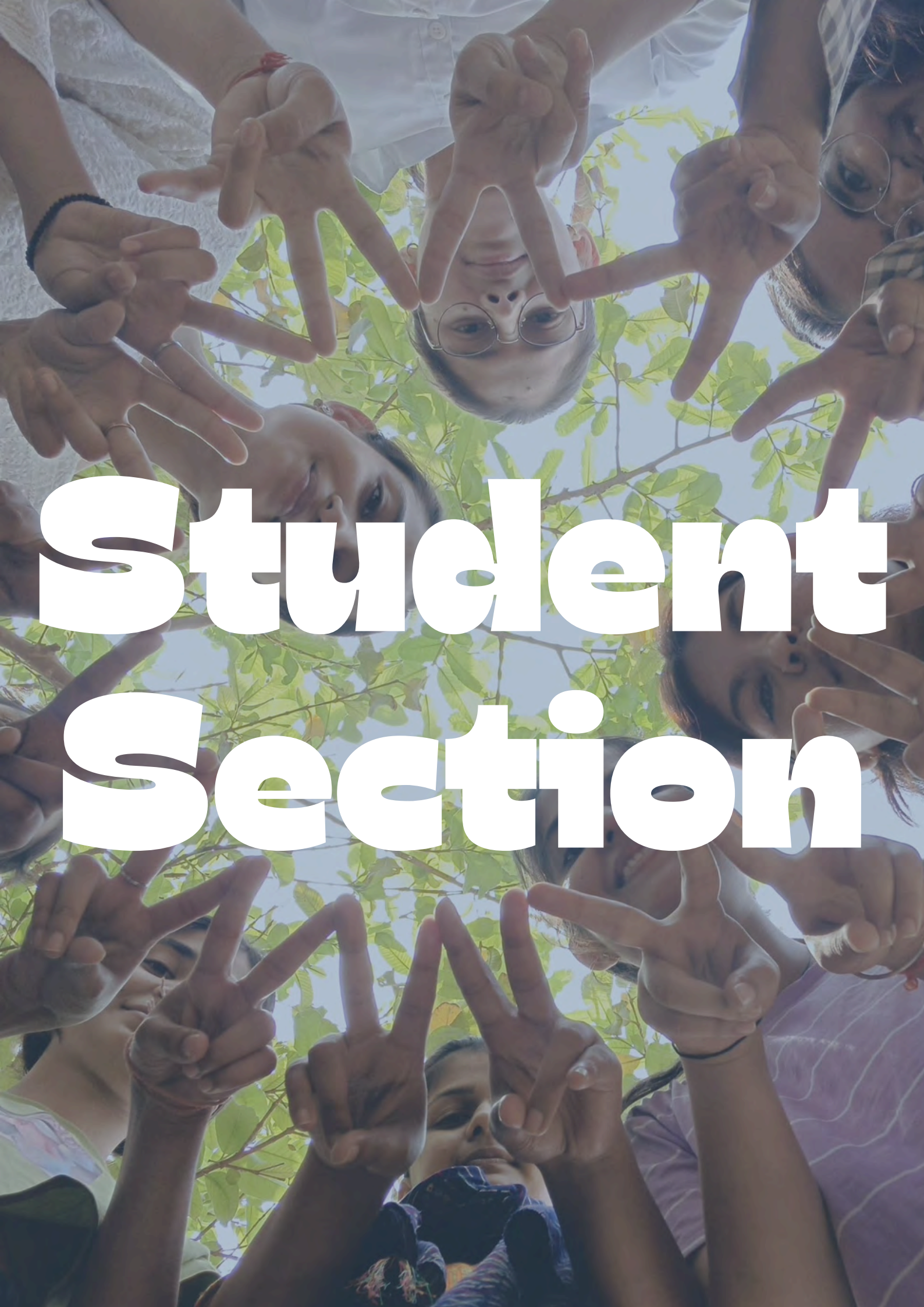
[7] A streak of light in the sky produced by the burning of a meteoroid in Earth's atmosphere

[9] The astronomer who discovered that Mars orbits the sun in an elliptical orbit

[11] The largest circular storm in our solar system is on the surface of which planet?

Crossward Puzzle





Student Section



Appolonia's Star

Annanya
1st year
B.Sc. (Hons)
Physics

She is a part of Appolonia, the Western Music Society of Maitreyi College. She performed at Sri Venkateshwara College, SRCC, St. Stephen's and LSR College. She also performed during Rhapsody, 2024.



Trenchant's Celeb

Draksha
1st year
B.Sc. (Hons)
Physics

She is part of Trenchant, the English Debating Society of Maitreyi College. She won 1st position in Jaypee Institute of IT competition: JOUST-Penned on 5th Nov'23 and she got Special Mention as International Press (Journalist) in Dyal Singh Model United Nations held from 10th to 11th February, 2024.

An Aptitude

She is actively serving as a dedicated volunteer and is a valued member of the NSS wing of Maitreyi College as a part of Social media core team . She selflessly served "The Blind Relief Association" of Delhi, making a meaningful impact on the lives of individuals in need. She volunteered in the National Workshop on "Spreading Awareness on Emerging Challenges of Air Pollution and Climate Change on Human Health in Urban Ecosystem". She also dedicated her time to the "Swachh Bharat Mission" and the prestigious "Purple Fest" held at Rashtrapati Bhavan, organized by Smt. Draupadi Murmu and was felicitated by the esteemed Cure India team

Tripti
2nd year
B.Sc. (Hons)
Physics

As an enthusiastic volunteer for NSS 2023-2024, she played a pivotal role in community service. Notably, she held a key position in the Creative and Organizing team. Rukshar's thirst for knowledge led her to engage in enlightening sessions such as "Employability Skills in the Post-Pandemic Era and the Future of Work" and the Alumna Lecture on "Quantum Information and Applications with Paul Traps." Rukshar's philanthropic spirit shone through participation in initiatives like #WalkWithNiley, health check-up camps, and the "Purple Fest" at Rashtrapati Bhawan. She was a Member of financial team of Scintillation in 2022-2023 and Sub-head of HR-PR/financial team of Scintillation in 2023-2024.

Rukshar
2nd year
B.Sc. (Hons)
Physics

Forgiving

Oratory Genius

Her passion for debating shines through her time with Trenchant, the English debating society of Maitreyi College. She was part of the Parliamentary debating wing, she excelled in various competitions, bringing laurels to the college. She was the Semifinalist at Kirorimal College Fresher's British Parliamentary Debate - Broke 7th on tabs. She further showcased her skills by reaching to the octo-finals at BITS Pilani-QED-Asian Parliamentary debate. Additionally, Kumud received a Special Mention 1 at the Y20-Maitreyi Chapter event. Debating has been a lifelong passion for Kumud, and Trenchant provided her the perfect platform to hone her skills. She highly recommends her juniors to join Trenchant, as it offers valuable experiences beyond their science backgrounds. She was a part of fellowship program by Blue Planet Environmental Solutions.



Kumud Tanwar
3rd year
B.Sc. (Hons)
Physics

Pacesetters



She leads the Physics Department the President. In the quiz held at IUAC to celebrate National Science Day, she was amongst the top 10 scorers.

