



Newsletter of the Physical Research Laboratory

THE SPECTRUM

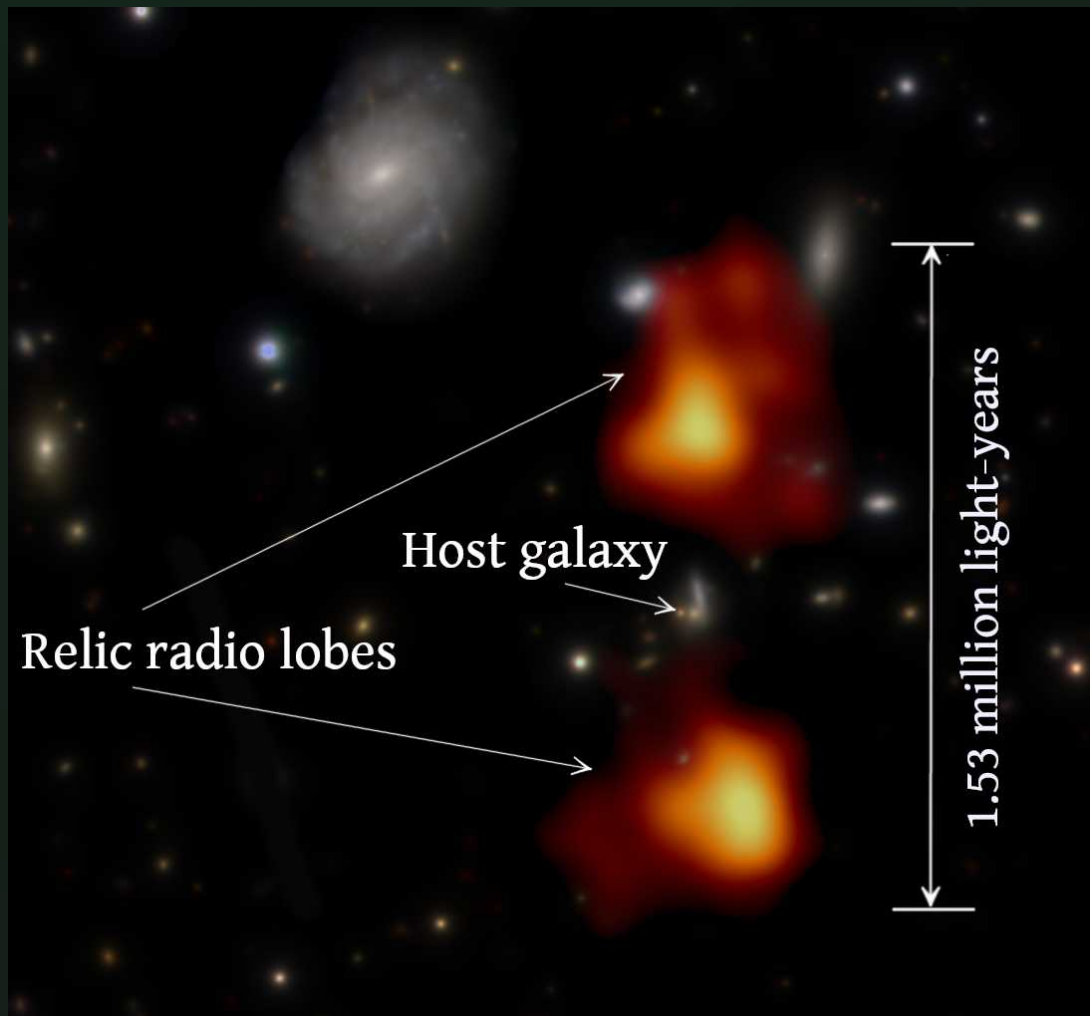


Image of the Month

325 MHz GMRT radio image of a remnant radio galaxy hosted in a galaxy located at a distance of 4.26 billion light-years (redshift 0.26) with a total radio size of 1.53 million light-years. The false colour radio emission is overlaid onto the optical image from the Subaru telescope.



