

ISSUE 7 | 2019-20

PHYSIKOS

| Department Of Physics
| Gargi College

Shatter That Glass Ceiling

Did you know that out of
565 total space travellers
only 65 are women? That's
only **11.5%**!

16

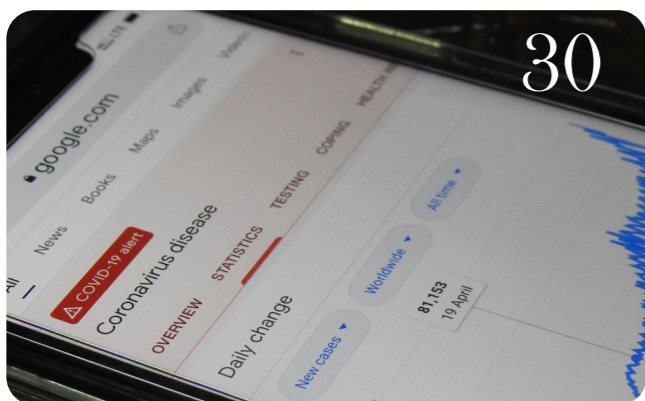
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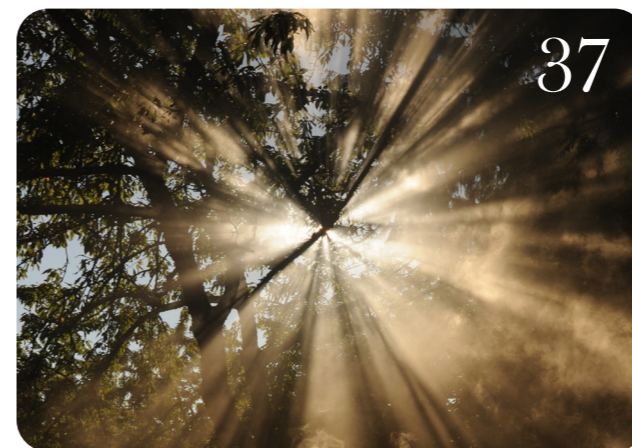


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FROM THE PRINCIPAL'S DESK



Dear Readers,

I am delighted to know that the Department of Physics is releasing its annual magazine Physikos 2019-2020. We, at Gargi, emphasize on the acquisition of knowledge, useful skills, critical thinking, and problem-solving abilities and believe that every student is unique and special. As educators we are committed to nurture and develop every student to her maximum potential in a caring environment. Departmental periodicals are one such endeavour in this direction. These magazines provide a promising platform to our students to showcase their skills, creativity and ideas.

I congratulate the entire editorial team & contributors for the upcoming issue of Physikos 2019-2020 and enthusiastically look forward to reading our students' perspective on the various issues undertaken.

- Dr. Promila Kumar
Principal (Oftg)

MESSAGE FROM THE TEACHER IN-CHARGE



Dear Readers,

Many congratulations to the whole team who have worked with so much of zeal to publish the Physics Department magazine.

- Dr. N. Chandrika Devi
Assistant Professor,
Physics Department,
Gargi College,
Delhi University.

MESSAGE FROM TEACHER CO-ORDINATOR: PHYSIKOS



Dear Readers,

First of all kudos to the dedicated team of enthusiasts for bringing forth the 2019-20 edition of the PHYSIKOS. I would like to complement Ms. Preetisha Goswami for her meticulous and well-coordinated compilation of the PHYSIKOS. We have a dedicated team of union members to be proud of their dedicated efforts and commitments. Hearty congratulations to Dr. Alka Garg for the Meritorious Teacher Award and making the department proud. Many congratulations to Dr. Deepti Lehri and Dr. Alka Garg for completing 25 glorious years full of devoted and committed work for the college and Physics department. We truly appreciate and value their immense contributions.

In the ongoing crisis, everyone has to adopt new strategies, methods and other newer ways in every sphere of life. There will be changes in the teaching-learning processes to meet the challenges of keeping everyone safe and at the same time implementing effective methods of accessible learning. Blended learning, flipped classroom, online and virtual learning will have to be integrated with the conventional practices.

In the beginning of the session, a two day summer workshop was conducted by the faculty members (Dr. Alka Garg, Dr. Vandna Luthra and Dr. Archana) to provide insight

about interdisciplinary research. Students from different departments participated and learnt about various topics such as crystal structures, open resources for various applications and X-ray diffraction.

Our department had adopted e-polling for various union posts of the Physics Society for the last few years as a measure to enhance the participation of students in the process. Hopefully, in the upcoming session it will be of more relevance than ever before.

An inaugural lecture was delivered on the topic, "The Future scopes of research activities in Accelerators, Associated Science and Applications" by a very eminent speaker, Dr. Dinakar Kanjilal, FNA, FNASc, DAE Raja Ramanna Fellow and Former Director, Inter University Accelerator Center (IUAC). His talk apprised the students about the cutting-edge research in the field as well as of the career options. The batch distribution to the newly formed Union members, appreciation of the dedicated work of the outgoing union members, certificate distribution to the participants of the summer workshop as well as the release of the PHYSIKOS 18-19 with the certificate of recognition for the editorial team members were notable parts of the event. An e-waste collection drive for the year was initiated by the chief guest Dr. Dinakar Kanjilal, Dr. Promila Kumar (Principal), faculty members and students. E-waste awareness and Own-a-Mug are some of the ongoing activities that have been actively promoted by the department for many years.

Many vibrant activities were organized by the union members such as 'PARICHAY' which provided a platform to exhibit unique talent of the students and brought new networking opportunities. The event received huge participation as students enjoyed the enthralling dances, songs, poetry amongst many more talents of the students from different states of India. Later, another event 'The Well of Spells' received overwhelming participation from various

other departments as well. Dr. Chhaya Sawhney from the B.El.Ed department judged this event alongside me. We congratulate Ms. Ripundhi from Physics (H) 2nd year who secured the title of 'Spell Wizard'. A movie screening of 'Cosmos Ep 1' was attended by the students from many departments and was followed by some discussions.

The Annual Sports Meet of Gargi College, SPIN 2020, was held on February 28, 2020 in which our students participated with utter enthusiasm. A lot of Quasarians bagged a number of medals and trophies in Gargi Sports Olympiad and for other intra-college and inter-college events and students brought laurels to the department. Our students won first prize in the inter-departmental March Past competition with the motto of "Aatmadeepah Bhawa, meaning BE YOUR OWN LIGHT". It was truly an amazing coordinated display by our students and provided us wonderful moments to cherish. Hearty congratulations to all the enthusiastic participants.

A group of students accompanied by Dr. Hira Joshi visited IUAC and participated in a poster competition under my supervision to celebrate the "National Science Day" on Feb. 28, 2020. Many students visited Vigyan Samagam and attended Seminars and Conferences to abreast themselves with the latest developments in many fields.

A lot of appreciation to the winners of various competitions, members of different societies and to those displaying immense talent for sports activities for their dedicated efforts and winning accolades, awards and certificates. Proud of you all!

It is always useful to guide students for different research projects. This year, it was a delight to direct 8 students for BAMC Masterclasses conducted by Quarknet, in which students did hands-on analysis of data from the CMS Experiment at CERN. This provided an enriching experience in the field of particle physics, webinars by the world renowned scientists

and use of software iSpy and CIMA for analysis of the data.

National Graduate Physics Examination, 2020 under the aegis of Indian Association of Physics Teachers was held for the first time in Gargi for the Physics (H) students. Four students were placed among centre top 10% in part A of this examination out of 41 enrolled at this centre. The examination was conducted on January 19, 2020 at 297 centres spread all over India with a total enrolment of 11638 candidates. Muskan Khanna, Prerna Sharma, Shruti Gupta and Vaishali Yadav as centre top 10% students.

The non-teaching staff is the backbone of our department and we thank them sincerely for their unconditional support.

We shall remain indebted to the Principal, Dr. Promila Kumar, office, administrative and accounts staff for their constant support throughout the year.

The Physics Research Laboratory has many facilities for carrying out research at a UG, PG and Ph.D level. I would like to praise the hard-work of Ph.D students for submission of their theses (at the Department of Physics & Astrophysics, DU) under my supervision and best wishes for forthcoming opportunities.

The department is committed to bring more changes in the upcoming session to impart quality education to the students by overcoming the challenges in the post-Covid era. All of us need to tune to the 'new normal'. Best wishes to the 2017-20 batch and all the other students for their future endeavours and surely the perseverance, hard-work and dedication will pave ways for rejuvenating and redefining the interests and goals in these unprecedented circumstances. Sincere prayers to the Almighty for the well-being of all humanity and harmonious co-existence of all stakeholders.

Any suggestions and inputs can be send to phys.gargi@gmail.com.

"Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less" — Marie Curie

Looking forward for a wonderful year ahead.

- Dr. Vandna Luthra

Teacher Co-ordinator – PHYSIKOS

Teacher Convener – Quasar: Physics Society

MESSAGE FROM THE EDITOR



Greetings!

It makes me exhilarated as well as nervous to present to you all the 7th issue of the annual magazine of the Department of Physics, Gargi College, PHYSIKOS.

It is my second year as a Physikos team member and my first as the editor of any magazine. It was a great accolade for me to have been a member of this team for two years in a row for which I shall always be thankful to Dr. Vandna Luthra Ma'am to have given me this astonishing learning opportunity and for putting trust on me.

Physikos is a concerted effort of all the members of the editorial team as well as the contributors of the variant articles who have made this journey smooth, successful and fun. Our main motive while formulating this magazine was to provide a platform through which our budding aptitudes and tyro writers get an opportunity to share their views, ideas, thoughts and experiences. We did face some difficulties due to lockdown when we couldn't meet physically to orchestrate and everything had to be arranged virtually. Nevertheless, we did not let it affect our zeal to make this publication one of the best.

Hope you enjoy going through this compilation as much as we had fun creating it.

Happy reading readers!

- Preetisha Goswami

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

Editor

WHAT'S NEXT?

Nikita Saini & Prerna Sharma
3rd Year, B.Sc.(Hons.) Physics

Physics is a vast stream and has immense applications. If you have completed your graduation with physics then you will definitely expect something marvellous in your future and yes, physics has that capability to take you on heights. So, have you decided where to go after getting your Physics degree? If you are still struggling to find the path, here are some options for you. After completing a bachelor in physics, one can go ahead in many career options. Some of them are the following:

PHYSICS COURSES: ENTRANCE EXAMS FOR M.SC. & INTEGRATED PhD

Many students prefer pursuing masters in physics after completing their B.Sc.(H) Physics. For that, they can apply for the following entrance exams:

1. IIT JAM (Joint Admission Test) :

The courses provided are-

- MSc Physics
- Joint MSc-PhD in Physics
- MSc-PhD Dual Degree in Physics
- MSc Applied Geophysics
- MSc Astronomy
- Joint MSc- PhD in Atmosphere and Ocean Sciences
- Joint MSc-PhD in Geophysics
- MSc-PhD Dual Degree in Environmental Science and Engineering
- MSc (Tech) in Applied Geophysics

Website for further information:
<https://www.iitsystem.ac.in/>

2. National Entrance Screening Test (NEST):

The courses provided are-

- Integrated MSc programme in Basic Sciences (Physics, Chemistry, Biology, and Mathematics).

Website for further information:
<https://www.nestexam.in/>

3. Joint Entrance Screening Test (JEST):

The courses provided are-

- PhD Programme in Physics
- Integrated MSc-PhD Programme
- Integrated PhD Programme
- MSc Programme in Physics

Website for further information:
<https://www.jest.org.in/>

4. Orissa University of Agriculture and Technology (OUAT):

The courses provided are-

- MSc Programme in Physics
- PhD Programme in Physics

Website for further information:
<http://www.ouat.nic.in/>

5. Tata Institute of Fundamental Research (TIFR GS):

The courses provided are-

- PhD Programme in Physics
- Integrated MSc-PhD Programme

Website for further information:
<http://univ.tifr.res.in/>

6. Indian Institute of Science Education and Research (IISER):

The courses provided are-

- Integrated BS-MS in Physics
- Integrated PhD Programme
- PhD Programme in Physical Science

Website for further information:
<http://www.iiseradmission.in/>

7. University of Delhi (DU):

DU conducts entrance exam for students willing to get admission for M.Sc. in Delhi University. 50% of seats of M.Sc. Physics are reserved for those who have completed their graduation from Delhi University and are selected on a merit basis. The rest 50% of seats are for students who qualify the entrance exam.

The courses provided are-

- M.Sc. in Physics
- M.Sc. in Nanotechnology
- M.Sc. in Nanoscience and Nanotechnology
- M.Sc. in Nuclear Science and Technology
- M.Sc. in environmental studies

Website for more information:
<http://www.du.ac.in/>

8. Banaras Hindu University (BHU):

BHU conducts entrance exams for the selection of students for post-graduation.

The courses provided are-

- M.Sc. in Physics
- M.Sc. in Geophysics
- M.Sc. in Environmental Science

Website for further information:
<https://www.bhu.ac.in/>

9. Jawaharlal Nehru University (JNU):

For pursuing post-graduation from JNU, you need to clear its entrance exam and after that, you have

to go through an interview process. If you crack both of them, then you will be selected in JNU for post-graduation.

The courses provided are-

- M.Sc. in Physics
- M.Sc. in Environmental Sciences

Website for more information:
<http://www.jnu.ac.in/>

10. Birla Institute of Technology and Science (BITS), Pilani, Rajasthan:

BITS, Pilani conducts admission test, BITSAT for admissions in post-graduation courses.

The courses provided are-

- M.Sc. in Physics

Website for more information:
<https://www.bits-pilani.ac.in/>

11. National Graduate Physics Examination (NGPE):

NGPE is an undergraduate level examination which is conducted on similar lines as that of NSEP.

After clearing NGPE and an interview, S.N. Bose National Centre for Basic Sciences, Kolkata, permits direct admission of toppers, in the integrated PhD program.

Website for more information:
<https://iapt.org.in/exams/nse/ngpe.html>

OTHER UNIVERSITIES FOR PHYSICS STUDENTS:

There are many more universities that provide master's in physics. They conduct their entrance exams and for more information, you can check on the particular website of that university. Some of those universities are the following:

- Aligarh Muslim University, Aligarh
- Andhra University, Visakhapatnam
- Chandigarh University, Chandigarh
- Christ University, Bangalore

- Dr. BR Ambedkar Open University, Hyderabad
- Gauhati University, Guwahati
- Integral University, Lucknow
- Jadavpur University, Kolkata
- Jamia Millia Islamia, New Delhi
- Kerala University, Thiruvananthapuram
- Madras University, Chennai
- Maharaja Saraji Rao University of Baroda, Vadodara
- Manipal University, Jaipur
- Panjab University, Chandigarh
- Ravenshaw University, Cuttack, Odisha
- REVA University, Bangalore
- Savitribai Phule Pune University, Pune
- SRM Institute of Science and Technology, Chennai
- University of Calcutta, Kolkata
- University of Hyderabad, Hyderabad
- University of Mumbai, Mumbai
- University of Pune, Pune

POST GRADUATION COURSES AVAILABLE FOR STUDENTS OF B.Sc. (H) PHYSICS:

After B.Sc. (H) Physics, there are many courses which the students can choose according to their interest, in their masters. Some of them are the following:

1. **M.Sc. in Acoustical Physics:** The Acoustical Physics is the branch of physics that explains the concept of mechanical waves in gases, liquid, and solids. It includes topics such as vibration, sound, ultrasound, and infrasound.
2. **M.Sc. in Astrophysics:** It deals with the study of space science. It explains the birth, life, death of stars, planets, nebulae, and other objects of the universe on the basis of laws of physics and chemistry.
3. **M.Sc. in Astronomy:** It deals with the science of celestial objects like stars, moons, planets, nebulae, comets, etc. It explains their origin and evolution on the basis of physics, chemistry, and mathematics.
4. **M.Sc. in Biophysics:** Biophysics is the study of all the biological processes with respect to the methods of physics. It involves all the scales of biological organization.