Yuvika Thakur
3rd year
B.Sc.(Hons)
Physics

She attended the Asian Winter School 2023 organized by Sokendai University of Japan. Currently, she is the General Secretary of the Physics Department. In the National Science Day quiz held at IUAC, she was among the top 5 scorers

Aliya
2nd year
B.Sc. (Hons)
Physics



Team Player

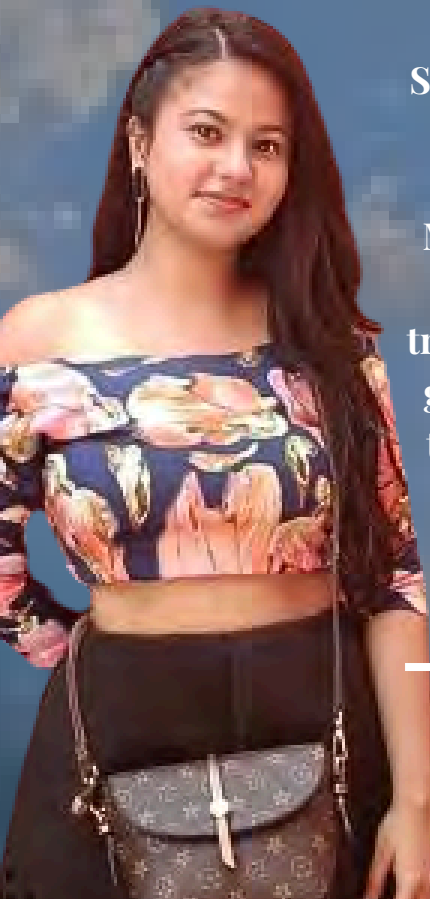
Over the course of two years, she actively participated in various sports like kho-kho, football, athletics, tug-of-war, volleyball, powerlifting, softball, and hockey. In football, her team secured 3rd place in the Sports Fest organized by JMC College in April 2023 and 4th place in the Inter-College Football tournament of Delhi University. She also had the opportunity to participate in football training sessions organized by sports department in collaboration with the French Embassy and the German Embassy.



In athletics, she represented Maitreyi college in the Inter-College Athletics tournament in the 800 m and long jump events. Additionally, she contributed as a member of the college's hockey team in the Inter-College Hockey Tournament. Jaeu's passion for sports has not only shaped her personality but also instilled values of respect, sportsmanship, and teamwork. She strongly encourage her juniors to prioritize their physical well-being by dedicating at least 30 minutes to sports and physical activity.

Jaeu Mishr
3rd year
B.Sc.(Hons) Physics

Trailblazers



She had started a two months internship in Med Tour Easy. Currently her training period is going on and in the next month she will be joining their project.

Nimisha
2nd year
B.Sc.(Hons)
Physics

She won the Meritorious Award during her first year and she is the Treasurer of Physics Department Society for 2023-24.

Reetika
2nd year
B.Sc. (Hons)
Physics



Her academic brilliance shines through her attendance in the Asian Winter School at Sokendai University in Japan as well as the coveted Giambani summer school on cosmology. Her research prowess is evidenced by her participation in SIP and impactful presentations at prestigious conferences, including Equinox 2023, where she was recognized for the best question.

Her work on "Soil Resistivity Testing and its Greenfield Applications" has been published in renowned journals like Vantage and IJNRD. Her dedication to making a difference extends beyond the classroom, as she has volunteered various departmental events. Her exceptional achievements have earned her a Meritorious award from the University of Delhi.

Neelakshi Lakra
2nd year
B.Sc. (Hons)
Physics

Multifaceted

Her intellectual prowess shines through her attendance in the Asian Winter School at Sokendai University in Japan. She participated in the SIP at Maitreyi College and she presented her work at the International Conference Equinox 2023 and the Interdisciplinary Conference Avlokan 2023, where she delved into the intricacies of "Soil Resistivity Testing and Green Field Applications."

Her work has been published in renowned journals like Vantage and IJNRD. Her leadership qualities are equally impressive, as she has volunteered for various events. She got first prize in the Essay Writing Competition at Avgaahan, Maitreyi College's Interdisciplinary academic fest.

Karina
2nd year
B.Sc. (Hons)
Physics

SUMMER INTERNSHIP PROJECTS



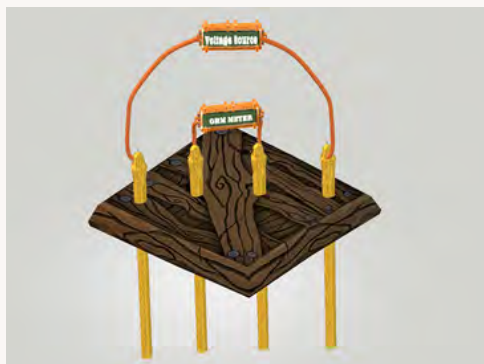
The Centre of Research (CFR), Maitreyi College, established in 2019, is committed to indulging the enthusiasm for research among our faculty and students. CFR undertakes two types of activities - viz. the Summer Internship Program (SIP) and Annual Research Project (ARP). SIP is carried out in the months of May-July every year, wherein students, under the guidance of teachers, carry out two-month long projects in college.

Soil Resistivity Testing for Green Field Applications

Students: [B.Sc. (Hons) Physics, 2nd year]

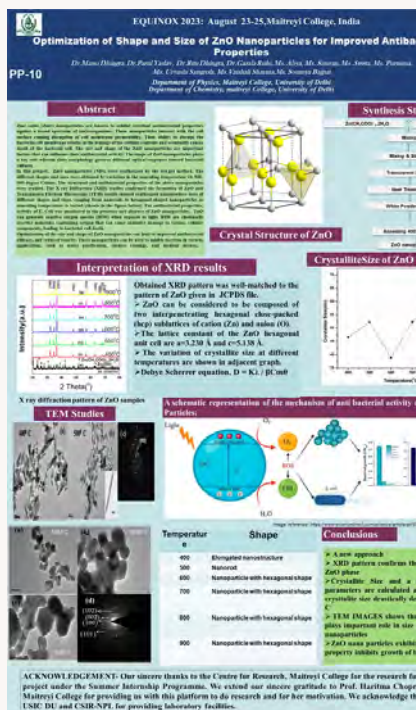
- Neelakshi Lakra • Kashish Mishra
- Karina • Saniya

Mentors: Dr. Poonam Juneja
Dr. Prajwalit Shikha



Their project aimed to study different soil samples using the Wenner method and to deduce the geophysical properties of these soil samples. And to finally design a better soil resistivity measuring kit, which is economical and available easily. Such kits can be further used for Greenfield applications.

They presented their project at the annual international conference Equinox, 2023 & at Avlokan, 2023.



Optimization of Shape & Size of ZnO Nanoparticles for improved Antibacterial Properties

Students: [B.Sc(Hons.) Physics,3rd year]

- Vaishali Sharma
- Urvashi Sangrola
- Purnima
- Shweta Singh
- Aditi Pandey [B.Sc(Hons.) Physics, 2nd Year]
- Simran

Mentor: Dr Parul Yadav. Dr Ritu Dhingra
Dr Mansi Dhingra Dr Gazala

The method adopted was to prepare ZnO nanoparticles by Sol gel method. These were then heated to different temperatures 400–900°C to get ZnO at different temperatures. XRD and electron microscopy was done to study the properties and structure of the nanoparticles. They presented their work at the International Conference Equinox, 2023 and the Interdisciplinary Conference Avlokan, 2023.