March 2023 Issue



Table of Contents

Freeze-in dark matter through a tangibly forbidden channel	3
Plasma Sheath Around Sunlit Moon: Monotonic & non-monotonic structures.....	4
Fire and Precipitation history of the Kashmir Himalaya during the last 4000 years.....	5
CDAP: A portable CCD-based daytime airglow photometer for investigations of ionospheric-thermospheric phenomena.....	6
Search and Characterization of Remnant Radio Galaxies in the XMM-LSS Deep Field.....	7
Characterization of gravity waves in three dimensions in the daytime thermosphere using combined optical and radio measurements and of horizontal neutral winds	8
Latitudinal Movement of OI 630.0 nm Nightglow Brightness and Equatorial Electric Fields.....	9
4 th PRL Conference on Condensed Matter Physics (PRL CCMP 2023)	10
7th National Symposium on Shock Waves (NSSW-2023).....	12
Public lecture on “Indian Planetary and Space Missions”	13
Science Express Reached Pune.....	14
Science Carnival 2023 at Science City, Ahmedabad.....	15
PRL Ka Amrut Vyakhyaan.....	16
Swachhta Pakhwada 2023.....	17
USO Outreach activities: February, 2023.....	18
National Science Day 2023 @ PRL.....	19
Frontiers in Geosciences Research Conference (FGRC-2023).....	20
Inter-Area PRL Football Tournament.....	22
Annual Badminton Tournament for the year 2022-23.....	23
USO-SWC Badminton Tournament.....	24
PRL Monthly Publications Digest.....	25
Awards and Honors.....	27
Cyber Security Awareness.....	28
Obituary.....	29

The Author



Sudipta Show

Freeze-in dark matter through a tangibly forbidden channel

(Nabarun Chakrabarty, Partha Konar, Rishav Roshan, **Sudipta Show**)

A plethora of celestial experiments confirmed that our known fundamental matter particles only constitute a small part of the Universe. Instead, it is dominated by some mysterious, unknown matter known as dark matter. Hence, theoretical modeling and experimental findings for such dark matter candidates are active research domains in which PRL groups also participate. Several competing theories exist on how these dark matter particles were produced in the early phase when the Universe was hot and dense. Moreover, how dark matter (relic) density froze in terms of the expansion of the Universe and interaction with other particles. The present work explores the possibility of gradual dark matter production from decay through a freeze-in mechanism, where feeble interaction with the Standard Model bath can easily evade the severe constraints of the direct search experiments. This scenario becomes even more interesting if one includes the thermal masses of the particles involved in dark matter phenomenology. Incorporating such thermal corrections opens the possibility of dark matter production via channels that remain kinematically disallowed in the standard setup. We investigate in a minimally extended new physics framework, also known to resolve the muon ($g - 2$) anomaly.