Image source: <https://unsplash.com/>

5. **M.Sc. in Fibre Optical Physics:** Fibre Optical Physics, basically involves the detailed study of lasers, fibre optical systems, and fibre optical technologies.
6. **M.Sc. in Fluid Physics:** Fluid Physics deals with the complete study of fluids like liquids and gases. It involves the holistic approach of physics behind the fluids.
7. **M.Sc. in Geophysics:** It deals with the study of the physical process, and physical properties of the earth and its environment. It involves the quantitative methods for its analysis.
8. **M.Sc. in Materials Physics:** Material physics utilizes the laws of physics to understand the physical properties of materials. It includes advanced solid-state physics.
9. **M.Sc. in Medical/Health Physics:** Medical Physics is a stream that is the application of physics laws, concepts, and theories to medicine and healthcare. It includes the sub-branches of radiation therapy and radiology.
10. **M.Sc. in Molecular Physics:** It involves the study of the physical properties of molecules and their bond formations. It uses spectroscopy and scattering concepts.
11. **M.Sc. in Nuclear Physics:** Nuclear physics deals with the study of protons and neutrons present in the center of the atoms, and the forces which bound them together inside the atom. It involves nuclear reactions like nuclear fusion, nuclear fission, etc
12. **M.Sc. in Optical Physics:** It deals with the study of light and its phenomena like reflection, refraction, diffraction, and interference, etc. It explains the interaction of light with the matter.
13. **M.Sc. in Plasma Physics:** Plasma Physics is the study of the interaction of charged particles and fluids with the self-consistent electric and magnetic field. It is a basic research discipline that has immense applications.

JOB SCOPES FOR PHYSICS STUDENTS:

Various career scopes in physics are:

1. Researcher
2. Lab Supervisor
3. Consulting Physicist
4. Research Associate
5. Senior Physicist
6. Technician
7. Teacher
8. Scientist
9. Assistant Scientist
10. Radiation Oncologist
11. Radiologist
12. Professor

CAREER OPTIONS IN GOVERNMENT SECTORS:

If you want to work in the government sector, then you don't need to worry because there are many career scopes in the government sector as well for physics students. They are the following:

- Research or Scientists - You can go for research works & become a scientist in some of the government organizations for scientific research.
1. Defense Research and Development Organization (DRDO)
 2. Physical Research Laboratory, Ahmedabad
 3. Saha Institute of Nuclear Physics, Kolkata
 4. Indian Space Research Organization (ISRO)
 5. Nuclear Science Centre, New Delhi.
 6. Bhabha Atomic Research Centre (BARC)
 7. Oil and Natural Gas Corporation (ONGC)
 8. Bharat Heavy Electricals Limited (BHEL)
 9. National Thermal Power Corporation (NTPC)
- You can become a government officer in government jobs like
1. Railway Officer.
 2. State Bank of India (SBI).
 3. Staff Selection Commission.

4. Banking Sectors.
5. UPSC Geoscientist and other Government Sector Services.

- You can become a professor in colleges after completing your PhD in Physics. Some universities select assistant professors on the basis of your degrees, skills & the colleges from where you've qualified.
- You can become a lecturer after completing your M.Sc. in physics and after clearing NET.

CAREER OPTION IN PRIVATE SECTORS

You have career options in private sectors also. They are the following:

1. TCS – Tata Consultancy Services
2. Analog Devices
3. GE Digital
4. Atomic Labs
5. Tesla
6. Solar Industries India Ltd
7. NASA

ENTRANCE EXAMS FOR STUDYING ABROAD:

Some students desire to pursue their masters from abroad after completing their B.Sc. (H) Physics from India. But for that, you need to crack some entrance exams. Different countries conduct different exams for their local language proficiency. Some of them are the following:

- GMAT (Graduate Management Admission Test)
- GRE (Graduate Record Examinations)
- IELTS (The International English Language Testing System)
- PTE (Pearson Test of English)
- SAT (Scholastic Assessment Test)
- TOEFL (Test of English as a Foreign language)

SOME UNIVERSITIES FOR PHYSICS AND ASTRONOMY IN ABROAD:

- Massachusetts Institute of Technology (MIT), United States
- University of Cambridge, United Kingdom
- Harvard University, United States
- Stanford University, United States
- The University of California, Berkeley (UCB), United States
- University of Oxford, United Kingdom
- Princeton University, United States
- California Institute of Technology (Caltech), United States
- The University of Tokyo, Japan
- ETH Zurich (Swiss Federal Institute of Technology), Switzerland

Website for further information:
<https://studyabroad.shiksha.com/>

OTHER SCOPES:

We all know that some people have an interest in physics but some students desire to diverge in fields other than physics. So for those students, they should be aware of other scopes that are not just confined to physics.

- **LLB:** Students who are interested to join the law faculty can go for LLB. You just need to clear the entrance exam of the University in which you want admission.
- **Entrepreneurship:** Entrepreneurship is the ability and willingness to develop, organize, and run a business corporation, along with any of its anxieties in order to make a profit. The most well-known example of entrepreneurship is the starting of new businesses. It can be classified into small or home businesses to multinational companies. In economics, the profits that an entrepreneur makes is with an assortment of land, natural resources, labor, and capital.

Some links you can refer to for information regarding this:

<https://startupnation.com/>

<https://ittybiz.com/>
<https://studio.envato.com/freelance-switch/>
<https://www.entrepreneur.com/>

You can also refer to web applications like:

- <https://www.linkedin.com/>
 - <https://www.zoho.com/>
 - <https://blinksale.com/home/>
- **MBA:** Students who desire to get admission to top MBA colleges have to apply for some entrance exams. Some of them are the following:
 1. CAT (Common Admission Test)
 2. XAT (Xavier Aptitude Test)
 3. IIFT (Indian Institute of Foreign Trade)
 4. NMAT (NMIMS Management Aptitude Test)
 5. SNAP (Symbiosis National Aptitude Test)

- **Actuarial Science:** It is a course which mainly focuses on Mathematical Statistics, Real-World Business, Accountancy, Corporate Finance, Economics, Communication, Interpersonal, and Leadership Skills. Also, it provides you with quality education about insurance and risk management.

Some top universities for M.Sc actuarial science in India are:

1. Amity University, Noida, UP
2. Christ University, Bangalore, Karnataka
3. University of Kerala, Thiruvananthapuram, Kerala
4. BS Abdur Rahman University, Chennai, Tamil Nadu
5. DS Actuarial Education, Mumbai, Maharashtra

DEFENCE SERVICES:

Recruitments into Indian Military Academy (IMA), Officers Training Academy (OTA), Indian Naval Academy (INA), and Indian Air Force Academy (AFA) are done through Combined Defence Services (CDS) Examination which is conducted twice a year by Union Public Service Commission (UPSC).

Women Eligibility: Women are eligible for Officers Training Academy (OTA).



Image source: <https://unsplash.com/>

NCC Special Entry: The NCC cadets can join Defence Services if their age limit is between 19-25 years and they must have qualified a degree with 50% aggregate.

For more information: <https://www.upsc.gov.in/>
AFCAT: Air Force Common Admission Test is held for the recruitment in Indian Air Force. After clearing AFCAT, you will be called for an SSB interview.

For more information: <https://afcat.cdac.in/AFCAT/>

Indian Navy: Currently women can join the Indian Navy as officers in branches like ATC, Law,

Logistics, Observer, Education, Naval Architecture. For more information: <https://www.joinindiannavy.gov.in/>

In Coast Guard jobs, women are recruited as officers in General Duty, General Duty (Pilot/Navigation), and General Duty (CPL Holders, Short Service Entry) branches.

CIVIL SERVICES:

The recruitments into Indian Civil services are done through CSE (Civil Services Examination) which is conducted by the UPSC. This exam is conducted in three stages - a preliminary examination, known as the Civil Service Aptitude Test or CSAT, and the main examination followed by an interview or personality test. Civil Services includes:

1. Indian Administrative Service (IAS)
2. Indian Police Service (IPS)
3. Indian Forest Service (IFS)
4. Indian Foreign Service (IFS)

For more information: <https://www.upsc.gov.in/>

References:

- [1] <https://www.successcds.net/Career/women-in-armed-forces.html>
- [2] <https://scoop.eduncle.com/career-option-after-bsc-physics>
- [3] <https://studyabroad.shiksha.com/>
- [4] <https://www.quora.com/>
- [5] <https://en.m.wikipedia.org>
- [6] <https://collegedunia.com/>
- [7] <https://www.shiksha.com/>
- [8] <https://physicstoday.scitation.org/>
- [9] <https://university.careers360.com/>
- [10] <https://www.space.com/>

DISCLAIMER:

We do not endorse any university and aspirants are requested to check the websites of the respective universities.

Shatter That Glass Ceiling

Preetisha Goswami
2nd Year, B.Sc.(Hons.) Physics

As of March 2020, of the 565 total space travellers only 65 women have flown in space, including cosmonauts, astronauts, payload specialists and space station participants, out of which only 2 are of Indian Origin.

Russian cosmonaut Valentina Tereshkova was the first woman to have travelled into space. She flew on Vostok 6 on June 16, 1963 and spent almost three days in space. She orbited Earth 48 times in her space capsule. But that was her only trip into space.

KALPANA CHAWLA was an astronaut, engineer and the first woman of Indian origin to go into space, although she was with NASA. She was one of the seven members on the ill-fated space shuttle Columbia, which disintegrated upon atmospheric entry, 16 minutes

prior to schedule landing, killing all seven on board in 2003. She earned a bachelor's degree in aeronautical engineering from Punjab Engineering College, India, 1982, master's degree in aerospace engineering from University of Texas, 1984 & doctorate of philosophy in aerospace engineering from University of Colorado, 1988.

SUNITA L. WILLIAMS (Captain, U.S. Navy, Ret.), born in Euclid, Ohio, to Indian American neuroanatomist Deepak Pandya and Slovene American Ursuline Bonnie (Zalokar) Pandya, became the second woman of Indian origin to have flown in space, who was also with NASA.

Williams participated in 7 spacewalks and was the second woman ever to be commander of a space

station. Interestingly, she is also the first person to have run a marathon while in space. As a naval aviator, she logged more than 3,000 flight hours in more than 30 different aircrafts.

Williams earned a bachelor's degree in physical science from the U.S. Naval Academy and a master of



NASA astronaut Sunita Williams, Expedition 32 flight engineer, appears to touch the bright sun. Image courtesy: <https://www.nasa.gov/>

science in engineering management at Florida Institute of Technology.

Some of the other notable firsts/achievements of women in space are:

- The 2013 astronaut class was the first with equal numbers of women and men.
- Roscosmos cosmonaut Svetlana Savitskaya was the first woman to participate in a spacewalk on July 25, 1984 on her second trip to Salyut 7. On Aug. 19, 1982, as part of the Soyuz T-7 mission to the Salyut 7 space station, she became the second woman to enter outer space.
- NASA astronaut Susan Helms shares the record for longest single spacewalk with fellow NASA astronaut Jim Voss, totalling 8 hours 56 minutes. A member of Expedition 2 from March to August 2001, Helms was the first female crew member aboard the space station.
- The most number of women in space at one time happened in 2010, when space shuttle Discovery visited the space

station for the STS-131 mission. 4 out of 7 Discovery's crew were women.

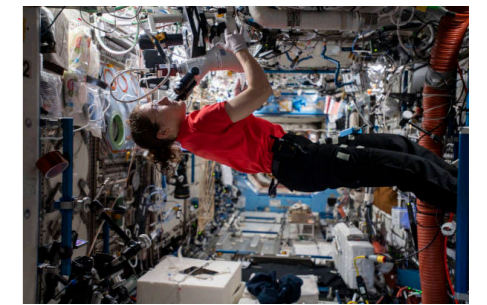
- NASA astronaut Anne McClain holds the rank of Lieutenant Colonel as an Army Aviator, with more than 2,000 flight hours in 20 different aircraft. She became the first woman to live aboard the space station as part of two different crews with other women: Serena Auñón-Chancellor in 2018 and Christina Koch in 2019.
- The first all-female spacewalk was completed by NASA astronauts Jessica Meir and Christina Koch in October 2019.
- NASA Astronaut Peggy Whitson holds numerous spaceflight records. She holds the record for the most spacewalk time for female space travellers. She also served as the first science officer aboard the space station, the first female commander of the space station and the first woman to be station commander on two different missions. She is the only woman to serve as chief of



NASA Astronaut Peggy Whitson Image courtesy: <https://www.nasa.gov/>

the astronaut office.

- NASA Astronaut Christina Koch returned to Earth on 6th February 2020, after being in microgravity for 328 days, which set the record for the longest time in space for a woman during a single mission. She launched on March 14, 2019.



NASA astronaut and engineer Christina Koch Image courtesy: <https://www.nasa.gov/>

During that time, she worked on hundreds of experiments, including studies of protein crystals and plants in space. She participated in a number of studies to support future exploration missions, including research into how the human body adjusts to weightlessness, isolation, radiation and the stress of long-duration spaceflight. Koch earned bachelor's degrees in electrical engineering and physics and a master's degree in electrical engineering from North Carolina State University in Raleigh, NC, and worked at NASA's Goddard Space Flight Center's Laboratory for High Energy Astrophysics, contributing to scientific instruments on several missions studying cosmology and astrophysics.

These are only a few examples of women who have proved that the sky is NOT the limit. Many other remarkable women have shattered glass ceilings in various fields, be it science and technology, sports, entertainment, etc. and continue to do so every day. If there is one thing that you must consider to be limitless, it must be your success •

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Butterfly Effect

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Have you ever thought that a butterfly fluttering her wings in your garden can cause a tornado or hurricane in another part of the world?

About 45 years ago, Edward Lorenz posed a question that “Does the flap of a butterfly’s wings in Brazil set off a tornado in Texas?” in the 139th meeting of the American Association for the Advancement of Science. The answer to that question is the concept of “Butterfly effect”. A single act like a butterfly flapping its wings cannot cause a typhoon but can serve as catalysts that act on starting conditions. Like if a person travels back into the past and kills a bug that was meant to get into the eye of a lion so that the king can run away. But now the bug is killed and so the king by the lion. The person travels back to the present and sees that there

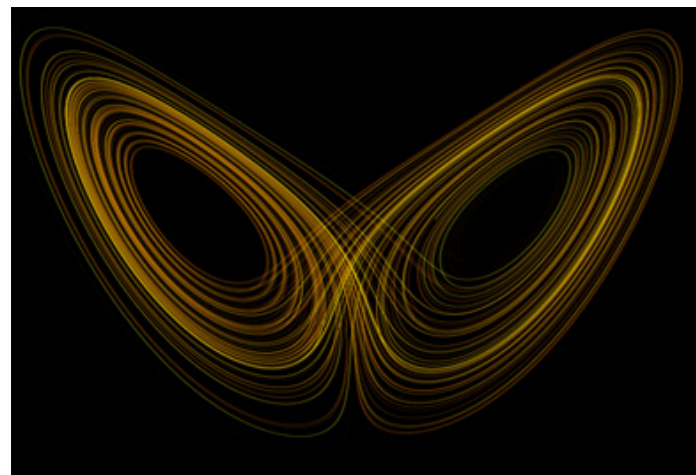


Image Source:
https://commons.wikimedia.org/wiki/File:Lorenz_attractor_yb.svg



Image source: <https://unsplash.com/>

was a nuclear war going on in the present date. The idea behind is that small variances in the initial conditions in one state of the system can result in a larger difference in the later state. The Butterfly effect has proven true using a mathematical model that leads to Chaos theory which was given by Edward Lorenz. It answers “why” this butterfly effect happens and hence is a set of conditions that defines why a small change can lead to a dramatic effect on a sensitive system.