Enviro-Safe: Exploring the role of Naturally Combined Materials in the Treatment of Laboratory Generated Waste

Students: [B.Sc. (Hons) Physics, 2nd year]

- Jeau Mishr
- Amanjot
- Dipti

Mentor: Dr Ritu Dhingra.

The project involved creating containers equipped with pH sensors for the treatment of Acidic and Basic wastes generated in the student laboratories during the summer months of June–July. They presented their work at the International Conference Equinox, 2023.



Thin film as an electrical transducer for an Arduino based electrochemical sensor

Students:

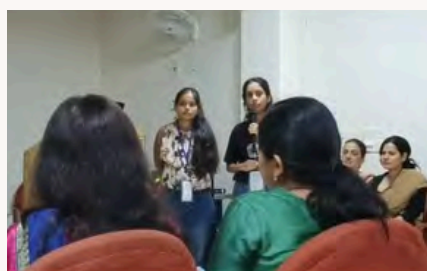
- Vaishali Bagauli, 3rd Year BSc (hons) Physics
- Sharanya Renjit, 3rd Year BSc (hons) Physics
- Pranshi Mathur, 3rd Year BSc (hons) Physics
- Ria Goel, 3rd Year BSc (hons) Physics
- Bhavna, 3rd Year BSc (hons) Physics
- Soumya Bajpai, 2nd Year BSc (hons) Physics

Mentor: Dr Parul Yadav

Dr. Shalini Lumb Talwar

Dr.Mansi Dhingra

The project involved developing a cost efficient, Arduino-based fully automated electrochemical sensor using thin film of polypyrrole as an electrical transducer. Polypyrrole can also be replaced by any conducting polymer for the sensor to work.



Investigation of Structural and Optical properties of Solution grown 4-nitrobenzaldehyde Single Crystal

Students: [B.Sc. (Hons) Physics, 2nd year]

- Pranjal Nayak
- Bhawna Jangid
- Renuka

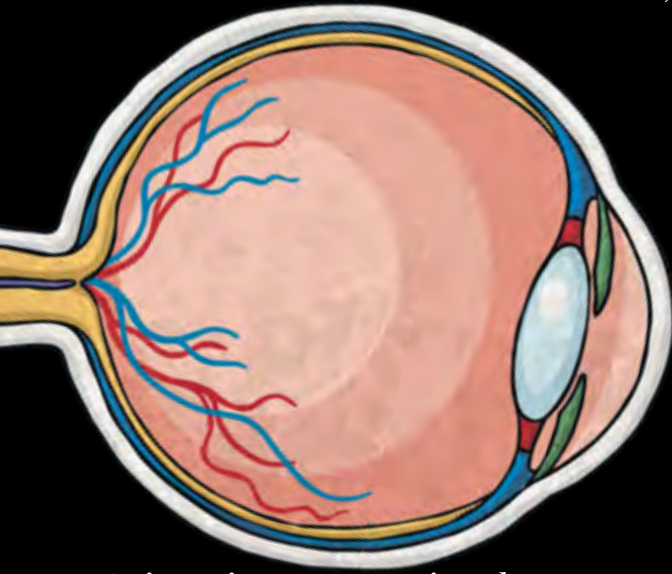
Mentor: Dr Sumit

The study summarized that Organic materials are more economical and environment friendly than inorganic materials which makes them beneficial for fabricating optical devices. o 4-nitrobenzaldehyde (4-NB) single crystals which are direct band gap material with 75% transparency was grown by slow evaporation method.



SOME COLOURS DO NOT EXIST

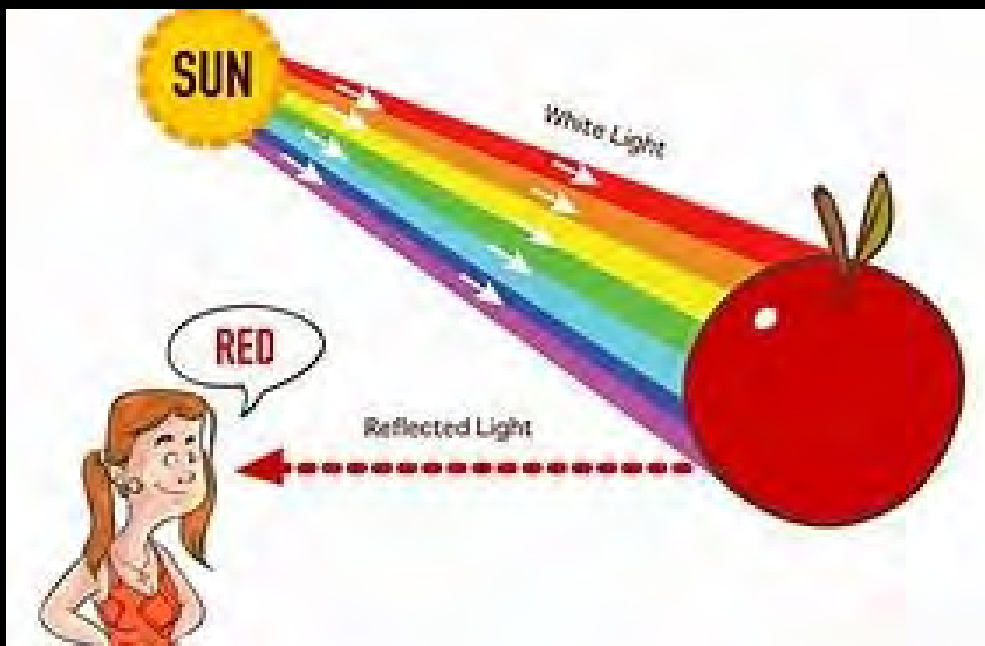
-Neelakshi Lakra, B.Sc. (Hons) Physics, 2nd year