Source/Reference of the Work: <https://doi.org/10.1103/PhysRevD.107.035021>

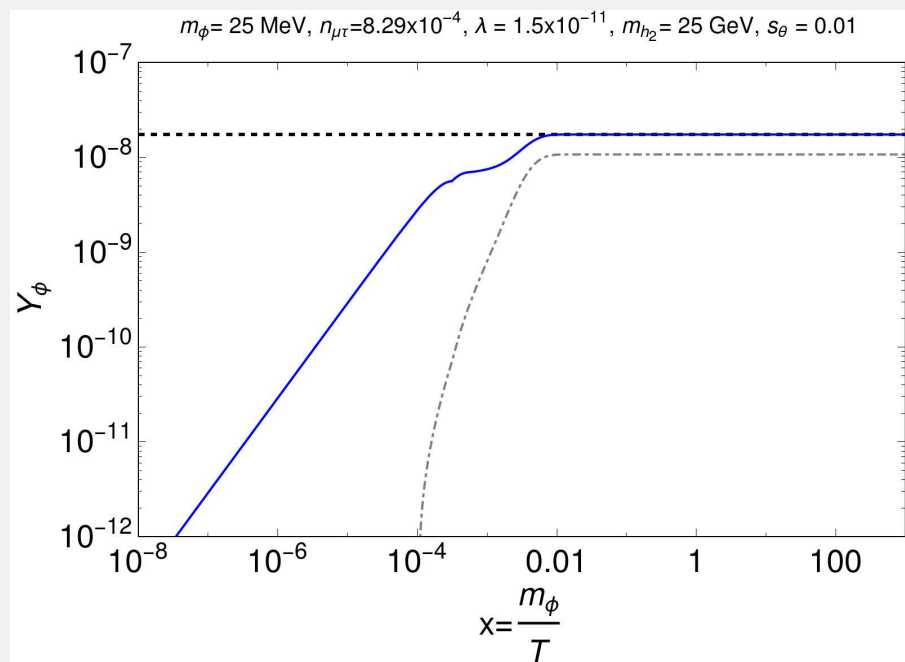


Figure Caption: Evolution of the DM comoving number density (blue line) as a function of x for dark matter mass of 25 MeV when scalar decays are not negligible. The dot-dashed line is the corresponding SF curve. The dashed horizontal line corresponds to the value of DM abundance for which the observed relic density is satisfied.

Plasma Sheath Around Sunlit Moon: Monotonic & Non-Monotonic Structures

(Trinesh Sana, S.K. Mishra)

The Author



Trinesh
Sana

The surface of the moon becomes electrically charged because of the dynamic interaction between UV radiation and solar wind/ambient plasma. This creates a space-charge region near the sunlit lunar surface, called the photoelectron sheath, where charged dust particles can float due to electrostatic Coulomb repulsion. Understanding the electric potential and plasma dynamics within this sheath is essential for efficient instrument operation on lunar modules. An analytical formulation of complex potential structures around the moon has been carried out, taking into account various factors such as solar radiation flux and spectrum, solar wind plasma, surface temperature, surface material characteristics, and angle of solar inclination. The results show that non-monotonic potential structures (Type A) exist within the sheath, which is more stable towards the terminator region, while both monotonic (Type B) and non-monotonic potential structures are equally probable near the equator region. In the region of marginal/zero photoemission, i.e., very close to the terminator, a traditional Debye sheath (Type C) forms. During each orbit, the Moon passes through exotic plasma conditions like the tail lobe and plasma sheet of the Earth's magnetosphere - in this scenario the whole illuminated globe of the Moon is shown to acquire negative charge. The study also suggests that a sufficiently strong negative charge development near terminator due to high plasma electron temperature, which may be harmful to long-term efficient instruments functioning over the Moon. This study could be valuable in developing test procedures for future lunar exploration missions.