Like the name, the whole concept is a chaos that makes it harder to understand the Butterfly effect. Benjamin Franklin offered a poetic perspective of it which he wrote even before the identification of the Butterfly Effect.

*“For want of a nail, the shoe was lost,
For want of a shoe, the horse was lost,
For want of a horse, the rider was lost,
For want of a rider, the battle was lost,
For want of a battle, the kingdom was lost,
And all for the want of a horseshoe nail.”*

In recent studies, physicists claimed that the butterfly effect is not supported in the quantum world. According to quantum physicists, damaging simulated pasts of quantum processes in the quantum computer causes very little change when returning to the present. In the research, qubits, or quantum bits time travel into the simulated past. One of them is then strongly damaged. Surprisingly, when all qubits come back to the present, they appear largely unchanged, as if reality is self-healing.

The Butterfly effect is like all other paradoxes we don’t know how it process, affect and can be understood. It will take a long time to get concrete proof that whether it exists or not and reach a point where we can explain it.

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Destination Mars

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NA S A launched its ‘Perseverance’ Rover to Mars on July 30, 2020. Let us have a look at NASA’s previous rovers to Mars and what’s special with this fourth generation rover.

Mars has fascinated the humankind for long. It’s perhaps the only planet that we wish to visit so eagerly since it has provided some conditions to support life - present or past. NASA has gone too far in the investigation of the Martian soil and in this pursuit NASA has had launched a series of rovers.

NASA’s incredible journey on Mars started about 23 years ago when the first ever rover of the size of a toy, a couple of feet in length and width, under the Mars Pathfinder Mission with the ‘Sojourner’ rover was egressed on the Martian soil. This ‘Sojourner’ rover lasted for about 83 days. It subsequently changed the history of Mars exploration forever.

NASA then sent twin rovers ‘Spirit’ and ‘Opportunity’ which lasted for about 6 and 15 years respectively. Then, ‘Curiosity’ was sent in 2012, which is followed by the altogether new rover ‘Perseverance’. ‘Perseverance’ is of the size

of a small car- just like ‘Curiosity’. It carries a unique instrument called MOXIE or Mars Oxygen ISRU Experiment. ISRU is a NASA jargon which means In Situ Resource Utilization. MOXIE will manufacture Oxygen on mars using the atmosphere’s carbon dioxide. The presence of Oxygen will bring the cost of Mars exploration in future very less. The presence of oxygen on mars will have two main advantages: oxygen if present in Mars’ atmosphere will be used for human astronauts, and oxygen will also be used for manufacturing rocket fuel. Besides MOXIE, ‘Perseverance’ will also carry with it ‘Ingenuity’, the first helicopter on Mars. ‘Perseverance’ also aims to bring the rock samples from Mars for analysis in laboratories which in turn will provide us biosignatures.

NASA has added new capabilities with each new rover and this fourth-generation is more than just a rover, for it will do wonders to quench our thirst for finding more and more about Mars.

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Schrödinger's Cat: DEAD OR ALIVE?

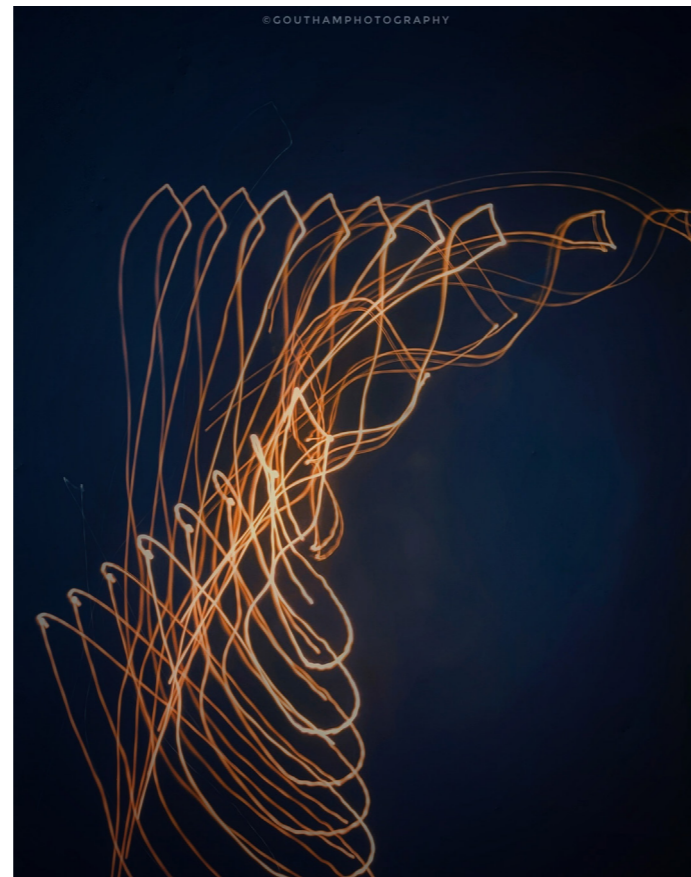
Nikita Saini
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Image source: <https://unsplash.com/>

The paradox of Schrödinger's cat builds up curiosity in literally everyone's mind. Is the Schrödinger's cat dead or alive? But first, let us know about Schrödinger's cat. In 1935, the eminent physicist, Erwin Schrödinger, did a theoretical experiment in which he placed a cat in a steel box. He kept a Geiger counter, a vial of poison, a hammer and a radioactive substance such that when the radioactive substance decays, the Geiger counter will detect it & trigger the hammer to release the poison which will eventually kill the cat. Here the paradox comes into the picture. Schrödinger claimed that until the box is opened, the cat will be "alive and dead.... in equal parts". Only if we observe, it becomes clear that whether the cat is dead or alive and not both. So until the box is disclosed, the cat's state is absolutely unknown and hence, the cat is considered to be dead and alive at the same time. Actually, physicists believe that the radioactive decay is a random process whose end is unknown and the atoms remain in a state of decaying and not decaying simultaneously. So it's tied to the cat's fate that whether the atoms have decayed completely

or not and the Schrödinger's cat remains alive and dead both at the same time until observed. Eric Martell, an associate professor of physics and astronomy, at Millikin University, said that Schrödinger used the cat's paradox to illustrate a point about the nature of wave particles in quantum mechanics. A wave function for a particle says without observing the particle, you cannot explain exactly what the particle's position is at that moment, there is only a probability that it could be in a particular position. That's why Schrödinger developed the cat's paradox to explain it. No cat was harmed in the experiment because the experiment was completely theoretical. •



Wave particles in quantum mechanics. Just a resemblance. Image courtesy: Goutham Krishna (gautikichu7@gmail.com)

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Image source: <https://unsplash.com/>

How Do Mobile Touch Screens Work?

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*Ever wondered why
your mobile screens
do not respond when
using it wearing
gloves?*

There are many types of touch screens, but in case of mobile phones there are two types:

1. Resistive Touch Screens

The resistive touch screens, as the name says, resist your touch and if you press harder, you can feel the screen bent slightly. This is how resistive touch works. There are two layers in resistive touch, the resistive layer and the conducting layer which are separated by tiny dots called spacers. The electric currents flow through the conductive layer at all times but when you touch the screen, the resistive layer goes in contact with the conducting layer and hence the electric current changes at that point. Now, each point on your screen is defined by a set of coordinates which corresponds to a defined function. The software used recognizes a change in the current at these coordinates and carries out the function that corresponds with the spot.

► Coming to gloves, they are made up of non-conducting materials, as a result of which the screens become non-responsive to the touch. •

2. Capacitive Touch Screens

Unlike resistive touch screens, capacitive screens do not use the pressure of your fingers to create a change in the flow of electricity. Instead, they work with things that carry electrical charges. We are composed of charges, both positive and negative on the whole being electrically neutral. Underneath the glass screen of your phone, there are tiny pieces of a conducting material called indium tin oxide that hold electric charges in an electrostatic grid of wire each even smaller than the human hair. There's a glass substrate, a conductive layer, a protector, a controller and electrodes at the corners. The electrodes apply a feeble voltage to the conductive layer to form an electrostatic field. Now, when we touch the screen, the electrostatic charge is transferred to the field that completes the circuit. A voltage drop is created at the point which is then recognized by the software.

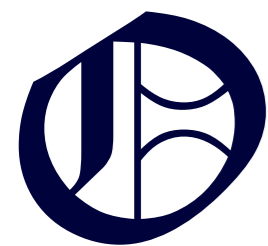
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How The Collision Of Black Holes Colliding Millions Of Light Years Away Helps Progress Cosmology On Earth

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On 14th September 2015, scientists heard the “sound” of two black holes colliding and merging 1.3 billion light years(!) away from Earth and made history. Each black hole was about 30 times the mass of our sun, and this event only lasted a fraction of a second, but the energy this event released was almost 50 times the energy contained in all the stars in the observable universe. Let it sink in that the energy from EVERY star in the observable universe would still pale in comparison to the energy emitted in JUST 0.2 seconds.

Now all these numbers seem a bit much to comprehend, so let’s take a step back and talk about gravitational waves. Gravitational Waves are simply

ripples in the fabric of spacetime caused by accelerating masses. Imagine throwing a rock in a calm body of water, and watch the water rippling outwards. This is what happened when the two black holes collided to create ripples in spacetime, essentially creating gravitational waves.

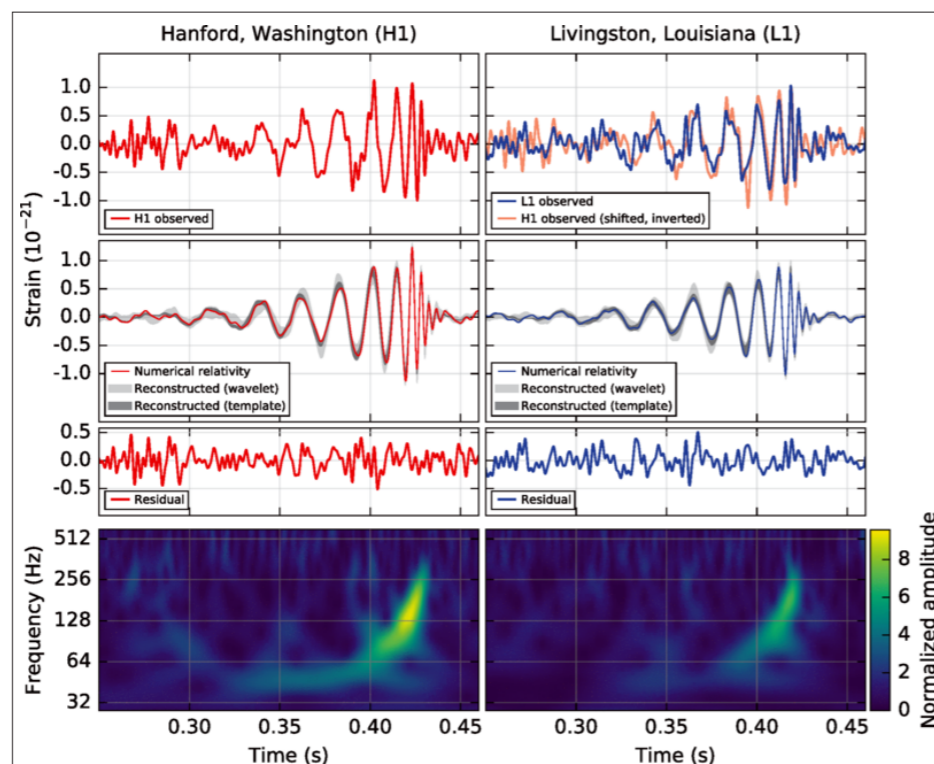


Image source: https://commons.wikimedia.org/wiki/File:LIGO_measurement_of_gravitational_waves.png

This event was historical, as it proved Einstein’s prediction of GWs made almost a century ago! This was also the first direct experimental observation of a black merger made. A question arises, how are GWs so elusive that they managed to be undetected for almost 100 years? This is because they cause extremely tiny changes in length, essentially distorting space by very very small amounts. How were these distortions detected then? LIGO.

LIGO stands for Laser Interferometer Gravitational-wave Observatory. That’s quite a mouthful, so let’s look at it simply. An interferometer is an L-shaped device with mirrors on either end of the arms, and a beam splitter at the junction of the arms. Light from a laser passes through the beam splitter on to the arms. But how does this help detect GWs? Let’s go back to when we said that GWs distort space.

When these Gravitational Waves pass through Earth, it distorts the arms of LIGO in the opposite direction. This means that when one arm contracts, the other arm stretches. This might seem easy to detect, but this change in length is almost infinitesimal (even though the length of these arms is 4 kilometers each, the distortion caused in each arm is only 10-18 m!) Imagine a proton, then divide its diameter by 1000- that is the distortion caused here! It is because of this that these observatories are considered the most sensitive instruments that have ever been built.

There are currently three observatories in the world, with two more to be functioning soon. Two of them are the Hanford and the Livingston observatory, both located ~3000 kilometers from each other. The third is a Virgo Interferometer located in Pisa, Italy. The difference in arrival times in the different observatories helps determine the location of the source of the wave through triangulation. GW150914, the first GW discovered, was localized to an arc in the sky, as only two observatories were functional then.

Gravitational Waves do more than just act as an observable parameter. They were used to test the theory of General Relativity,

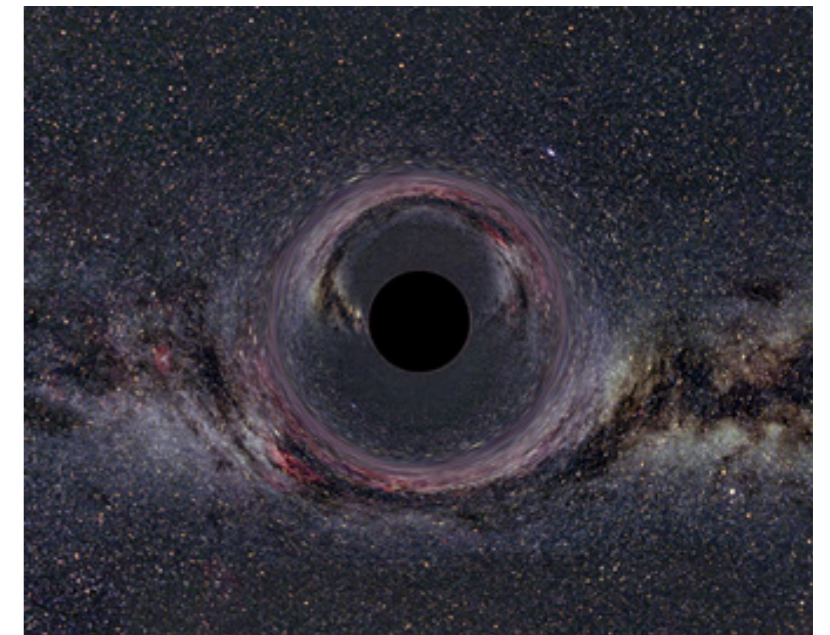


Image source: https://commons.wikimedia.org/wiki/File:Black_Hole_Milkyway.jpg

proposed by Einstein almost a century ago. This is done by checking whether the waves observed are of the form predicted, and by looking at the solutions of Einstein Field Equations.