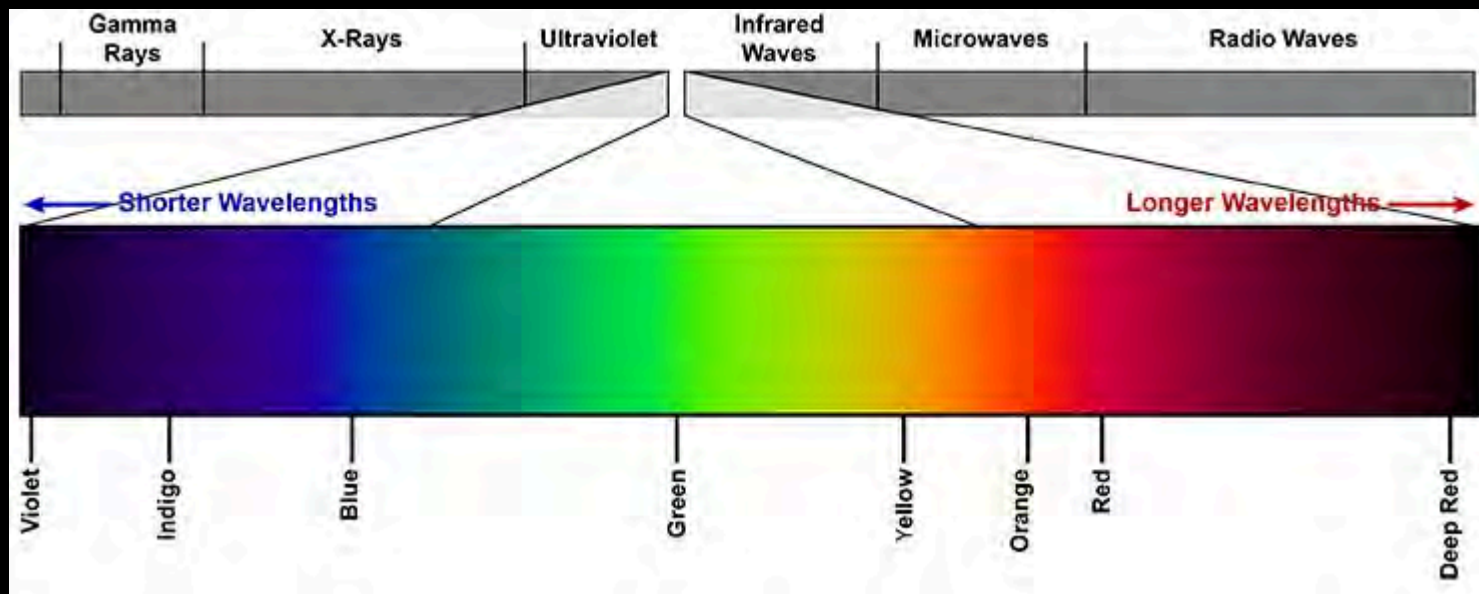
Our brain is a clever master of perception, constantly processing a multitude of photons that hit our retina. Under normal conditions, around 8 photons per second, make their way to our eyes. However, our brain doesn't individually analyze each photon; instead, it cleverly averages them out. It groups together photons that arrive from the same direction, with a similar pattern and purpose. This fascinating process allows us to perceive colors in a blended and coherent manner.

Let's imagine a scenario where two photons simultaneously reach our eyes. One photon has a wavelength of 500 nanometers, appearing blue, while the other has a wavelength of 600 nanometers, giving off a red hue. Rather than seeing a mishmash of colors, our brain performs its magic and averages them out. The result? We perceive the blended color as yellow, even though no individual photon had a wavelength of 550 nanometers. In this peculiar sense, we can consider a blend of green and red as yellow. If the blend leans more towards red, our brain might label it as orange.

Now, let's venture into the intriguing realm of blending blue and red light. What happens when we try to find the average or midpoint between these two colors? Surprisingly, the answer is green. Yet, our planet is abundant with green hues, and our brain has evolved to pay special attention to anything that deviates from this prevalent color.



Magenta—a color that doesn't exist as a single wavelength in the visible spectrum but captures our attention with its vibrant and distinct appearance. Our brain creates magenta as a perceptual bridge between the colors red and violet, which reside at opposite ends of the spectrum. Red and violet have vastly different wavelengths, making it impossible for them to coexist in a singular form. However, when we combine equal intensities of red and violet light, our brain conjures up the illusion of magenta. It is a clever trick our brain plays to assist us in interpreting the world around us. While magenta may not be a "real" color in the strictest sense, it represents one of the many ways our brain processes mixed wavelengths to aid our survival instincts.



Moving on to yellow, here's where things get even more fascinating. Did you know that we can't actually see the color yellow? Our brain, in all its imaginative glory, constructs the perception of yellow when our red and green color sensitive cones are equally stimulated. It's a beautiful illusion created by our brain to fill in the gaps and make sense of the world. While we have receptors that can detect the physical wavelength of yellow light, our brain doesn't truly know what yellow looks like. Interestingly, some animals possess the ability to perceive yellow. For instance, goldfish have a yellow cone in their eyes, enabling them to see the color yellow as it truly exists. If we could communicate with these creatures, they would offer us invaluable insights into the true nature of yellow.

So next time you marvel at the rich tapestry of colors, remember that your brain is the ultimate artist, skillfully crafting a vivid and coherent picture of the world, even when faced with the complexities of blending and averaging different hues. Colors are not always what they seem. They are a dance between the physical world and our brain's interpretation, adding a touch of wonder and intrigue to our perception of reality.

References:

1. Wikipedia - Impossible Color

Photos of planets – then v/s now

-Neelakshi Lakra, B.Sc. (Hons) Physics, 2nd year

In more than a century of space photography, humanity has advanced significantly. The only images we had access to back then were blurry ones of planets, with almost nothing to see. Now, space telescopes such as James Webb, gives us high-resolution pictures of planets that are colorful and detailed. If you're looking for some "then vs. now" content, check out these amazing planet shots and contrast the older ones with the more recent ones.

In the early days, astronomers used telescopes equipped with lenses to observe and study celestial objects, including planets. With the help of these telescopes, astronomers were able to peer into the night sky and observe the planets. They would carefully position their telescopes, adjust the focus, and capture the planetary images by employing various techniques such as sketching or using photographic plates.