Source/Reference of the Work: <https://doi.org/10.1093/mnras/stad155>

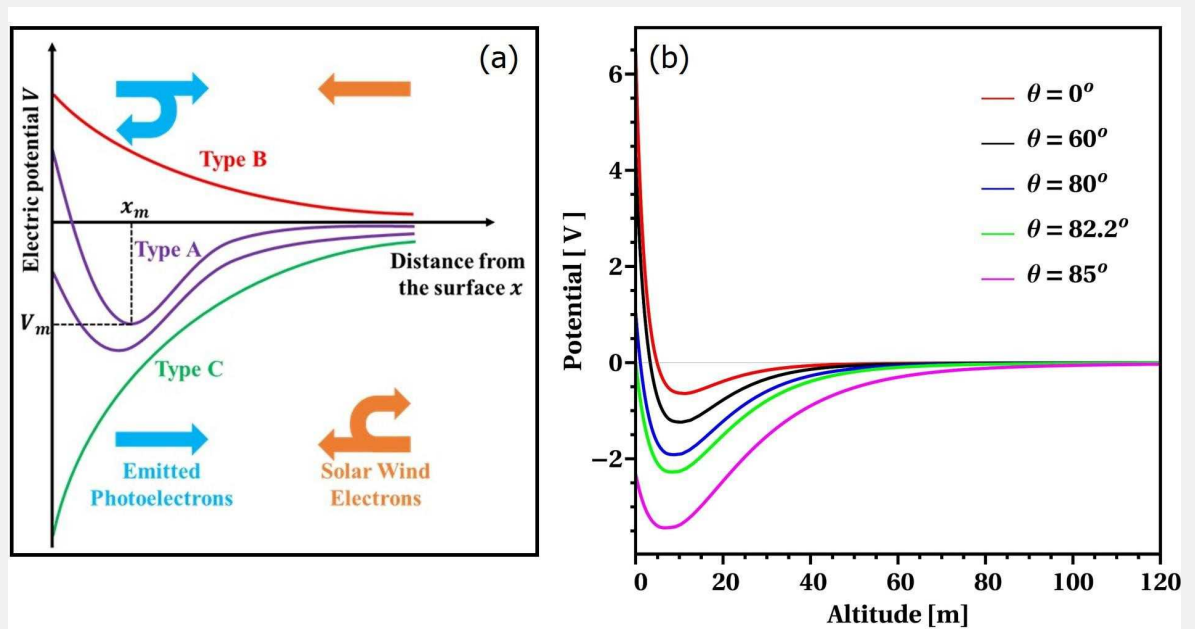


Figure Caption: (a) Different types of potential structures. (b) Altitude profiles of non-monotonic electric potential within photoelectron sheath over the lunar surface for different values of solar latitude.

Fire and Precipitation history of the Kashmir Himalaya during the last 4000 years

(*Sangeeta Verma, Abdur Rahman, Rayees Ahmad Shah, Rahul Kumar Agrawal, M. G. Yadava, Sanjeev Kumar*)

The Author



Sangeeta Verma

Similar to modern times, climate, vegetation, humans, and fire had a complex relationship throughout the human history. Scientists have used different proxies, such as charcoal and black carbon, to track the history of fire and its linkage to human development. Black carbon (BC) can be particularly useful in this regard as it may survive for years in various environments such as lacustrine and marine sediments because of its inertness and resistance to oxidation. The carbon isotopic composition of BC ($\delta^{13}\text{C}_{\text{BC}}$) can provide information about the source of biomass (or fuel load) and dominant vegetation in the region along with changes in humidity, precipitation, and climate.

A study was conducted at PRL to understand fire history and its linkages to climate and civilizational evolution in the western Himalaya. This study is of particular value as western Himalaya (used interchangeably as Kashmir Himalaya here) is known as a gateway to India in the past and has significant archaeological values. To achieve the stated goal, sediment core was extracted from the Wular lake in Kashmir and dated using radiocarbon which revealed the time span of 3752 to 306 Cal years BP. The BC concentrations and $\delta^{13}\text{C}_{\text{BC}}$ were analysed in the core, which inferred about the fire events and precipitation conditions in the western Himalaya, respectively. The $\delta^{13}\text{C}_{\text{BC}}$ indicated two distinct climate phases; the first phase from 3752–1500 Cal year BP was characterized by low mean annual precipitation (dry climate) followed by a wetter phase with higher mean annual precipitation after 1500 Cal year BP until 306 Cal year BP. Within the dry phase, a period of extreme dryness and minimum precipitation around ~ 2500 Cal years BP was observed. Few excursions of BC concentration around 3000 Cal years BP indicated dynamic fire history in the region, which gradually declined until 1500 Cal year BP then increased again. The results, in combination with available archaeological studies from the region, suggested that forest fires in the Kashmir Himalaya during the last 4000 years were largely due to human-driven activities.