An interesting observation might be perhaps that of GW170817, the collision observed on 17th August 2017, which proved to be a minefield of information. What was most fascinating about 170817 was the discovery of a Kilonova, and how it allowed to test whether gravitons and photons traverse the same universe, its use as a standard siren and its consequent precision in the measurement of the Hubble Constant.

Gravitational Waves have been revolutionary in the field of Astrophysics, with every run of the observatory giving exponentially more information than before.

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What A Wonderful World!

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It is often said that physics is a difficult subject. To rephrase it properly “It is one of the most difficult subjects to study”. It is full of equations that can make you at once a madman as is said by many people. Most of us and many before have pursued this subject with fierce determination despite it being so-called “difficult” because we want to understand how things work.

We want to know how the grasshopper sitting on a long blade of grass can fly away so seamlessly. How in the morning when you wake up and pick up the toothpaste to get your teeth cleaned it comes out so easily out of the tube and you wonder what if there had been big chunks of ice in there. You know the answer. It's sitting right on your throat. You'd say to yourself, of course, it won't come out but that is not the whole answer you'd still be stuck with one and the most important question “why?”. We are all surrounded by puzzles in this world. Why aren't we engulfed by the bed in which we are sleeping like we would have been in quicksand or water? Why is water transparent and the ocean made of the same water is blue? How are atoms formed? Do they ever get destroyed? Why do matter and antimatter annihilate? Why was there excess of matter over antimatter during the formation of the universe according to big band theory? Was it a coincidence or was it because of a well-placed rule? Why flowers have intricate shapes or so do

galaxies for that matter? What designs their shape and how is everything working so perfectly like a canvas painted by some well-known artist. It is said that if many important constants like the value of G (gravitational constant), k_B (Boltzmann's constant), h (Planck's constant) etc. would have been different then our universe as we know it would not have existed. What is time? Why is it moving? Or is it moving at all? According to the general theory of relativity, it is said that space and time are mixed and is called space-time. So it is said that when you are moving say in a car or on foot you are moving in space and time but if you are not moving at all ignoring the movement of our planet you are still moving in time. How did this space-time come into being which does not let us stop for a second, which keeps us moving if not in space then in time?

These “whys” and “hows” keep chasing us every moment. More than answers we should have questions about everything. From the second we wake up till we go to sleep we should be filled with these everyday “looks easy but is difficult to understand phenomena”. No matter how difficult the equations get us and many more to come will be searching for answers. Physics is a subject which is observed in every aspect of life and to learn it, to be able to observe and interpret it is the biggest gift ever given to humankind.

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Image source: <https://unsplash.com/>

Vyommitra

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Vyommitra (a combination of two Sanskrit words, ‘Vyoma’ meaning space and ‘Mitra’ meaning friend) is the name given to the half-humanoid (in the form of a woman) which is being developed by ISRO that will eventually fly to space on an unmanned mission later this year. It aims to lay the ground for ISRO's manned mission Gaganyaan in 2022.

A humanoid is a robot that resembles a human being. Like any other robot, a humanoid's functions are determined by the computer systems. The functions of artificial intelligence systems such as Siri, Alexa, and Cortana are also extended in a humanoid. Vyommitra is being called a half-humanoid because she only has a head, two hands and a torso and doesn't have lower limbs.

• Why is ISRO developing a humanoid?

For the first time, ISRO plans to send a human into space by 2022. It's racing against time to develop a crew module and rock systems that will ensure the safe travel and return of the Indian astronaut. The humanoid is under development at a robotics laboratory at the Vikram Sarabhai Space Centre, a major space research centre of the Indian Space Research Organisation (ISRO), located in Thiruvananthapuram, Kerala. Once flown into space, ISRO's half-humanoid will be able to test systems in the crew module meant for the survival and safe travel of the first Indian astronaut in 2022.

• What are the tasks that Vyommitra will perform?

Vyommitra will test the ground for the human spaceflight and it's a very basic version of TARS-type, artificial-intelligence-and-robotics system. Once fully developed, she is expected to use types of equipment onboard, such as safety mechanisms and switches, receiving and acting on commands sent from ground stations, attaining launch and orbital postures, responding to the environment, generating warnings, replacing carbon dioxide canisters, monitoring of the crew module, receiving voice commands, responding via



*This is NOT Vyommitra.
Image source: <https://unsplash.com/>

speech (bilingual), operating switches, etc. Vyommitra also has lip movement synchronized to mimic speech.

Apart from performing technical tasks, Vyommitra's job also includes providing mental support to the astronauts. She can act as an artificial friend to the astronaut and provide tips on various aspects like the health of the spacecraft during the launch, landing and orbital phases.

Ultimately, the humanoid would also return to Earth to report on the changes that shall occur in the crew module during the spaceflight and return.

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Aurora Borealis vs Aurora Australis

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The bright dancing lights which are observed above the magnetic poles of the northern and southern hemispheres are known as the lights of 'aurora'. It displays varied hues of green, purple, pink and maybe a faint yellow. The aurora from near-circular bands around both the northern and southern hemispheres are known as auroral ovals. The Aurora Borealis and the Aurora Australis both are the types of auroras. Then what is the main difference between Aurora borealis and aurora australis?

• Difference between Aurora Borealis and Aurora Australis:

Aurora Borealis occurs on the north pole while the Aurora Australis occurs on the south pole. Aurora borealis is commonly known as northern lights while the Aurora Australis are commonly known as southern lights. The Aurora is the mythical roman goddess of dawn, while the Borealis and Australis are the Greek words for winds of the north and the south, respectively. Hence, the Aurora Borealis

means 'the dawn of the north' and the Aurora Australis means 'the dawn of the South'. Due to extremely remote locations, Aurora Australis is usually less popular than Aurora Borealis.

• How do the auroras form?

The cause of these mesmerizing auroras is the collision of gas particles in the Earth's atmosphere with the charged particles released from the Sun's atmosphere. Basically, the magnetosphere of the Earth protects the solar winds to enter into the Earth's atmosphere. However, in some conditions, the

charged particles from the solar wind penetrate this magnetic shield and energetically collide with the gas particles present in the Earth's atmosphere, and produces a light which is known as an 'aurora'.

The variation in the auroral color depends on the type of gas-particle which has collided. The most seen color is pale-yellowish green, which is due to oxygen molecules, present 60 miles above the earth. The rare, all-red color is due to high-altitude oxygen molecules, present 200 miles above the Earth. And the blue or purplish-red is due to nitrogen molecules.



Image source: <https://www.nasa.gov>

• Best locations to watch Aurora Borealis and Aurora Australis:

Grotta Lighthouse in Iceland, Tromso in Norway, Churchill in Canada, Aurora Sky Station in Sweden, Nuuk in Greenland are the best places to watch these beautiful lights - 'Auroras Borealis'. While Eaglehawk Neck, Cradle mountain in Australia, South Georgia Island, Steward Island in New Zealand, and Ushuaia in Argentina are the prime locations for observing the spectacular 'Aurora Australis'.

• Are Aurora Borealis and Aurora Australis mirror images of each other?

Earlier it was believed that the northern and southern auroras are mirror images of each other, but the scientists observed that it is not so. The reason behind the difference is found out to be the interactions between the Sun's outer atmosphere and Earth's magnetic field. The images from NASA's polar spacecraft and Imager for Magnetopause-to-Aurora Global Exploration (IMAGE) were analyzed and it showed that the auroras change in accordance with the "tilt" of Earth's magnetic field towards the sun and solar wind conditions.

Lead author Timothy J. Stubbs of the Laboratory for Extraterrestrial Physics at NASA's Goddard Space Flight Center, Greenbelt, Md, and his colleagues were the first to analyze the simultaneous observations of the whole aurora in the Northern and Southern Hemispheres for tracking their locations. To study auroras, they used the data of



Image source: <https://www.nasa.gov>

two spacecrafts. Fortunately, the orbits of IMAGE and polar were aligned and therefore, they simultaneously observed the entire auroral ovals in both hemispheres in detail.

Stubbs and his colleagues noted four important points in their study of auroras observed in October 2002. They observed the auroral ovals in opposite directions to each other depending on the orientation of the Interplanetary Magnetic Field (IMF), as predicted earlier. The IMF is the Sun's magnetic field that travels out into space through the solar wind. They noted that the auroral ovals also shifts in opposite directions to each other depending on the "dipole tilt angle" that is how far the Earth's Northern Magnetic Pole is leaning towards the Sun.

One more important point that they observed was that following the change in the orientation of IMF, the southern auroral oval shifts towards the Sun while the northern auroral oval remains unchanged. The scientists believed that the southern auroral oval moved

because the solar wind penetrated into the magnetosphere in the southern hemisphere while it was not able to penetrate into the northern hemisphere.

The most surprising thing was that for this event, both the southern and northern auroral ovals were leaning towards the dawn side of the earth. Scientists believe that leaning may be related to the "imperfections" in the Earth's magnetic field. "Because Earth's magnetic field is not a perfect dipole, we think this fact plays some role in causing auroras not to be mirror images of each other", Stubbs said. Now we know that the aurora borealis and aurora australis are not the mirror images of each other, but researchers never stop, still, there is a lot left to be known.

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PREDESTINATION PARADOX: History Must Be Preserved

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Image source: <https://pixabay.com/>



Have you ever imagined travelling back in time and wanted to change the past? Isn't it interesting to travel back and change our past as per our accordance and wish?

But, things are always destined to come out the similar way, and that whatever has happened must happen. Sound complicated?

Imagine that your loved one dies in a hit-and-run car accident and you travel back in time to save him from his fortune, only to find that on your way to the accident you are the one who accidentally drives over him. Your try to change the past has

therefore derived in a predestination paradox.

A predestination paradox, also known as a causality loop, causal loop, and closed-loop or closed time loop (less often), is a paradox of time travel that is often used as a convention in science fiction. This 'predestination' word derives from the Greek word "proorizo" with "pro" meaning "before" and the verb "chorizo" meaning to "determine".

A Predestination Paradox refers to a phenomenon in which someone travelling back in time becomes part of past incidents, and may even have caused the initial event that caused that individual to travel back in time in the first place.

In this hypothetical paradox of time travel, history is illustrated as being unalterable and predestined, with any trials to change past events hardly resulting in that event being fulfilled. Science-fiction provides considerable ground for analyzing this "Effect before Cause" theory, and over the years has provided much entertainment in the characteristic of countless books, stories, and movies on the content.

It has been in use since classical times, Greek physician Hippocrates (460-370 BC) using it to interpret a planned result following the administration of medication. It is mentioned four times in the Bible, or more precisely in the Epistles of Paul, and overtime in religion has come to exemplify God having immutably determined all incidents throughout the period that will come to pass.

The concept of a predestination paradox has been analyzed by scientific writers in the past, most notably by Robert A. Heinlein in his short stories entitled "By His Bootstraps" (1941) and "All You Zombies" (1959). However, it was the Star Trek franchise that designed the utterance "Predestination Paradox" in a 1996 episode of Star Trek: Deep Space Nine episode titled "Trials and Tribble-actions".

A straightforward predestination example implicates that hit-and-run incident emphasizing the predestination paradox involving the object. In addition to a person travelling backward in time and fulfilling his role in a past event, another type of predestination paradox involves information brought from the future causing a person to fulfil his part in an event yet to happen. In either case, any attempts to change either the past or future are convicted to eventually fail.

Say, for example, a man obtains information from the future that he was destined to die from a heart attack. He subsequently takes up active exercise management in order to avoid his predestined destiny but ultimately ends up overexerting himself and dying from the very heart attack he set out to stave off. In other words, both cause and effect run in consecutive circles, resulting in chicken or egg type catastrophes. It is the fact that the information obtained from the future was truly known to happen that makes them instances

Image source: <https://pixabay.com/>



of predestination paradoxes, though. Otherwise, it would just be a question of past events resulting in future actions.

The solution to a paradox:

'Novikov's self-consistency principle', which affirms that a time traveller is impeded to only creating a compatible or constrained version of history. In other words, there must be a nil probability of establishing a time paradox.

According to another solution called the 'timeline-protection hypothesis', any endeavors to change the timeline would arise in a probability warping being created to protect the timeline.

Conclusion:

HISTORY MUST BE PRESERVED

According to the predestination paradox, history is pre-written and anything interacting with past events will only be able to act in a compatible way that stimulates the already specified past events to be conserved.

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COVID-19

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“The world is in this together” and “You are not alone, let’s fight it together” probably are two statements you are hearing amid this global pandemic of COVID-19 and it is true as well, nobody is safe, everybody is in the radar of this Coronavirus and the only way out is ‘self isolation’. But why this virus is such jeopardy to the world? How this has affected our niches? And how is this affecting our lives? So let’s dig deep into this devil.

- **What is Coronavirus?**

Coronaviruses are a group of viruses which are responsible for causing diseases in mammals and birds and respiratory tract infections in human beings that can range from mild to severe. SARS, MERS and COVID-19 (recently declared as pandemic) are some of the lethal diseases caused by this virus to human beings.

- **COVID-19 :**

Coronavirus disease 2019 aka COVID-19 is an infectious disease caused by SARS-CoV-19 (severe acute respiratory syndrome coronavirus 2). Its first case was identified in December 2019 in Wuhan, China and since it is spreading like a wild fire across the globe with more than 2.4 million confirmed cases globally and approximately 1.5 lakh deaths.

Its common symptoms include fever, cough and shortness of breath. Fatigue, muscle pain, diarrhoea, sore throat, loss of smell and abdominal pain are also observed as the symptoms of this deadly disease declared by the medical experts. If you were exposed to this infection then the onset of symptoms would typically take 2-14 days. Majority of the cases result in mild symptoms but some take progression to pneumonia and multi-organ failure. This virus is primarily spread between people through close contact or small droplets produced by coughing or sneezing. Not only this, this virus can survive for 72 hours on any surface and doesn’t remain in the air for long. This increases the threat of infection among humans and hence the only way to control it is isolation. Also scientists claimed

that this virus spreads from human to human which makes it more fatal.

- **How the world is coping with ‘the VIRUS’?**

As of now there is no vaccine or medicine for COVID-19 although scientists are working their head out to find one but still no progress. But World Health Organization (WHO) has given some preventive measures like frequent washing of hands for about 20 seconds, maintaining physical distance from others (especially those with symptoms), covering sneezes and cough with tissue, wearing mask, avoid touching your face, eyes and nose with unwashed hands and disinfecting the surfaces which are regularly exposed and used. WHO has also recommended

eating healthy homemade food for building one's immunity. Many countries like India, Italy, Spain, England, USA etc. have used the formula of LOCKDOWN to manage this pandemic but can't say safely that it worked, I mean still the cases are increasing. But they have no other option, quarantining is the only way to deal with this pandemic and this can't be done without lockdown.

- **Its effect on us:**

The worrying of catching the infection, the longing to go out and hang out with friends, praying for the normal life to come back and boring self isolation has affected our mental health to a great extent. We might not know it but all this has mentally broken us all. But keeping yourself happy and healthy is the major task of the time. Keeping ourselves

busy with various activities like cleaning, yoga, exercise, family time, me time etc will do the trick.

- **Its socio-economic effects:**

The coronavirus pandemic caused the largest global recession in history with one-third of the global population being put in lockdown. The manufacturing units and factories have all shut down which made many workers unemployed at this time. Arts, theatre, sports and entertainment industry has also suffered the pandemic's outcome. No social events or gatherings are appreciated right now. Many political rallies and campaign are also being cancelled due to this. Students across the globe are suffering a lot as semester exams are being hampered and the beginning of the new academic year will be delayed and what not

is interrupted by this pandemic.