Mercury



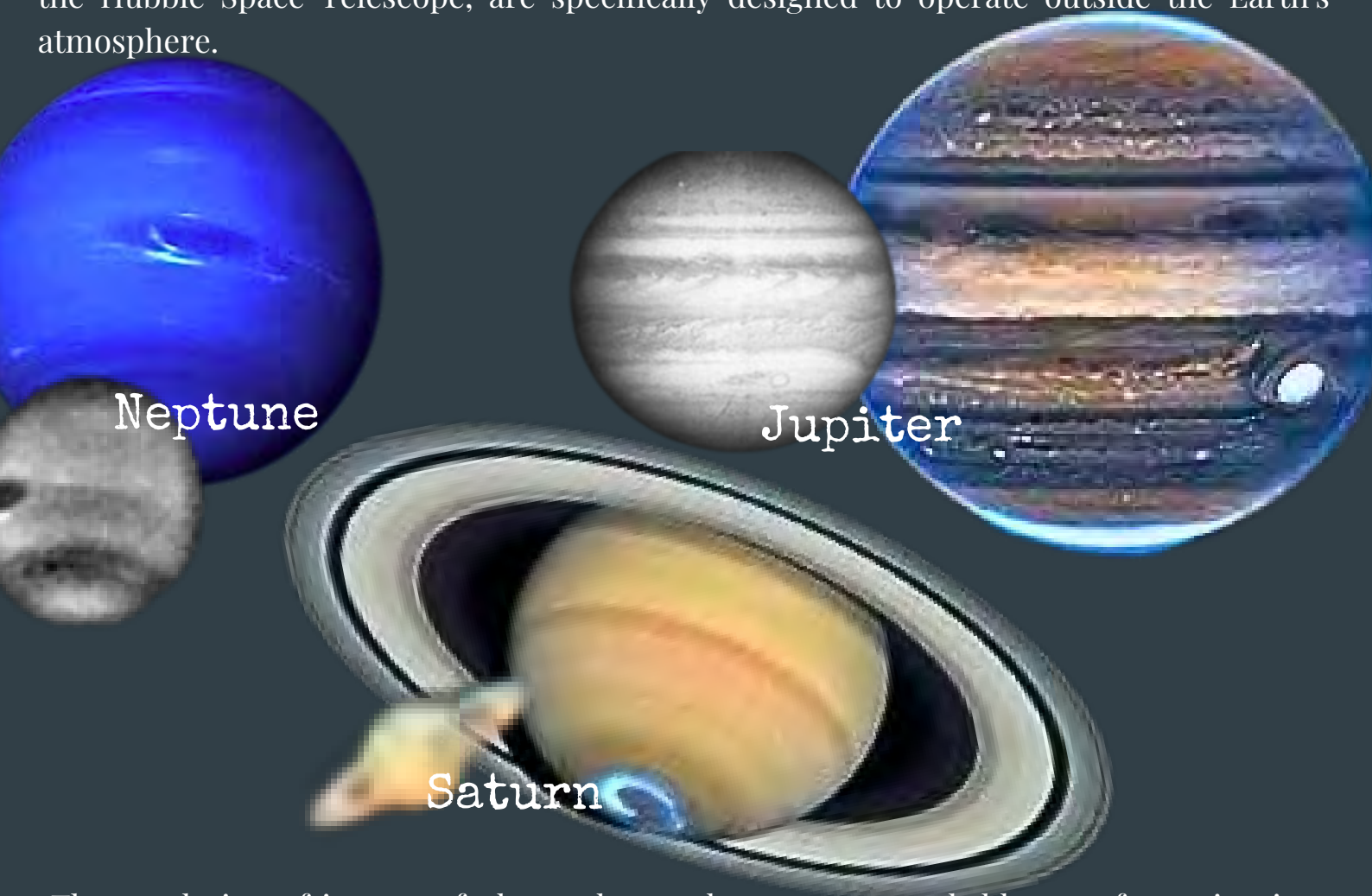
Mars

In the present era, capturing images of planets has evolved significantly. Today, we rely on space telescopes and sophisticated imaging equipment to capture stunning and detailed images of planets. They are equipped with powerful lenses and detectors that can capture light from distant celestial objects without being affected by atmospheric interference. These telescopes are launched into space and positioned in orbits that provide optimal viewing conditions for capturing high-resolution images of planets and other astronomical phenomena.



Earth

The key differences between the historical method and the current method of capturing planet images lie in the technology and the capabilities available. In the past, astronomers relied on ground-based telescopes with lenses to observe and capture images of planets. These telescopes were limited by the Earth's atmosphere, which can introduce distortions, blurring, and other visual artifacts that affect the quality and resolution of the images. On the other hand, modern methods utilize space telescopes that are free from the constraints of Earth's atmosphere. They are equipped with advanced optics, detectors, and image processing capabilities that enable the production of high resolution images of planets and other celestial objects. Space telescopes, such as the Hubble Space Telescope, are specifically designed to operate outside the Earth's atmosphere.



The resolution of images of planets has undergone a remarkable transformation in a relatively short period. By positioning telescopes above the Earth's atmosphere, space based observatories can overcome the limitations imposed by atmospheric interference. As a result, the resolution of planet images improved dramatically, offering unprecedented levels of detail and clarity. Furthermore, advancements in imaging technology, such as the development of more sensitive detectors and sophisticated image processing techniques, have contributed to further enhancements in resolution. These advancements allow for the extraction of finer details and subtle features from the captured images, enabling scientists and astronomers to gain deeper insights into the composition, structure, and dynamics of planets.

Reference:

1. Starwalk.space - Photos of Planets: Then and Now [Infographic]

Lise Meitner : The Forgotten Atomic Pioneer

~ By Lakshita Dahiya, B.Sc. (Hons) Physics 2nd Year

Vienna's undiscovered genius

Lise Meitner was an Austrian-Swedish physicist who was born on November 7, 1878 in Vienna. She received her doctorate in 1906 and then in 1907, she moved to Berlin to study with physicist Max Planck and chemist Otto Hahn.

The discovery of Protactinium 231

She worked with Hahn for 30 years in Berlin where they each led a section in Kaiser Wilhelm Institute for Chemistry. Meitner and Hahn collaborated for their work in radioactivity combining their knowledge in Physics and Chemistry respectively. In 1918, they discovered the most stable isotope of the radioactive element 91, Protactinium [Pa]-231. The name means 'precursor of Actinium', since Actinium is obtained from the decay of Protactinium.

Her work on Nuclear Fission

Chemist Ida Noddack published a paper pointing out that the elements produced could be lighter than Uranium. Hahn and Meitner, along with chemist Fritz Strassman, followed up Fermi's experiments but they halted them since she had to flee Germany in 1938.

During the same year in December, Strassman and Hahn continued their work with bombarding Uranium atoms with neutrons and found isotopes of Barium among the decay products. They were unable to explain it since it was believed that the nucleus could not conceivably split in two to form much lighter elements due to the small amount of neutron. Hahn sent Meitner a letter describing the unexpected results and understand the physical reasons behind it. She shared the letter with physicist Otto Frisch, her nephew who visited her during Christmas.

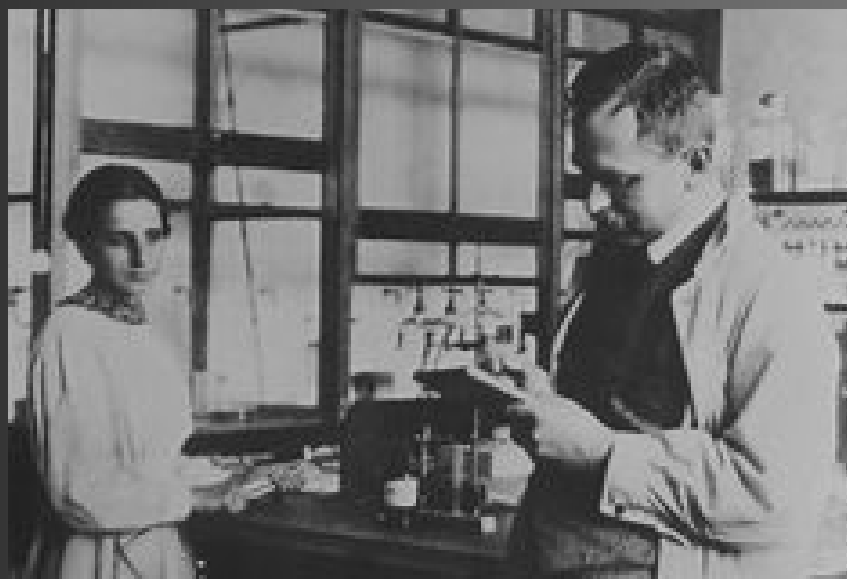
They did some calculations and Meitner suggested that they view the nucleus like a liquid drop. Frisch visualized the idea that after being struck by neutrons, the nucleus might get elongated and pinched and finally split into two separate nuclei, just as a liquid drop would! After the split, the two nuclei would be driven apart due to their mutual electric repulsion, which is about 200 MeV.