Source/Reference of the Work: <https://doi.org/10.1016/j.palaeo.2023.111401>

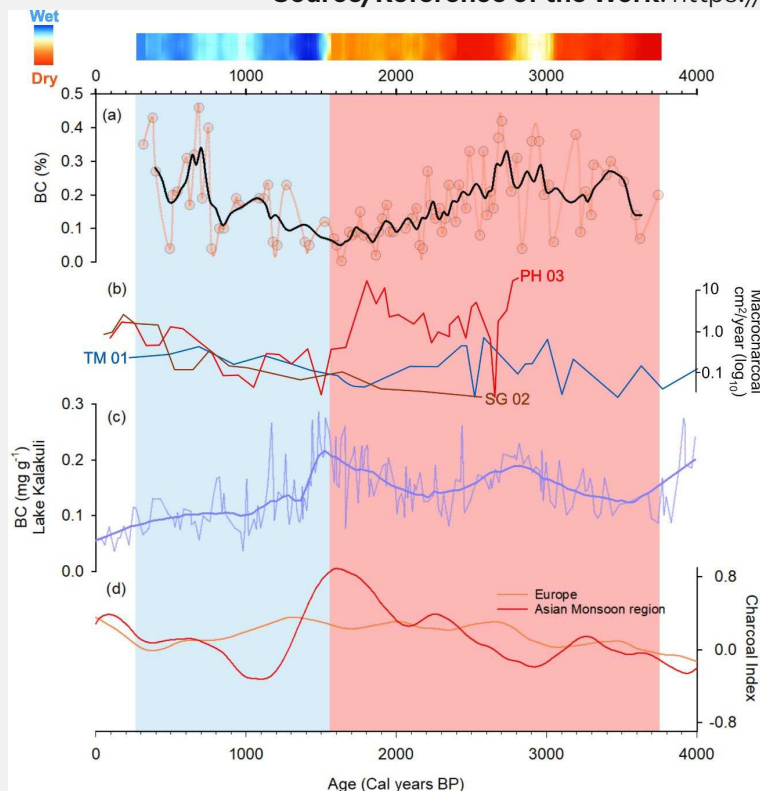


Figure Caption: (a) The BC concentrations (light orange dots) and its 4-point running average (black line) during this study, (b) macrocharcoal data from Spate et al. (2022), (c) BC concentration (mg g⁻¹) in Lake Kalakuli, China (Zhang et al., 2020), and (d) Charcoal index of Europe and Asian Monsoon region (Marlon et al., 2013). The colour strip at the top of the figure shows the wet and dry phases over the Kashmir Himalaya.

CDAP: A portable CCD-based daytime airglow photometer for investigations of ionospheric-thermospheric phenomena

(Duggirala Pallamraju, Pradip Suryawanshi, Shashank Urmalia, Sunil Kumar, Sovan Saha, Ravindra P. Singh, Pankaj K. Kushwaha, and Mohit Soni)

The Author



Duggirala
Pallamraju

Airglow emissions occur naturally due to the photochemical and chemiluminescent processes taking place in the upper atmosphere. The variations in their brightness depend on the densities of species taking part in the producing emissions. Therefore, they serve as an effective tracer of the dynamics at altitudes from where they are generated. This method of investigations of atmospheric regions is called “passive remote sensing”. The emission processes are active in both the day and the night. While the measurements of the emissions in the nighttime is relatively simple, measurements in the day pose a challenge due to the presence of strong solar background. PRL has pioneered the technique of detection of such dayglow signals in the daytime and has made unique contributions internationally. Following up on earlier methods and by innovative augmentation in the design, software, and automation, we have developed CCD-based daytime airglow photometer (CDAP) to obtain the OI 630.0 nm dayglow signal wherein a low-resolution Fabry-Perot etalon is used as a high spectral resolution filter. The figure shows the cross-sectional view of CDAP. Fraunhofer spectrum is imaged onto the CCD which enables earmarking of the spectral regions corresponding to the signal and the background brightness. The spectral resolution achieved by this instrument is 0.026 nm at 630.0 nm. The daily variations in dayglow emissions match perfectly with the measured dayglow from the collocated Multi-wavelength Imaging Spectrograph using Echelle grating (MISE), which is yet another large field-of-view technique to measure dayglow emissions at multiple wavelengths simultaneously. CDAP is reliable, rugged, portable, and has no moving parts, which makes it also suitable for space-borne applications.