The world has suffered a lot and it has to suffer more, thanks to COVID-19 but we'll fight this and will come out stronger. In no time this horrendous episode of our life will be over and will become a history we survived •



Photo courtesy:
Preetisha Goswami
2nd Year, B.Sc.(Hons.) Physics

References:
[1] <https://www.who.int/>
[2] The Hindu
[3] Navbharat Times
[4] Wikipedia

MOVIE CREED

COSMOS: A Spacetime Odyssey (2014)

GENRE: Science documentary

I cannot explain in words about this show. One can acquire some profound information related to Earth, old discoverers who sacrificed their life to search the truth of the unknown, our universe, stars, galaxies, planets, comets, etc. The series covers the journey from beginning of our universe to the end. It includes all scientific rules of nature, theories about formation of Earth, how technology develops, and the mind blowing animations of history where works of many scientists were shown. You can watch it again and again without getting bored of it.

I highly recommend you all to watch this intriguing series as it could be a life changing experience for you, knowing the secrets of the formative years of our planet and a plethora of other space related information.

// Megha Kandari
2nd Year, B.Sc.(Hons.) Physics

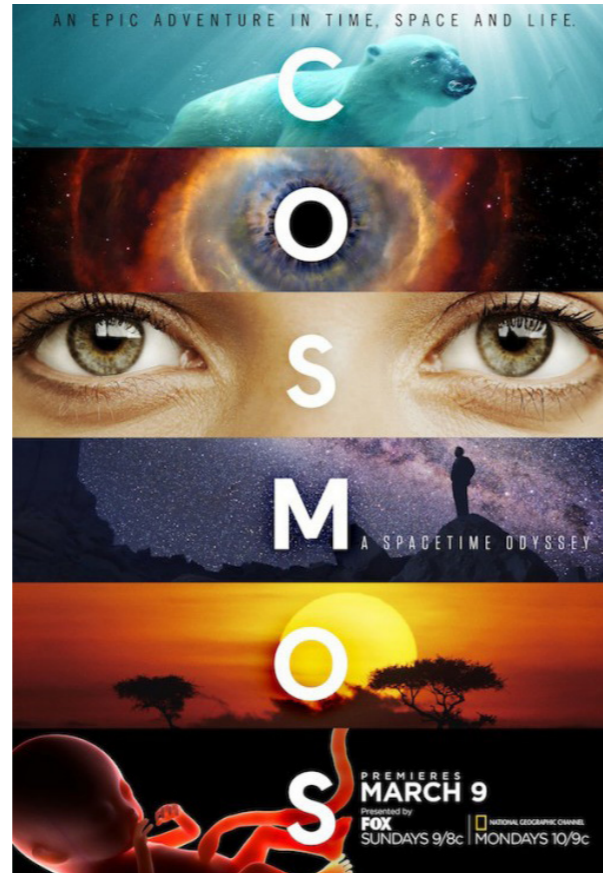


Image source: <http://www.impawards.com/>

Coherence (2013)

GENRE: Science fiction, Thriller, Mystery

Directed by James Ward Byrkit, Coherence is a story about eight friends who meet for dinner on the night the Miller's Comet passes over Earth. This movie might take more than one watch to understand. It is based on the theories of multiple parallel realities and is different from the other sci-fi movies.

[Spoiler Alert]

While discussing news about the Miller's Comet during dinner, one of them recalls that one such comet passed through Finland in 1923 and it affected many people. After it passed, people would get lost, would end up in the wrong home, they would forget things and wouldn't know where they were. Amidst this, a power

cut occurs which marks the start of intertwined realities. The passing of the comet causes their house and the occupants to intertwine with multiple such houses and occupants from other realities. The city gets covered in darkness except for a house two blocks away from them. But there exists an unusual dark area outside the houses, which is the dark zone in between the realities and whosoever passes through that, never returns to his/her original reality.

Two of them decide to go and make a phone call from the "other house" and as a result cross over into another reality and their doubles come in from yet another reality but no one realizes this switch!

Quantum decoherence would have stopped these realities from interacting but the comet was in such close proximity to Earth, it made them interact. The movie is filled with many such intricate details. One dialogue that hits is, "All this while we were wondering if the other 'us' were the darker versions of us, but what if we are the darker versions?"

// Gunjan Bisht
1st Year, B.Sc.(Hons.) Physics



Image source: <http://www.impawards.com/>

Dark (2017-20)

Image source: <http://www.tinycouchreview.com/>



// Jyotismita Adhikary
3rd Year, B.Sc.(Hons.) Physics

GENRE: Thriller, Drama, Science fiction, Mystery, Supernatural

This summer I came across this wonderful science fiction series named "Dark". Dark is the very definition of complexity. It promises to keep us on the edge and also makes us think about the things long after we've finished watching the series. The story revolves mainly around time travelling by a teenager and subsequently many more due to opening of a portal and how the deeds in different times affect the past, present and the future. But it would not give the series justice to explain it in this way because it is way more complex than that. It talks about how our lives are connected with others and how a small deed or action can affect the world which is actually based on the concept of butterfly effect. The series also discusses many paradoxes. Among those the one which caught my eye was the Bootstrap paradox. The series gives a feeling of connectedness. It also discusses possibilities of multiverses. This is one of the few series which cannot be explained entirely with a few lines. It makes you think about your very existence and how different it can be from our perception. This series is a must watch for anyone who is remotely, if not deeply, interested in physics.

The Island (2005)

GENRE: Science fiction , Action, Thriller, Adventure

CAST: Scarlett Johansson, Ewan Mc Gregor, Sean Bean, Djimon Hounsou.

DIRECTOR: Michael Bay

SYNOPSIS : "The Island" is not a film praising about the beauty of an island, in fact its a science fiction action thriller film. Michael Bay used the idea of genetic engineering in this film.

"The Island" gives a glance of dark side of science and technology and the threat lying in future.

REVIEW :

The movie begins with people living in a sterile sealed futuristic environment. The first half of the film deals with the life of people living there. They are told that the outer world is contaminated by pathogen. All the residents are made to follow strict set of instructions. They are frequently shown an advertisement of an island- the only pathogen free place on earth and the only way to get there is by winning the lottery.

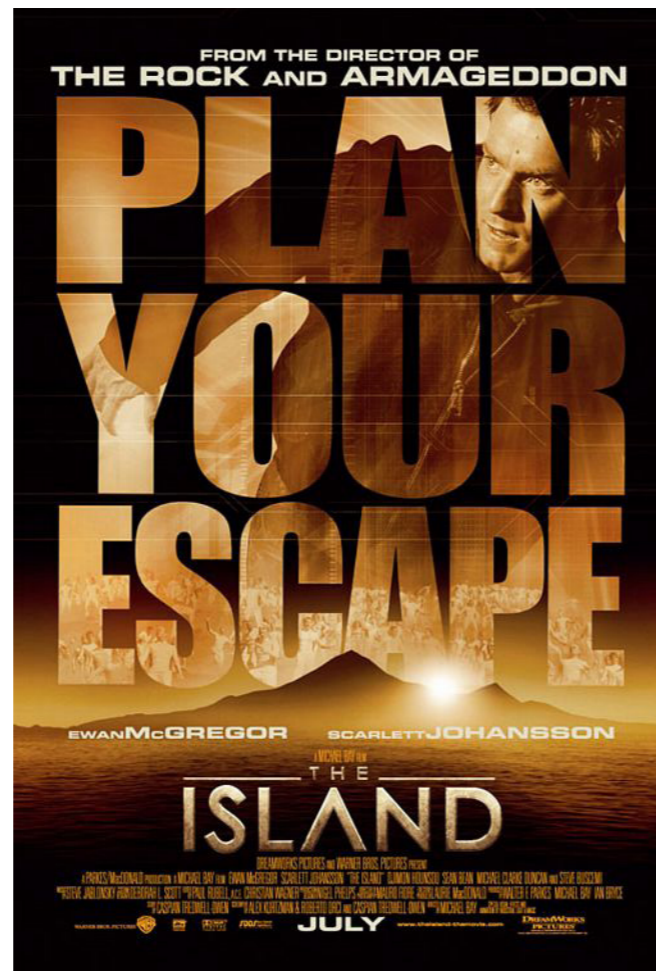
Story turns when one person, out of curiosity breached into the restricted area of the sealed world and discovered that outer world might be different than what they are told.

Avoiding some spoilers, lets skip to the second half of the film. It begins when two of the residents escape from the sealed world. This part is full of action where they are chased with the help of high tech gadgets and automobiles, meanwhile revealing the underlying truth of the sealed world.

I absolutely loved this film. It keeps me thinking of few unanswered questions. I would recommend this movie to all the people who take a keen interest in sci-fi and thriller. It has simply enough of an ethical and moral argument at its core to create it thought provocative.

// Mansi Singh
3rd Year, B.Sc.(Hons.) Physics

Image source: <http://www.impawards.com/>



The Nobel Prize in Physics 2020

Perna Sharma
3rd Year, B.Sc.(Hons.) Physics

The Nobel Prize in Physics 2020 is divided into two parts:-
One half the Noble Prize awarded to **ROGER PENROSE** for the discovery that black hole formation may be a robust prediction of the overall theory of relativity.

He proved that black holes are an immediate consequence of Albert Einstein's general theory of relativity by using ingenious mathematical methods. Einstein didn't himself speculate that black holes exist, these super-heavyweight anomalies that invade everything that enters them. Nothing can flee or escape, not even a ray of light.

After 10 years of Einstein's death, in January 1965, Roger Penrose proved that black holes really can form and interpreted them in detail; at their heart, black holes hide a singularity during which all the known laws of nature cease. His groundbreaking article remains considered due to the foremost vital contribution to the general theory of relativity since Einstein.

The other half of the Noble Prize awarded jointly to Professor **REINHARD GENZEL** and Professor **ANDREA GHEZ** - for the discovery of the very fact that supermassive compact object is centered at the centre of our galaxy.

They have been regulating and monitoring the centre of the Milky Way for nearly three decades. They were studying and monitoring the compact radio source Sagittarius A* near the galaxy's centre which we now call to be a Supermassive Blackhole.

Sagittarius A* is 25,000 light-years away. They managed to keep tracking the stars using near infrared telescopes and successfully proved that the mass was concentrated at a centre - Sagittarius A*. They detected stars 'S2' and 'So2' named by the teams which orbited Sagittarius A* in 16 years, taking elliptical orbit. The imaging of the black hole silhouette by the Event Horizon Telescope further establishes the existence of supermassive black holes, thereby upholding the prize this year.

After being honoured by this award Professor ANDREA GHEZ becomes the fourth woman to be awarded the Nobel prize in Physics after Marie Curie in 1903, Maria Goeppert-Meyer in 1963, Donna Strickland in 2018.

References:

[1] <https://www.nobelprize.org>

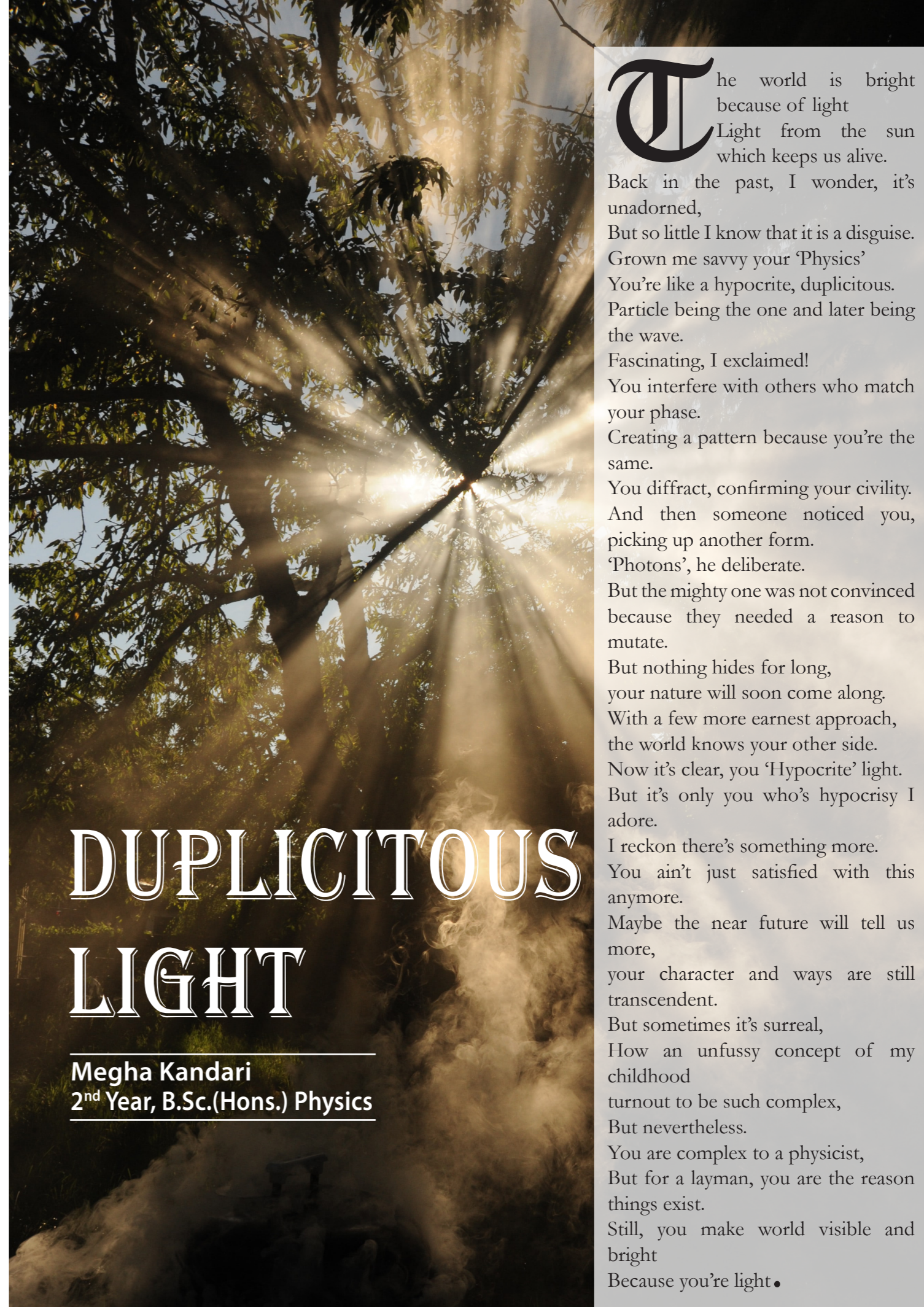
[2] <https://www.thehindu.com>

BE AWARE, THOUGHTS (MESS) INSIDE

Prachi Rauthan
2nd Year, B.Sc.(Hons.) Physics



Solving the mysteries that never existed, are we?
Seeking justice for the crime never committed, are we?
Escaping into the oblivion, are we?
Sun rises in the East, is "The Universal Truth"
But what if East is lost itself
Seeking directions from defaulted compass
Truth is what we are talking about
If it is not universal
It might be a lie, probability fair enough
In this meaningless world, seeking meaning, are we?
Looting the "now" of its presence, are we?
Identity over survival
Deterrence over compassion
Just existing over living, are we?
Wait, in this havoc and circling thoughts
WHAT is the answer
Well "now" the question is yours
and the answer too
But Hey!
Be aware, Thoughts (mess) inside.



DUPLICITOUS LIGHT

Megha Kandari
2nd Year, B.Sc.(Hons.) Physics

The world is bright
because of light
Light from the sun
which keeps us alive.