After Christmas, Frisch left Sweden and they remained in contact through telephones. Having made the initial breakthrough, Frisch talked briefly with Bohr who then carried the news of discovery of fission to America. This news was met with immediate interest in America and following this Meitner and Frisch published their findings and sent their paper to 'Nature' in January. Dr. Meitner was the first to describe this process as 'nuclear fission' after learning the term 'Binary fission' was used by biologists to describe the division of cell nuclei.

Meanwhile, Hahn and Strassman published a separate paper and did not even mention Meitner's role in this discovery. Scientists realized that if fission reaction emitted enough secondary neutrons, it might cause a chain reaction releasing enormous amounts of energy. This led to the Manhattan Project where many scientists including Frisch worked on the atomic bomb, but Meitner wanted nothing to do with it and refused to work for the development of the atomic bomb since she was deeply saddened that her findings led to such a destructive output. She continued her research on nuclear reactions and helped develop the first nuclear reactor in Sweden.

In 1944, Otto Hahn was awarded the Nobel Prize in Chemistry for his research into fission, but Meitner's work was completely overlooked by the Nobel Prize committee. This 'mistake' was never acknowledged and in 1966, Meitner, along with Hahn and Strassman, was awarded the Enrico Fermi Award.



Lise Meitner and Otto Hahn in Berlin, 1913.

Having experienced many struggles due to her gender alone, she actively supported women's education and their career in science. Many consider Meitner as the 'most significant woman of the 20th century'. Meitner is one among many women who are said to have failed to receive their due credit for their outstanding contributions in science. To word it better, this failure isn't of these women but of the worldwide scientific committees and scientists who discredited their efforts for decades.



I will have nothing to do with a bomb! [Response to being invited (1943) to work with Otto Robert Frisch and some British scientists at Los Alamos during the Manhattan Project to create the atomic bomb.]

— Lise Meitner —

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Maharishi Kanad

The Propounder of the Atomic Theory & Vaisheshika Darshana

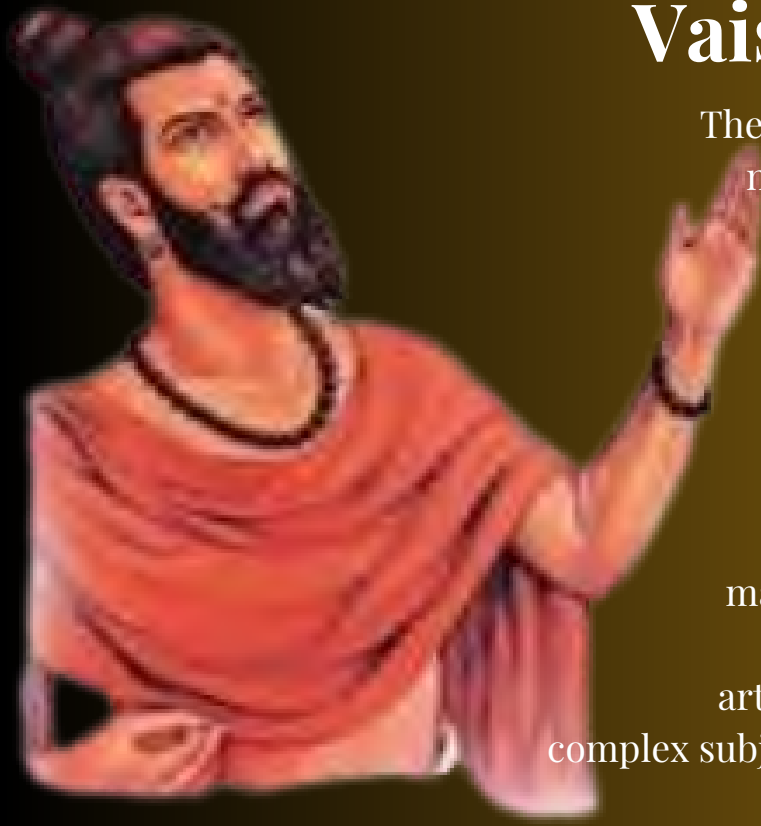
~ By Kashish Mishra, B.Sc.(Hons) Physics, 2nd Year

Kashyap Rishi was born between 600 BCE and 200 BCE (unclear) in Prabhas Kshetra near Dwaraka in Gujarat. He was an ancient Indian scientist, philosopher and physicist. As a child, he was a keen observer and was always fascinated by the smallest things around him. His father was also a great philosopher, who along with Kashyap used to observe nature. He was also famously known as Maharishi Kanada. It is said that he ate Sama rice during his meditation that made his name 'Kanad'. The word 'Kanad' means 'atom eater' as 'Kan (कण)' in Sanskrit means 'the smallest particle'. Also, he was the originator of the particle-molecule theory and hence called Kanad. Once Kashyap Rishi was on a pilgrimage to Prayag when he saw thousands of pilgrims scattering rice grains and flowers in the streets which they offered at the temple. Rishi Kashyap started gathering up the rice grains. People around him were curious about his behavior and investigated him. To this he replied that each single grain in itself may seem worthless, but a collection of hundred grains make up a person's meal, the collection of many meals would feed an entire family and ultimately the entire mankind, thus even a single grain of rice is important.

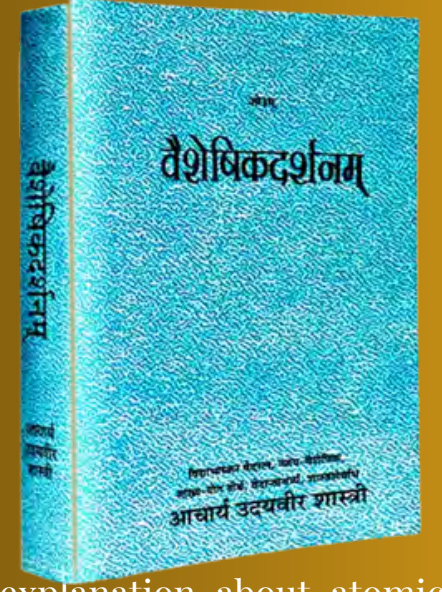
This incident shows his interest of looking deep and beyond, which is highly fascinating. The major work of Maharishi Kanad is *Vaiśeṣika Sūtra*. The *Vaiśeṣika Sūtra* also known as Kanada sutra, which is one of the six philosophies of ancient Vedic India. The *Vaiśeṣika Sūtra*, just like other five aasthika philosophers take vedas as the primary source of knowledge.

Vaiśeṣika Darshan

The aim of *Vaiśeṣika Darshan* is to understand the nature, cosmos and aatma with self-experiment and to pursue our aims of human life, *manav purusartha* namely Dharm (righteousness), Artha (prosperity), Kama (pleasure) and Moksha (liberation). These six philosophies (Nyaya, Vaisheshika, Samkhya, Yoga, ĩmāmsā and Vedanta) are the foundation pillars for wisdom of India for many ages. The *Vaiśeṣika Darshan* was written in sutra format. Sutra is basically a aphoristic articulation technique in Sanskrit, used to express complex subject in shortest format.