Back in the past, I wonder, it's
unadorned,
But so little I know that it is a disguise.
Grown me savvy your 'Physics'
You're like a hypocrite, duplicitous.
Particle being the one and later being
the wave.
Fascinating, I exclaimed!
You interfere with others who match
your phase.
Creating a pattern because you're the
same.
You diffract, confirming your civility.
And then someone noticed you,
picking up another form.
'Photons', he deliberate.
But the mighty one was not convinced
because they needed a reason to
mutate.
But nothing hides for long,
your nature will soon come along.
With a few more earnest approach,
the world knows your other side.
Now it's clear, you 'Hypocrite' light.
But it's only you who's hypocrisy I
adore.
I reckon there's something more.
You ain't just satisfied with this
anymore.
Maybe the near future will tell us
more,
your character and ways are still
transcendent.
But sometimes it's surreal,
How an unfussy concept of my
childhood
turnout to be such complex,
But nevertheless.
You are complex to a physicist,
But for a layman, you are the reason
things exist.
Still, you make world visible and
bright
Because you're light.

TRIGGER WARNING: Facts Brimmed With Appropriate Humour

Rishu Jakhar
2nd Year, B.Sc.(Hons.) Physics

Can we stop here once for this moment to pay heed towards this question frequently asked these days to students “Why are you studying Physics? (Or with any other basic sciences you can relate)” The question is quite amusing, isn’t it?

But more are the blatant replies:

- (i) Because I found this subject quite engaging and even used to score well in it (or maybe I had developed the talent to cram technical content?)
- (ii) Because I used to connect its concepts with real-life and find it interesting (ok buddy, so you are using Kirchhoff’s law thrice a day and feeling relieved? Not bad.)
- (iii) I am bound to study it because I filled the subject in admission form (umm well this is the language of gods)

Let me clear in prior that it’s not the fault of any of us to come up with such replies. It’s a normal human nature that we always try to sound more sorted, sophisticated and logical. But what if we start doing it

logically? What if we rail up ourselves in a system where we can think in a novel way and not just how Edison thought? The failures, the drawbacks, the shortcomings should also be a part of our curriculum and learning. Isn’t it? And here the shortcomings I refer should be related to what a student thinks and not always those from Bohr’s atomic model. The words may sound rebellious and harsh but these are not anyhow against what we are learning in our sciences. In fact, science melts every harsh and dissonant complication into a very harmonious reasoning. It’s the Physics which urges us to compute how the earth could have been, how it is now and what it can be in upcoming times. The facts and observations are flabbergasting. The records which have been set in the history of mankind leave us awestruck at different levels. Let us appreciate that science is a broader and more beautiful concept than a mere subject. Its flexibility of providing us with a platform to fantasize and experiment is bewildering, the achievements made so far leave us dazed until and unless the word science doesn’t remind us of our NCERT textbooks, the stream with the brightest job opportunities, a subject which murders creativity of students on the holy name of labs and observations, that too at a dramatic rate (Quite filmy? Sad? Now imagine actually going through it.

Wait. Where have we reached by now? And why was this piece of writing containing more of frustrating facts and not the magic this discipline actually possesses?

Magic Square

Rani Verma
2nd Year, B.Sc.(Hons.) Microbiology

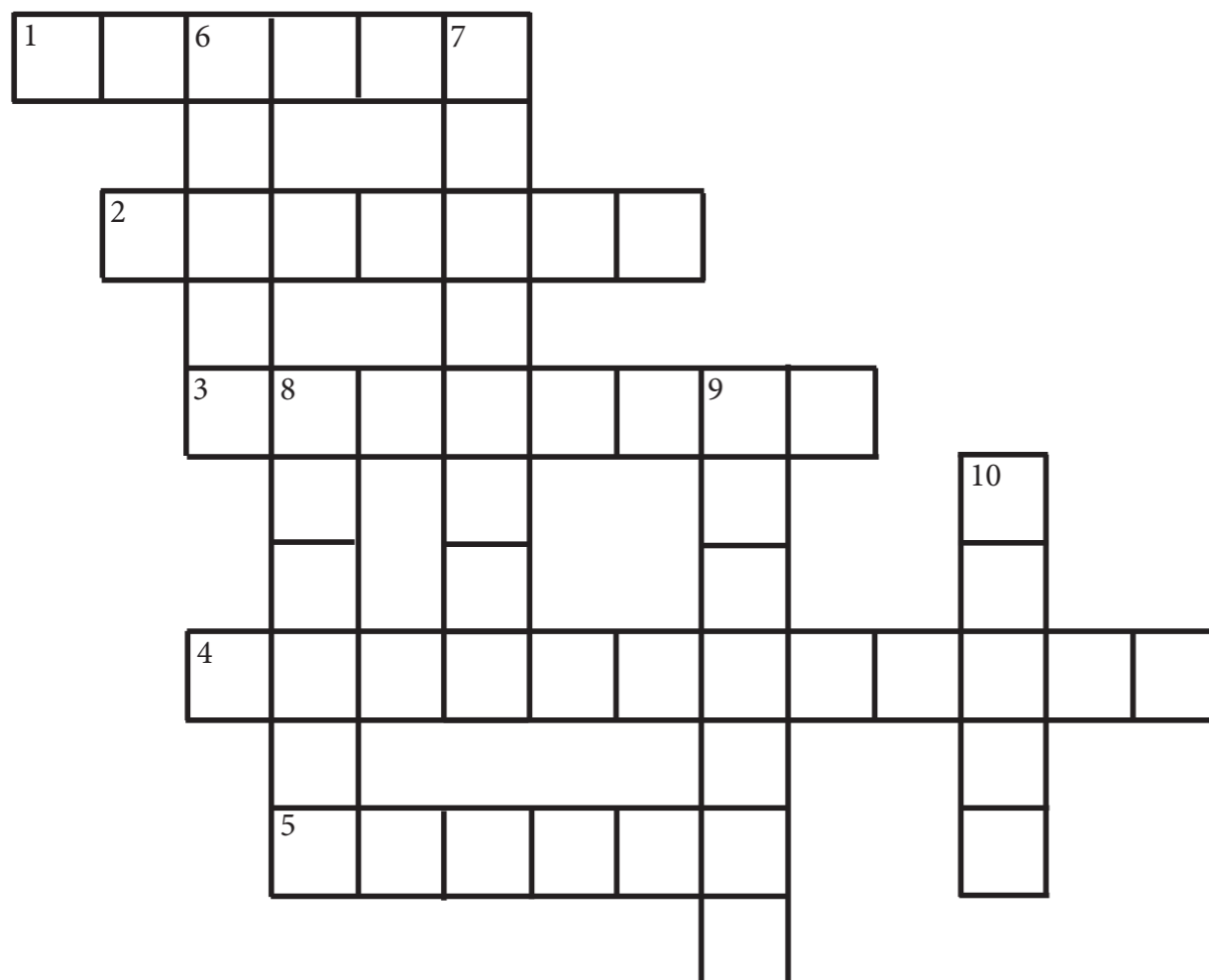
29			87
	30	22	
			35
	92		

Fill in the 4X4 magic square with the numbers 1 to 99 so that the number in every row, column, diagonal, central square, corner and the boxes with same colour add up to same number, i.e., 136.

THE NUMBERS SHOULD NOT REPEAT!

Answers on page 54-55.

Crossword



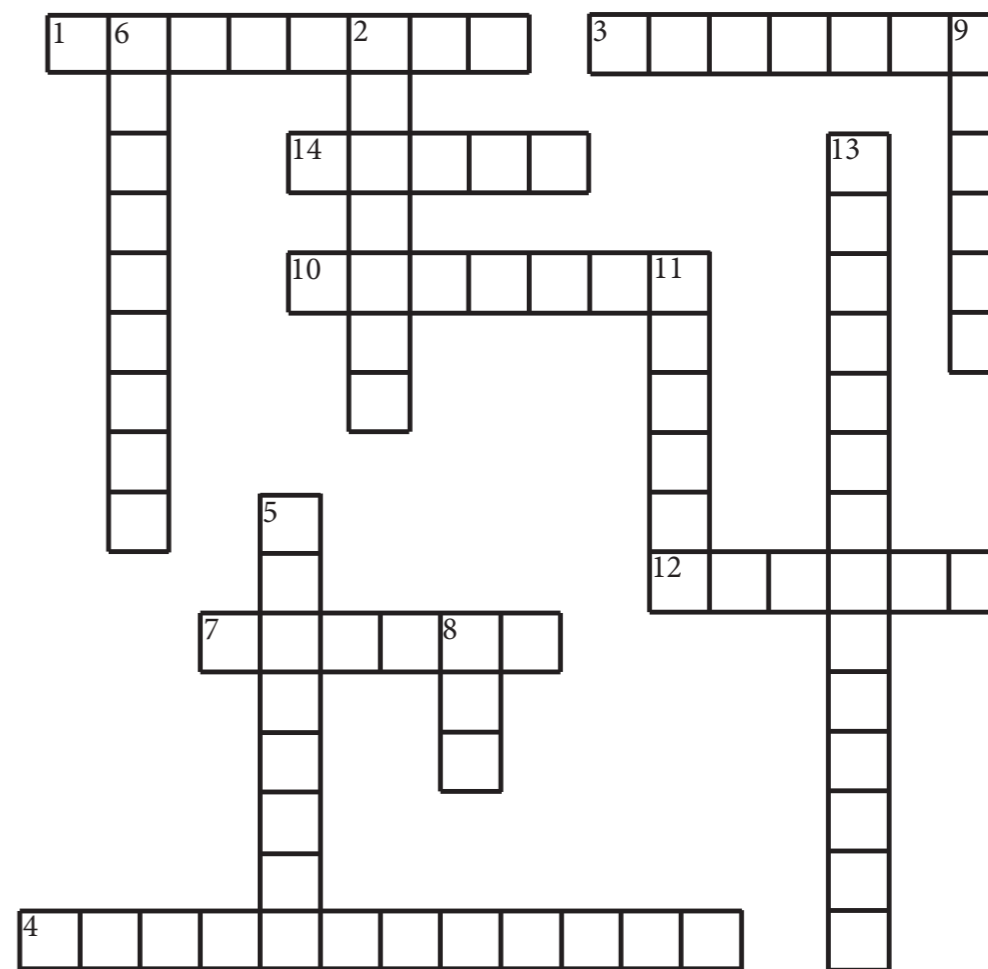
ACROSS

1. Quintessence (6)
2. Author of The Almagest (7)
3. Created in weak interactions (8)
4. So close, yet so far (12)
5. DC generator (6)

DOWN

6. Largest moon of saturn (5)
7. Unit of measurement for ionizing radiation (8)
8. Father of geometry (6)
9. Isotope's mass number = number of _____ (7)
10. The God particle (5)

Tanishi Verma
1st Year, B.Sc.(Hons.) Physics



ACROSS

1. The first artificial Earth satellite launched by The Soviet Union in 1957.
3. The natural science that studies matter, its motion and behaviour through space and time and the related entities of energy and force.
4. The lowest temperature possible.
7. A quantity that has both magnitude and direction.
10. The branch of mechanics concerned with bodies at rest and forces in equilibrium.
12. SI unit of force.
14. A subatomic particle which is intermediate in mass between an electron and a proton and transmits the strong interaction that binds nucleons together in the atomic nucleus.

DOWN

2. A property of matter by which it continues in its existing state of rest or uniform motion in a straight line, unless that state is changed by an external force.
5. Any motion of a body where gravity is the only force acting upon it.
6. The physical science of light generation, detection, and manipulation through emission, transmission, modulation, signal processing, switching, amplification, and sensing.
8. SI unit of electrical resistance.
9. The quantities that are fully described by a magnitude (or numerical value) alone.
11. The measure of how much an object is stretched or deformed.
13. The tendency of liquid surfaces to shrink into the minimum surface area possible.

Gunjan Bisht
1st Year, B.Sc.(Hons.) Physics

Answers on page 54.

Canvas painting by
Sakshi Sharma
2nd Year, B.Sc.(Hons.) Physics

QUASAR CORNER



*Inspired by an Instagram filter

BAMC Masterclasses:

Hands-on analysis of data from CMS Experiment at CERN- A way forward for Practical learning of Particle Physics.

Dr. Vandna Luthra
Physics Department,
Gargi College.

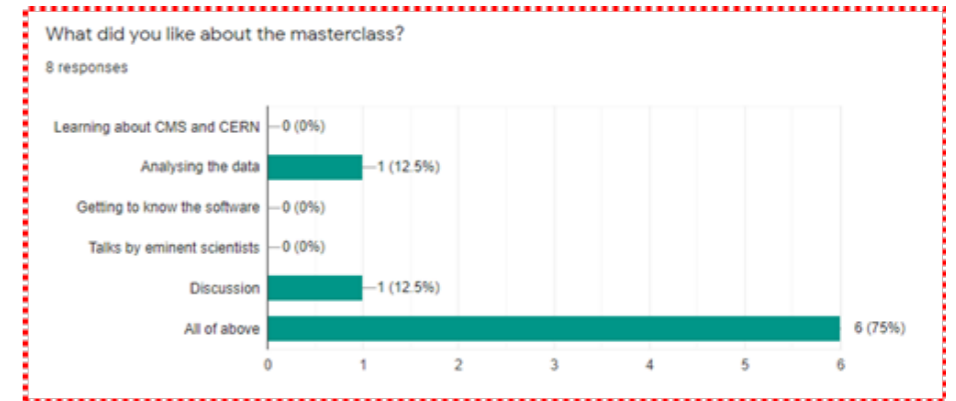
This year eight B.Sc Physics (Hons.) students participated in the Big Analysis of Muons in CMS (BAMC) Masterclass implemented by International Masterclasses, QuarkNet [1], and the International Particle Physics Outreach Group (IPPOG), which was done under my direction. As part of this unique masterclass, the students attended an online particle physics lecture, independently

analyzed authentic data from the CMS experiment of the Large Hadron Collider (LHC) at CERN [2], and participated in a webinar to discuss results with physicists. In particular, the students studied interactions in CMS detector that result in one muon and one neutrino, two muons or four muons. The purpose of this was to find the ratio of W^+ to W^- events (from one muon and one neutrino) and find the masses of parent particles that transform into 2 muons or 4

muons. The students used the iSpy and CIMA software to complete their measurements and analysis which was then discussed in a videoconference with physicists in this field by comparing the collated results of the participants from across different countries with data obtained from scientists at CERN.

From feedback obtained from the students who participated in this event, the students agreed that they learnt more about particle physics and particularly gained an insight into the experiments at CERN, as they had the opportunity to work with and analyze real data. It also helped them to fill in gaps between theoretical knowledge and they could visualize the collisions and were able to ask questions from renowned

physicists working at CERN and in the field in particle physics from different international collaborating institutes. The students felt it was beneficial for UG students to be exposed to real-life experiments and interact with scientists through webinars and felt that such experiences should be integrated into the teaching wherever possible to find out about the discoveries and future in fields such as particle physics in order to increase practical knowledge and give a more comprehensive



and well-rounded understanding of what is taught in the lessons. I am thankful to the organizers of BAMC Masterclasses for providing an enriching learning opportunity which is a perfect outreach activity. Many such

activities are the need of the hour for other fields as well so as to retain the interests of the students in science and will surely bridge the gap between the theoretical and applied physics.

References

- [1] <https://quarknet.org/content/bamc-masterclass-student-launch-page>
- [2] <https://home.cern/science/experiments/cms>

STUDENT EXPERIENCE

Shruti Gupta
3rd Year, B.Sc.(Hons.) Physics

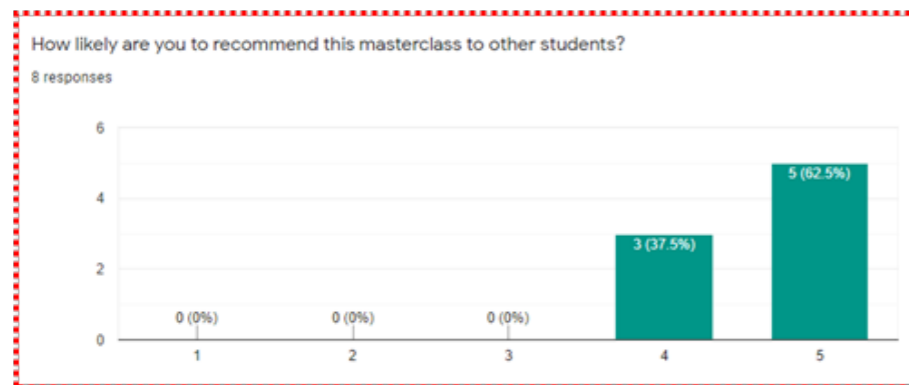
On 27th May, 2020, at 9:00am, our college participated in an online webinar for students pursuing/interested in physics which aimed at Big Analysis Of Muons implemented by International Masterclass, Quark Net and the International Particle Physics Outreach Group(IPPOG).

In this particle physics lecture, students analyzed authentic data from Compact Muon Solenoid (CMS) experiment of the large hadron collider at CERN. They learned about missing energy particle, 2, 3 and 4 muon reactions. They filled data in CIMA and interpret some histograms.

The webinar started with great enthusiasm and full of positivity. Dr. Vandna Luthra Ma'am,

Physics Department, Gargi College was the instructor of this webinar and helped students in every way possible. The Physicists of this lecture discussed results with students and made them visualize the histograms recorded. After this, they held a query session in which students from all over the world asked their doubts with the physicists.

The much attended and well organized webinar came to an end. Students enjoyed this lecture and it made them look at physics with a new perspective. It will surely be helpful for their future. Overall it was a very informative and interactive session.



THE INAUGURAL LECTURE

Gunjan Bisht
1st Year, B.Sc.(Hons.) Physics

Quasar, the Physics Department of Gargi College organised its inaugural lecture on "Future scopes of research activities in Accelerators, associated science and applications" dated 11th Sept, 2019. It was held in one of the lecture halls of the college with Dr. Dinakar Kanjilal, FNA, FNASc, DAE Raja Ramana a fellow and former director, IUAC, as the eminent speaker.

The event started at 12:20pm with the arrival of the guest, Dr. Dinakar Kanjilal. It was followed by a traditional lamp lighting ceremony by our

guest, Dr. Dinakar Kanjilal, Dr. N Chandrika Devi - TIC (Physics Department), Dr. Vandna Luthra - convener, Physics Society and all the faculty members. It went along with a melodious Saraswati Vandana sung by Preeti, a student of 2nd year.

Students from all three years volunteered in the event and took care of the decorum, presentation and technical issues related to it.

Dr. N Chandrika Devi then presented a token of gratitude to our guest, Dr. Dinakar Kanjilal. The Physics department celebrated that week

(11-18 Sept 2019) as 'e-waste collection and awareness' week. Students and teachers were asked to bring e-waste such as earphones, old batteries etc. Dr. Dinakar Kanjilal along with the faculty and students headed off to the Physics lab and disposed of all the e-waste safely. E-waste from the lab was also disposed of. They were also informed about the proper ways to deal with e-waste.

It was followed by a lecture on "Future scopes of research activities in Accelerators, associated science and applications" by Dr. Dinakar Kanjilal. He gave

a brief presentation on how the Accelerator systems work and what all kinds we have in India. He also clarified how undergrad/postgrad/doctorate students can join the research activities conducted by IUAC and other research centres in the country. An open discussion and query session followed up next.

Priyanka Gupta, president, Quasar, thanked Dr. Dinakar Kanjilal for his eminent presence.



An investiture ceremony was held for the newly elected union of Quasar which has Romanpreet as Joint Secretary, Kashish Bhatia as General Secretary, Tanvi Sharma as the Treasurer, Rishu Jakhar as Vice President and Priyanka Gupta as the President.

Next, the department distributed certificates to the students of different science subjects (physics, life sciences, physical sciences etc.) who attended the summer workshop organised by the Physics department on 18th and 19th July, 2019.



Dr. Dinakar Kanjilal was presented with a copy of 'PHYSIKOS'- the annual magazine of the Physics Department. The event concluded with refreshments arranged for all the teachers and the students.



From teachers and lab staff



E-WASTE COLLECTION

SUMMER WORKSHOP

Megha Kandari
2nd Year, B.Sc.(Hons.) Physics

The two days summer workshop organised by the Department of Physics, Gargi college, which began on 18th July, 2019, was a very interesting and informative workshop.

The workshop was kick-started by the inauguration and motivational talk by our very own principal ma'am Dr. Promila Kumar. She started by praising the efforts of the coordinator of the event Dr. Vandna Luthra ma'am. She appreciated the efforts, enthusiasm of the coordinator for organizing this interdisciplinary workshop for the benefit of the students, especially how it will orient students towards higher studies and adopting science as a career. The workshop was also attended by the students of other science departments. Her words really motivated us to attend and enjoy this workshop even more. Then it was Dr. Alka Garg ma'am who introduced the topic of X-ray diffraction and with her ever enthusiastic tone which captures your attention anyway, was so informative that students were making notes out of curiosity. She told us about different techniques and various apparatus related to X-ray diffraction which included some mathematics as well. Then to our greatest delight, she shared her PhD research work and showed us different patterns of X-ray diffraction.

The second day started with the presentation by Dr. Archana ma'am on Solid States. She covered topics like Bravais lattices and solid-state theory which

was very intriguing. Then the day was further continued by Dr. Vandna Luthra Ma'am. She taught us about plagiarism and copyright issues and about various other certificates related to the authenticity of one's work. She also gave us profound knowledge on open book sources and various software like SFS, Blender light works video editing, GIMP and POWTOON. These were a few things which we were oblivious about but after this informative session, I'm sure that at least all the attendees will be careful from next time. She also gave a substantive lecture on XRD, its basics and applications. To conclude

the workshop ma'am solved a problem using python. As the event coordinator, Dr. Vandna Luthra Ma'am appreciated the efforts of the teaching and non-teaching staff for participating keenly in this very workshop.

This was an illuminating workshop satisfying our quest knowledge and curiosity. All the students had extensively enjoyed themselves and are really looking forward to other such workshops in near future.

**ORGANIZES
SUMMER WORKSHOP
JULY 18-19 2019**

Flavours of Interdisciplinary Research

18th July
10.00 – 1.00 pm
1.30-3.00
Talks/ Lectures cum Hands-on

19th July
10.00 – 1.00 pm
1.30 to 3.00 **Venue : Physics Lab**
Talks/ Lectures cum Hands-on


Free and Open Sources
Interfacing of Experiments using Expeyes
Simulations using Python
Crystal Structures
X-Ray Diffraction
X-Rays and Material Science

Come and Explore the joy of Science

For Registration queries send mail to phys.gargi@gmail.com

Workshop On Quantum Mechanics & Its Applications

Ayushi Choudhary
2nd Year, B.Sc.(Hons.) Physics

 On 24th September 2019, a workshop was organized by The National Academy of Sciences, India-Delhi Chapter and Department of Physics, Daulat Ram College, University of Delhi on the topic “Quantum Mechanics and its Applications”. The limelight of the workshop were the keynote speakers Prof. Ajoy K. Ghatak (Meghnad Saha Fellow of National Academy of Sciences, India, Formerly Professor of Physics at IIT Delhi), Prof. Patrick Das Gupta (Department of Physics and Astrophysics, University of Delhi) and Prof. Anirban Pathak (Department of Physics, Jaypee Institute of Information Technology, Noida).

Students from different colleges attended the workshop. It commenced with lamp lighting followed by a welcome speech given by the TIC (Physics) Neetu Aggarwal. The workshop began with a technical session with Professor Ajoy Ghatak on basic quantum physics and its applications. In this session, the Professor talked about applications of quantum physics on a microscopic level. He presented a lecture on what is light and evolution of quantum theory. Later, he compared quantum and classical mechanics. He also explained the role of quantum mechanics in diffraction and interference phenomena. Moreover, he also mentioned several

scientists and their contribution to quantum physics.

After this 1 hour session, there was a tea break which was followed by another technical session with Prof. Ajoy Ghatak in which he talked about polarisation beam splitter. Later in Prof. Patrick gave some information on calcite crystal and double refraction in calcite crystal. The Professor had highlighted the applications of quantum mechanics on macroscopic level & application of quantum mechanics in super-fluids and superconductors. He mentioned the three hallmarks of superconductors i.e., zero resistance, complete diamagnetism & macroscopic quantum effects. He also provided information on phonons, cooper pair of electrons, tunnelling, bounce state, flux quantisation. This session was followed by an interactive session with Prof. Patrick. A quiz (written) was also organised by department of physics, Daulat Ram College on quantum mechanics.

The last technical session was conducted by Prof. Anirban Pathak. He presented his lecture concerning the modern application of quantum mechanics. In this session, he mentioned the use of quantum mechanics in satellites, microprocessor, medical and research imaging such as magnetic resonance imaging and electron microscopy. He

also mentioned about inherent advantage yielded by quantum cryptography, quantum computing and quantum teleportation. He had presented further the advantages of quantum computers i.e., computational tasks can be performed exponentially faster than classical computers, it may progress the fields of medicine, logistics, financial services, artificial intelligence and cloud security (used in electoral services). Instead of using classical bits, quantum computers use qubits, which can be in

a superposition of states. Another active research topic is quantum teleportation, which deals with techniques to transmit quantum information over arbitrary distances.

There was an interactive doubt session with Prof. Anirban Pathak. Later on, prizes and certificates were distributed to the winners of the quiz followed by a formal vote of thanks.

Spell Bee

Nikita Saini
3rd Year, B.Sc.(Hons.) Physics

The department of physics organized spell bee competition, ‘The Well of Spells’ and received enthusiastic participation from various departments. Dr. Chhaya Sawhney, Department of Elementary Education and Dr. Vandna Luthra, Department of Physics were the judges for the day.

The professors pronounced the words that the students were supposed to tell the spelling of. If correctly answered then they got points for that. Every student was given a different word.

After 5 rounds of mind-boggling and confusing spellings, Ripundhi Lepcha, Physics Hons (II) bagged the title of “Spell Wizard”. It was a tough competition indeed.

Prize to the winner and token of love to judges were given away. The event was wrapped up with some words of motivation from judges.

The event was a great success. The students gave reviews that this kind of competitions should be conducted every year because it was interesting and knowledgeable as well.



Visit to IUAC

Prerna Sharma
3rd Year, B.Sc.(Hons.) Physics

This academic visit was carried out at Inter-university Accelerator Centre (IUAC) on 28th February 2020 (National Science Day), especially for final year students. The purpose of the visit was to make students aware of on-going researches and development in the field of Atomic Physics, Nuclear Physics, Materials Science, etc. IUAC, with the primary and basic purpose of providing front ranking accelerator based research facilities to create chances for international level competitive research under the university system, was established in October 1984.

Dr. Heera Joshi along with 11 students visited the centre where students from different colleges were



also invited. On this prestigious occasion of National Science Day, introduction speech was delivered followed by the theme "WOMEN IN SCIENCE". After that, Dr. D.K.Aswal, the director of CSIR-National Physical Laboratory (NPL-India) is mandated to be India's "National Measurement Institute" (NMI) delivered a lecture in which he explained the importance of accurate and precise measurements in the growth of Indian Science and Industry.

On the same day, there was a poster making competition under the topic "Applications of Particle Accelerators for mankind: Futuristic view" in which teams from various colleges participated and discussed queries with jury members. Students from our college also presented a poster under the guidance of Dr. Vandna Luthra Ma'am. After that, there was another lecture on Materials Science after lunch break followed by another lecture by one of the honourable scientists of IUAC about the infrastructure, achievements, and research of this well-developed centre.

After all these lectures and interactions with



scientists, all students were divided into groups and were headed by one scientist of IUAC who helped them to visit labs, production areas, and research work going on in respective labs. Students took almost 2 hours to see and understand the complete set of instruments and production facilities of colliders and this session was full of enthusiasm followed by interesting queries of students.

It is correctly said that "see and know" is a better option than "read and learn". Where students got a chance to visualize practical implications.

Then, the IUAC team extend their gratitude to Dr. D.K Aswal, all honourable scientists and respected guests of the event followed by the announcement of the winner team of poster making competition and thanked each and every member of the event to make this event successful at this extent and wished good luck to students for their bright future •



References

[1] www.iuac.res.in

Talent Hunt

Megha Kandari
2nd Year, B.Sc.(Hons.) Physics

It's easy to find other's talents but it takes a lot of self-awareness to know one's own. Sometimes it's surreal to open up in front of people, having self-doubt, "Is my talent worth showcasing?" But folks take my words, "EVERY TALENT IS UNIQUE."

With this impression in mind QUASAR: The Department Of Physics, organised 'PARICHYA' 19 : Talent Hunt (25th September' 19), to give a platform to various skill bearers to showcase their talents. The event



It became quite difficult for the members of the jury to choose one among so many god-gifted talents. They were all appreciated and were awarded certificates.

This event concluded with a 'vote of thanks' speech by Quasar President, Priyanka. The whole department relished the event immensely and is looking forward to its next edition •



was solicited by the gracious presence of our faculty of Quasar. Their support and patience were astounding.

The event began with a warm welcome by the anchors. The room was filled with excitement and nervousness. There were all genres of talents, from dancing to signing, from poetry to mirror writing and the way all the contestants presented themselves was marvellous. The event can be recognized as a huge success. Everyone sat glued to the show as it was going and going through the mesmerizing phases.



Answers

Crossword

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Across: 1) Aether, 2) Ptolemy, 3) Neutrino, 4) Planck Length, 5) Dynamo
Down: 6) Titan, 7) Roentgen, 8) Euclid, 9) Nucleon, 10) Higgs

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Across: 1) Sputnik 1, 3) Physics, 4) Absolute Zero, 7) Vector, 10) Statics, 12) Newton, 14) Meson
Down: 2) Inertia, 5) Freefall, 6) Photonics, 8) Ohm, 9) Scalar, 11) Strain, 13) Surface Tension

Magic Square

29	1	19	87
76	30	22	8
17	13	71	35
14	92	24	6

1. Sum of numbers of any row is 136

29	1	19	87
76	30	22	8
17	13	71	35
14	92	24	6

2. Sum of numbers of any column is 136

29	1	19	87
76	30	22	8
17	13	71	35
14	92	24	6

3. Sum of numbers of any diagonal is 136

29	1	19	87
76	30	22	8
17	13	71	35
14	92	24	6

4. Sum of numbers of corners is 136

29	1	19	87
76	30	22	8
17	13	71	35
14	92	24	6

5. Sum of central squares is 136

29	1	19	87
76	30	22	8
17	13	71	35
14	92	24	6

6. Sum of identical coloured squares is 136

29	1	19	87
76	30	22	8
17	13	71	35
14	92	24	6

7. Sum of identical coloured squares is 136

29	1	19	87
76	30	22	8
17	13	71	35
14	92	24	6

8. Sum of identical coloured squares is 136

29	1	19	87
76	30	22	8
17	13	71	35
14	92	24	6

9. Sum of identical coloured squares is 136

29	1	19	87
76	30	22	8
17	13	71	35
14	92	24	6

10. Sum of identical coloured squares is 136

Student's Achievements

	NAME	BATCH	ACHIEVEMENTS
1.	ANANYA GUPTA	2017-20	➤ 3rd prize-Data Science Challenge on Internshala (cash prize worth Rs.10,000/-).
2.	ANSHULIKA	2017-20	➤ 1st position -Saraki (Gargi Olympiad).
3.	MANSI SINGH	2017-20	➤ 1st position - Doodling Competition (Department of Chemistry, Gargi College).
4.	PARUL	2017-20	<ul style="list-style-type: none"> ➤ 1st position-Poster making (Department of Political Science, Gargi College). ➤ 1st position-Saraki (Gargi Olympiad). ➤ 1st position-Vigoro (Gargi Olympiad). ➤ 3rd position-Tug of War (Gargi Olympiad). ➤ Part of Music Club at AADI foundation(Performed at Zistatva with AADI Foundation). ➤ Internship under WooCoupons for Social Media Marketing and Content Writing. ➤ Recruited as a Business development Executive under Freeskout (through Gargi Placement Cell). ➤ Core member in a women empowerment program under Manzil Mystics NGO and performed at places as a vocalist with my all girls band "WeBhor".
5.	RIYA VERMA	2017-20	➤ Internship with K5 solution and Yourshell in social media marketing.
6.	RIYA	2017-20	➤ 1st position-Vigoro (Gargi Olympiad).
7.	SAIFALI	2017-20	<ul style="list-style-type: none"> ➤ 2nd position-Poster making competition (Department of Political Science, Gargi College). ➤ 3rd position-Paper Mania-Fun with paper (Janki Devi Memorial College, DU). ➤ 2nd position-Waste to Dress-Newspaper Dressing (Lady Irwin College, DU). ➤ 2nd position-Doodle Drive-Doodle Making (SSCBS, DU). ➤ Member of Hues (The Fine Arts Society of Gargi College).
8.	SAKSHI	2017-20	<ul style="list-style-type: none"> ➤ 2nd position-Hand painting competition (Department of Botany, Gargi College). ➤ 2nd position-Costume making competition (Lady Irwin College, DU). ➤ Member of Hues (The Fine Arts Society of Gargi College).