The *Vaiśeṣika Darshan* contains 373 Sutras divided into ten chapters where each chapter is divided into two parts. According to Maharishi Kanad the whole universe can be described in six padharadha. He named the six padharadha as Dravya (substance), Guna Attributes/qualities), Karma (actions/motion), Samanya (generality/universal) and Samavaya (inherence). Further, he categorized and gave the definition of Dravya into nine parts (Pruthvi, Apas, Tejas, Vayu, Aakasha, Kaal, Dikh, Atma and Manas). To perceive Dravya (nature) we need 17 types of Guna or attributes. When we come in contact with nature (perceive) though Guna we have to perform certain karmas. In *Vaiśeṣika* these karmas are defined as five (Utkshepana, Avakshepana, Akunchana, Prasarana and Gamana).



While explaining about Dravya, Maharishi gave a detailed explanation about atomic theory, on the other hand he explained about gravitational force and laws of motion while explaining the Karna. He talked about the atom for the very first time in chapter four (comprising 25 sutras) after talking about Satya (the ultimate truth) and Nithya (eternal). Maharishi defined the atom as the fundamental existence of this nature, universal and eternal in sutra 4.1.1 and 4.1.2 . Also he described the structure of the atom in the seventh chapter of *Vaiśeṣika Darshan*. He argued that it is a spherical form (Sutra-7.1.20). The *Vaiśeṣika* sutras not only talk about what exists but also something which doesn't (the concept of non-existence) .

Apart from all these Maharishi guided mankind towards the ultimate goal by explaining the concept Dana (donation) and prathigraha (receiving). Also he laid stress on the transcendental nature of sukha (pleasure) and dukha (pain/sorrow) and one need not to bother with them and search for the ultimate truth through self-realization and introspection. As a result, renowned thinkers and saints like Sage Kanad were able to travel in parallel on the paths of spirituality and philosophy. From the above discussion, it is clear that India is the land of pure consciousness, whose scholars always stand out of the rest of the world with their wisdom, knowledge and passion for learning and teaching. Vaiśeṣika sutras hold the oldest record for atomic theory (of course, Vedas contain this knowledge before Vaiśeṣika as Maharishi himself mentioned Vedas as the proof in the last sutra). Maharishi gave the message of living a life of introspection and finding the ultimate truth which is a great message for every youth.

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SCAVENGER HUNT



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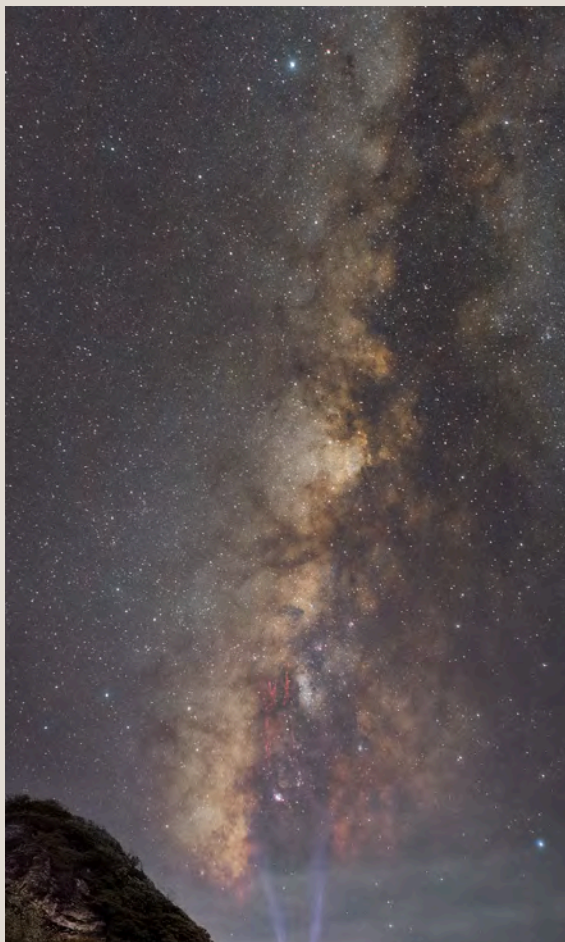
Jigsaw Puzzle

This Jigsaw Puzzle celebrates a very important accomplishment of India in 2023. Solve the Puzzle and find out this major accomplishment!!

SCAN ME



What after undergraduation ?



After earning a B.Sc. (Hons) in Physics, one can choose to enter academia or pursue research, two well-known and established professional options. The fields of engineering, data analysis, education, finance, business, healthcare, and technology are among those in high demand. It's likely that some of you have already chosen to support one of these employment opportunities. There is a chance to pursue aeronautical engineering because it is currently quite popular.

We have glorified examples of Indians who have excelled in these fields. We would like to add some more career prospects that you can dive into right after you graduate, namely

- Astro Photography
- Science Journalism



Astrophotography in India

With India right now booming in the fields of Aerospace Engineering, The Astrophotography Community of India has grown over the last two years - both in quantity as well as quality.

We had the pleasure of interviewing Astronomy photographer Soumyadeep Mukherjee one of the co-founders of the AstronomadsBangla Community. According to him, Astronomy photography has improved a lot in India from 2022 to 2024. It would be a brilliant time if you are into astrophotography.”



What is Astrophotography?

Astrophotography, also known as astronomical imaging, is the photography or imaging of astronomical objects, celestial events, or areas of the night sky.



Want to know more?

- Prospects of Astrophotography in India
- How to get started as a beginner?
- Connect with the experts!

Check out our [Interview Session with Soumyadeep Mukherjee](#).

[SEE THE FULL INTERVIEW:](#)



Maitreyi News

ALUMNAE ACCOLADES

ASTROPHYSICISTS SHINE BRIGHT



ANNU BURA

She is currently a 2nd year Ph. D. student at the Indian Institute of Astrophysics in Bengaluru. Let us hear about her academic and research endeavors in her own words.



Hear the words of
these amazing
students yourself



EQUATIONS ELEVATE EXPLORATION

KRIKA JAIN

She is currently pursuing her Masters in Mathematical Physics from Leipzig University, Germany. Her course is primarily theoretical Mathematical Physics. Let us hear her make us acquainted with this theoretical side of Physics where we can explore Astronomy and Cosmology.



ROCKING THE GEOLOGY GAME



AKSHITA ROHTAGI

She currently holds the position of Graduate Research Assistant at the Bureau of Economic Geology, University of Texas at Austin. She is doing a PhD in Computational Geophysics.

STUDENT SOARS TO LINDAU FELLOWSHIP

KAUSHALYA JHURIA

Kaushalya Jhuria, a postdoctoral researcher at the Berkeley Lab, has been selected to attend the prestigious 73rd Lindau Nobel Laureate Meeting. This event is a significant honor, recognizing the hard work and dedication of young scientists



EXCELLED IN STATE SERVICES



SWATI YADAV

She has successfully cleared the most prestigious exam of Uttar Pradesh i.e. Uttar Pradesh Public Services Exam-2023 and has been selected as the Deputy Jailor (Rank 42nd). She is also the recipient of the prestigious INSPIRE scholarship & Scholarship for Higher Education (SHE) between 2013-2018.



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Recharge Zone



Isha Trar
2nd Year
B.Sc. (Hons) Physics



College nahi hai chota hamara A++ grade hai hamara

Ladkiyon ko dekh lo saari topper se padhte hai ,har ek ladki yaha boom se lagti hai

Girls college ke apne maze hai par pata nahi vo kya hi to maze hai

Hmm to har din padhai, har din lab ke chakkar hi laga rahe hain, humein idhar se udhar college mein hi ghuma rahe hain...

Fir aayi Phyiscs Department ke freshers jisne dil me fun ki thodi se umang jagayi hain

Par do din baad hi MP ki mam ne test ke sunvayi karvayi hai

Aaj hi karlo fun jo ho sakte hai fir to test aur paper hi chalne hai..

75%attandance kah kah kar humko roj bulatein hai itni thand me bhi humko 7 bje uthvate hai

Na tumko pate na mujhko pata hmm college me attandance ke alava karne hi kya aatein hai

Na padhne aatein hai na khelna aate bss muh hath dho kar attandance ke liye dhonde aate hai

School se nikli sidha college thi par na tumko hi pate na mujhko hi pata abhi college me chill hi kya rahein hain...

Assignment par aassignment hote rahtein hai aur hum ek dusre ki copy mein se tapte rehtein hain

Na teri kami hi na mere kami hi na teacher ki kami hai na college ki kami hai fir bhi kami aa kha se rahi hain

Are mann mann mein kya soch rahein ho yeh teachers
ki kami hain

Voh toh baghwan jaise hai hamare kabhi choti si baat
par hassa deta hai kabhi thodi se baat par fatkar bhi
laga dete hai..

Tum idhar galat ho tum udhar galat ho yeh Physics ke
practical mein humein bata bhi to dete hain
Yeh girls college hai yaha par sbhi fashion queen banti firti
hai par hum kya karein hum to science ke bache hai, bss
snapchat ke filter ko dekhkar hi hasne lagte hai
Metro toh hamara dushra ghar ban gayi hai roj 1 ghante
usmein phone chalne ki lat lag gayi hai
Saari motivation Library me jakr aati hai par jaise hi bahar
aao voh dimag se kahi bhag si jati hai ...

Fir sidha canteen mein jate jate hi doston ke saath gappe
ladayein jatein hai fir chai ke maze liye jatein hai
Par na jyada ko janti hu na jyada ko pahchanti hu par jinse
bhi hai yaari unko kudh se jyada manti hu
Dost hi kamina mera sidha mat samjhna dikte hai haseen
par tum heroine mat samjhna
Aaj hi karlo fun jitne ho sakte hai fir to vahi test aur paper hi
chalne hai vahi assignment ka dukh fir se sahna hai..

Tum fest mein bhi jane, inn senior ko farewell bhi dena, sirf
padhai kar kar apni zindagi ko boring mat bana lena thoda
sa gum hai thoda si khushi hai bss yahi to DU ke maze hain...

Attendance metro aur assignment ko apni DU life mat
banana iss pyari se Delhi ko ghum kar isko thoda sa sudhar
lena..

Sometimes

Sometimes I just feel..
Is it real or is it reel..
Sometimes it feels like everything ..
And sometimes just nothing..
What's going on in my mind..
I just want my life to rewind..
I don't want anyone to risk me..
But don't know if someone can fix me..
Still showing that everything is fine..
I am alone and this is the sign..
Meeting new people every single day..
Or may be i am just losing my way..
Sometimes I want someone to feel me..
Sometimes I want
Someone to heal me.....



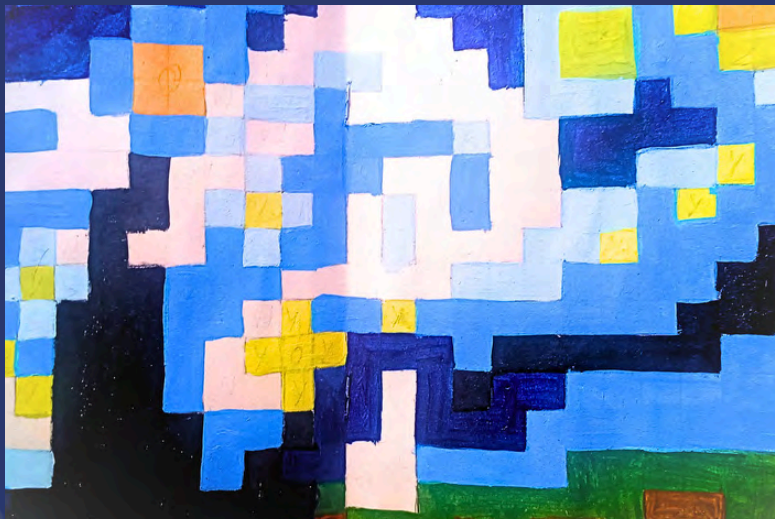
Saniya
2nd Year
B.Sc. (Hons) Physics

Artist Section



Tripti Patwa

Artist Section



Neelakshi Lakra

Artist Section



Lakshita Dahiya



Dewanshi

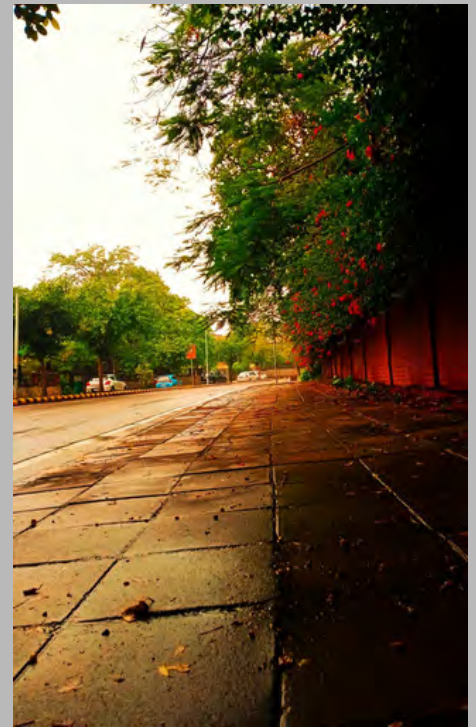
Artist Section



Reetika

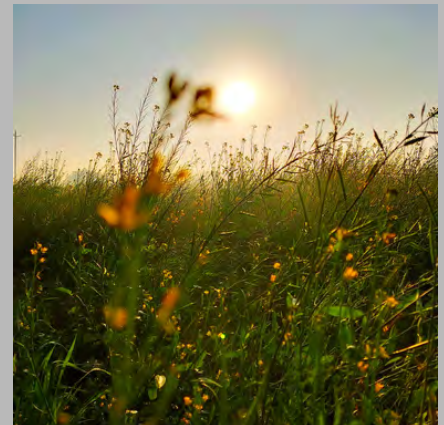


Rishika Verma



**B.Sc. (Hons)
Physics, 3rd
Year**

Priyanka



Annual Kaleidoscope of Memories



Acknowledgements

We owe a debt of gratitude to everyone who helped make this happen. We are especially thankful to Dipti Malik for designing the cover page and attending to even the smallest things that made this possible.



WE VALUE YOUR FEEDBACK!

As much as we enjoyed creating and putting together the magazine for you, we hope you enjoyed reading it as much. Simply scan the QR code to get in touch with us and share your candid opinions.



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What Next??

Competition for Magazine cover of 3rd edition of “Bhautik Kshitij”

For the 3rd edition of our Departmental Magazine , we would love to see your ideas, themes in the cover page. Do send to us your posters for the cover page. We await your participation!!



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