	NAME	BATCH	ACHIEVEMENTS
9.	MEEMANSHA BAHUGUNA	2017-20	➤ Internship under Eisystems Technex 2020 (IIT BHU) on python programming.
10.	SRISHTI DEHMIWAL	2017-20	➤ Internship on python programming at Eisystems Technex 2020 (IIT BHU).
11.	PRIYANKA GUPTA	2017-20	➤ Internship under Unschool on social media marketing.
12.	SONALI BHARDWAJ	2017-20	<ul style="list-style-type: none"> ➤ Internship under Program for International Student Assessment. ➤ Internship under Unschool on social media marketing.
13.	ANANYA SHANKAR	2018-21	➤ Treasurer of Quizzito (The Quiz Society of Gargi College).
14.	AYUSHI CHOUDHARY	2018-21	<ul style="list-style-type: none"> ➤ Project head of project KILKARNI (project by CDF and NSF). ➤ Internship under EXIMUS 2019 (IIM Bangalore).
15.	KASHISH BHATIA	2018-21	➤ Part of editing team of VOICES (Annual Magazine of Gargi College).
16.	MEGHA KANDARI	2018-21	<ul style="list-style-type: none"> ➤ 1st position – Quiz (Gargi Olympiad). ➤ Part of editing team of VOICES (Annual Magazine of Gargi College).
17.	MUSKAN VERMA	2018-21	➤ Internship under CAP at Nextias, Abhyuday (IIT Mumbai) and Techfest (IIT Kanpur).
18.	NEHA PANDEY	2018-21	<ul style="list-style-type: none"> ➤ Internship under KILKARI project. ➤ Internship under Kind Being.
19.	KOMAL KUMARI	2018-21	➤ 1st position in inter college ball badminton tournament.
20.	PRACHI RAUTHAN	2018-21	<ul style="list-style-type: none"> ➤ 2nd position-Intra Debating competition. ➤ Member of QED (The English Debating Society of Gargi College).
21.	PREETI REDHU	2018-21	<ul style="list-style-type: none"> ➤ Participated in CM Rally 2020. ➤ Sergeant in NCC.
22.	RISHU JAKHAR	2018-21	<ul style="list-style-type: none"> ➤ Campus Ambassador under CAP, Rendezvous, IITD. ➤ 70 days of internship of online training and teaching as ISP under Internship.
23.	SHREYA JOSHI	2018-21	➤ Internship under CAP:RDV, IIT Delhi.
24.	SAKSHI SHARMA	2018-21	<ul style="list-style-type: none"> ➤ Internship under KILKARI project (by CDF through NSS). ➤ Member of Union Creative Team.
25.	TANVI SHARMA	2018-21	➤ Internship under KILKARI project.

Spin 2020: Best March Past

Quasar, the Department Of Physics, Gargi College, won the best March Past in the Annual Sports Meet, SPIN 2020, held on Feb 28th, 2020. It was the hard work of all the girls of the squad who with their confidence & the motto of "AATMADEEPAH BHAWA", meaning BE YOUR OWN LIGHT, were successful in winning the championship. It was an amazingly synchronized performance & ultimately it added glory to the Department of Physics.



NAMES OF THE PARTICIPANTS:

B.Sc.(Hons) Physics, 2017-20: Priyanka, Yukta, Parul, Srishti, Muskan, Anjali, Ruchika, Mansi, Sakshi, Vidhi, Parnika.

B.Sc.(Hons) Physics, 2019-22: Vaishali, Navjeet, Aarzoo, Poonam, Tanya, Roman.

Student Union 2019-20



From left to right:

VICE-PRESIDENT Rishu Jakhar

TREASURER Tanvi Sharma

PRESIDENT Priyanka Gupta

GENERAL SECRETARY Kashish Bhatia

JOINT SECRETARY Romanpreet

Star Achievers!

- BATCH 2016-19

 <p>Himani Sharma CGPA = 9.324 (Sem I-VI)</p>	 <p>Sangeeta CGPA = 9.324 (Sem I-VI)</p>	 <p>Shivani Sharma CGPA = 9.27 (Sem I-VI)</p>
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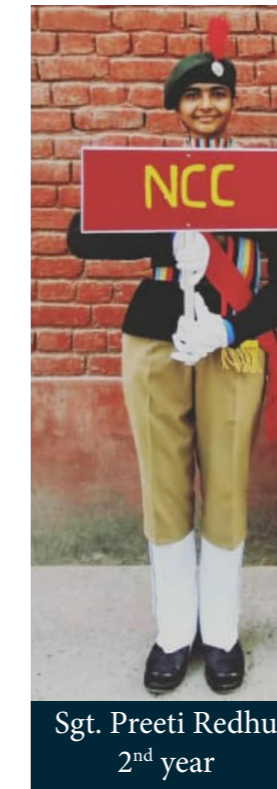
- BATCH 2017-20

 <p>Muskan Khanna CGPA = 9.89 (Sem III-IV)</p>	 <p>Arjyama Bordoloi CGPA = 9.79 (Sem III-IV)</p>	 <p>Jyotismita Adhikary CGPA = 9.715 (Sem III-IV)</p>
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- BATCH 2018-21

 <p>Ritika Pandey & Manju CGPA = 9.18 (Sem I-II)</p>	 <p>Shabana Sheikh CGPA = 8.86 (Sem I-II)</p>	 <p>Tanvi Sharma CGPA = 8.82 (Sem I-II)</p>
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Our National Cadet Corps



The Teaching Faculty



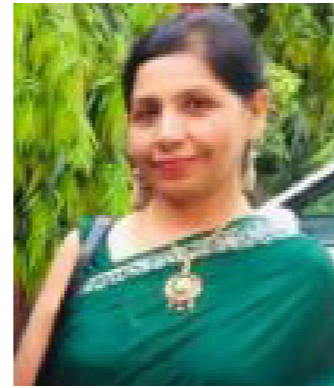
Dr. Indu Dutt



Dr. Deepti Lehri



Dr. Alka Garg



Dr. Vandna Luthra



Dr. Supreeti Das



Dr. N. Chandrika Devi



Mrs. Anita (on leave)



Dr. Hira Joshi



Mr. Munish



Dr. Archana Tripathi



Ms. Mansi Agrawal



Dr. Manvi



Mr. Sachin Kumar



Dr. Surendra Kumar

The Lab Faculty



From left to right: Mr. Shekhar Chand, Mr. Santosh, Mr. Sushil, Mr. Vinod Dubey, Mr. Sher Bhadur, Mr. Baleshwar Prasad, Mr. Hemraj, Mr. Sanjeev Kumar

Our Ph.D. Scholars



Mr. Sachin Kumar



Mr. Param Shivam Singh

Class of 2020



ANANYA



ANJALI



ANKITA



ANSHULIKA



ARJYAMA



CHANCHAL



JOCELYNE



JYOTISMITA



KALPANA



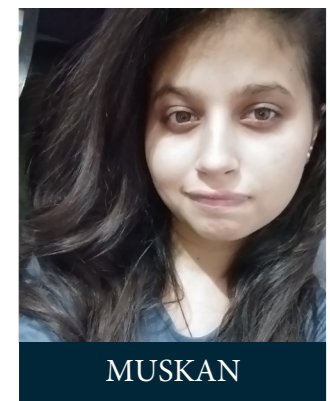
KRATI



MANSI



MEEMANSHA



MUSKAN



NIKITA



PARNIKA



PARUL



POOJA YADAV



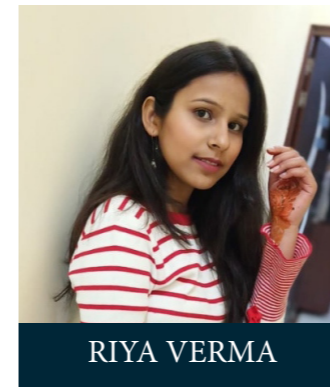
POOJA



PRERNA



PRIYANKA



RIYA VERMA



RIYA



RUCHI



RUCHIKA



SAIFALI



SAKSHI JAGLAN



SAKSHI

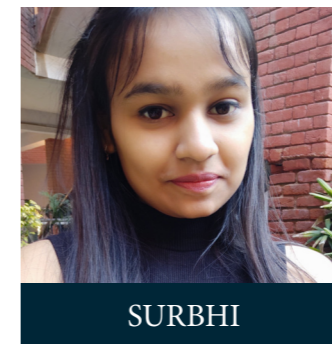


SHRUTI

SONALI



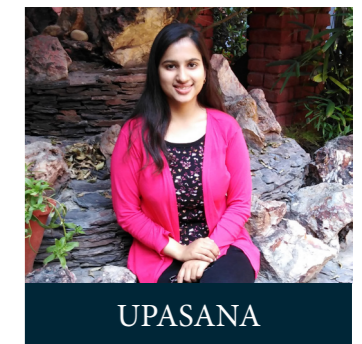
SRISHTI



SURBHI



TANYA



UPASANA



VAISHALI



VARTIKA



VIDHI



YUKTA

Messages from the Physikos Team Members

- NIKITA SAINI (Batch: 2017-20)
//Creative Writer

It gives immense pleasure to bring forth the edition 2019-20 of "Physikos". Physikos opens the world of physics and makes you more aware of the Physics Department, "Quasar". It's a beautiful learning process for physics enthusiasts. Working as a creative writer in Physikos has helped me to inculcate a great sense of team spirit. This gratifying experience has filled me with immense knowledge, dedication, and enthusiasm which will apparently be seen in my life onwards. My heartfelt gratitude to the teacher co-ordinator, Dr. Vandna Luthra Ma'am, and all the members of the Physikos who have been so generous and have taught me so many things for my future.



- MEGHA KANDARI (Batch: 2018-21)
//Creative Writer



Working with Physikos 2019-20 team was a great experience, to be the part and to create something is always a good feeling. Working under the discreet guidance of Dr. Vandna Luthra ma'am is something I'm gonna remember for quite a long time. In this creative journey, we faced a lot of challenges as a team, it isn't a piece of cake exactly to collect and display somebody's art and write ups but after seeing the result, our editor (Preetisha) deserves a clap.

For me creative writing was a pass time activity and I'm thankful that I could contribute to the magazine and my pieces made it to the final print. I really enjoyed my time proof-reading some great articles and reports by my classmates, seniors and juniors, they were simply amazing and informative.

Not just the creative part but all the technical things I learnt in this journey will always be one of the things I could count on as a soft skill. Be it be plagiarism checking, learning about different software or working in team, it was all great.

At the end I would just want to thank our teacher co-ordinator to give me this opportunity of exploration and hope to do the same next year as well with the same enthusiasm and keenness and with new people on board.



- PRERNA SHARMA (Batch: 2017-20)
//Designer

Learning and comprehending something new always add glory to our knowledge and being a part of 'Physikos' is the chance to learn new things. I came to know about new concepts and being able to do things professionally. In short, being a member of Physikos taught me cooperation, handling commodities professionally and I believe that it will definitely help in my future. It's the best opportunity I got during my graduation and will always cherish it. I am glad and delighted that 'Physikos' gave me the opportunity to do something for my very own 'Physics' department. Thank you very much!

- ANJALI KUMAR (Batch: 2019-22)
//Designer

It was really a great experience for me and would like to thank the teacher coordinator and committee members for teaching me a really great deed. As the time passed by, I actually felt my confidence lifting high. I have even acquired many 'cooperative qualities' and 'management skills', and all this motivated me to work harder in new fields, apart from studies.

I have learnt a lot regarding the 'plagiarism procedures' and could even successfully implement them in real life.

Also, being a part of designing team, I explored a lot about creativity. Once again, Thank you all!



- RITIKA PANDEY (Batch: 2018-21)
//Volunteer



Greetings!

I feel euphoric and overwhelmed at the release of the latest edition of the 'Quasar' mouthpiece. I feel humbled to be a part of this edition and would like to share a few thoughts and experiences. The originality of working with the magazine team has been unique for me and it has left me more refined at present than I was a few months ago. It has been my passion to journal some features in various print media and this opportunity gave me insights into the Do's and Don'ts of how one should write an article that is fully acknowledged and free from plagiarism in the world full of Artificial Intelligence floating all over the internet. It has always amazed me out of my wits to explore different things whenever I thought of writing anything for the magazine.

Here, most of the work was possible only through teamwork and this exercise in its very essence taught me arts of coordinating with fellow members which is unequivocally the best experience. I'm very thankful to Dr. Vandna Luthra ma'am who has been the guiding light throughout this journey and the Editor who left no stone unturned to create one of the best editions. Finally, I would love to recommend to all the Quasar family members to be a part of this module at least once in their course of duration here.

Happy Reading!

- AYUSHI CHOUDHARY (Batch: 2018-21)
//Volunteer

Reading a magazine is always fun, but being a part of creating a magazine is way more interesting. For me being a part of Physikos as a volunteer was a great opportunity. This was a valuable experience as I have learned many new skills. I have developed and educated myself with knowledge of various software, plagiarism, copyright certificates, etc. Given a chance, one should not miss it and grab it because that will be a golden chance to acquire skills (organizational skills, teamwork, presentation of ideas, etc).



- GUNJAN BISHT (Batch: 2019-22)
//Volunteer

I really wanted to be a part of physikos when I first saw the magazine being presented to the guests on Teacher's Day. When I heard that the applications for Physikos are open, I was very excited. On the day of the interview only, I learnt a lot of things that I had never heard of before. Over the period, I learnt so many things from our teacher and the team members as well like the importance of checking plagiarism. It was a wonderful experience altogether. I think that everyone should contribute something to the magazine because even when we leave the college, we will have this magazine of a certain year with our work on it and that is worth it.





GARGI COLLEGE
UNIVERSITY OF DELHI
ACCREDITED WITH GRADE 'A' BY NAAC