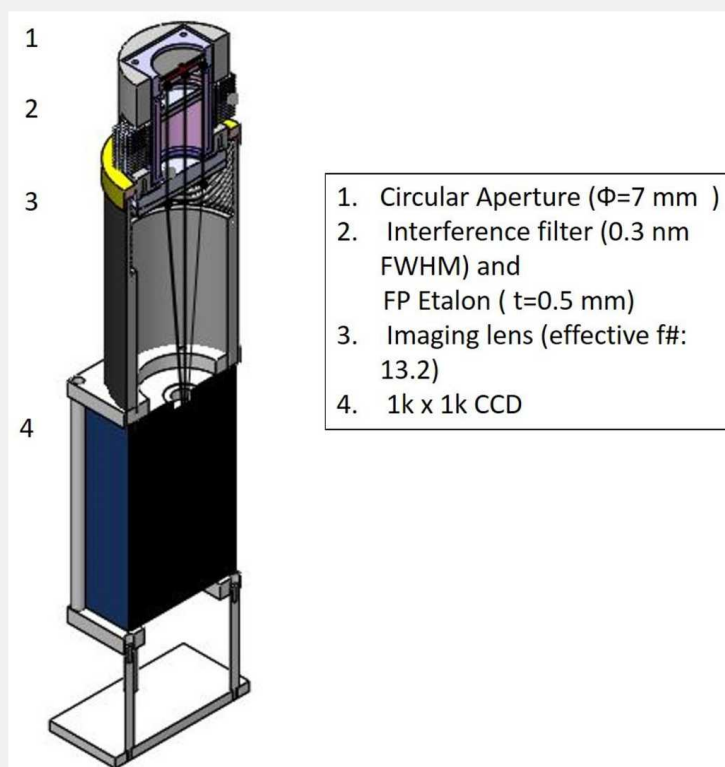


Figure Caption: Cross-section view of CDAP (CCD-based Daytime Airglow Photometer).

Search and Characterization of Remnant Radio Galaxies in the XMM-LSS Deep Field

(**Sushant Dutta**, Veeresh Singh, C. H. Ishwara Chandra, Yogesh Wadadekar, Abhijit Kayal and Ian Heywood)

The Author



**Sushant
Dutta**

Radio galaxies exhibiting jets and lobes spanning over hundreds of kilo-parsec are powered by Active Galactic Nuclei (AGN) at the centers of galaxies. Once AGN activity stops, the jets are no longer supported, but the lobes of plasma created by the jet activity can still be detected before they disappear due to radiative losses. Dying, or remnant, radio galaxies represent the final stage in a radio galaxy's lifecycle and are considered elusive because they spend a relatively short time in this phase. To detect dying radio galaxies, we used deep multi-frequency radio surveys performed with the Giant Metrewave Radio telescope (GMRT) at 325 MHz, the LOw-Frequency ARray (LOFAR) at 150 MHz, and the Very Large Array (VLA) at 1.4 GHz. By studying the images and spectra of 263 radio galaxies, we were able to identify 21 radio galaxies that showed relic emission from lobes with no AGN activity. These dying galaxies were searched for within a small sky area of 12 deg² in the XMM-Newton Large Scale Structure (XMM-LSS) extragalactic field. For the first time, they could detect remnant sources at higher redshifts ($z > 1$). Our remnants are found to reside mostly in non-cluster environments, and exhibit diverse properties in terms of morphology, spectral index ($\alpha_{150\text{ MHz}}^{1.4\text{ GHz}}$ in the range of -1.71 to 0.75 with a median of 1.10), and linear radio size (ranging from 242 kpc-1.3 Mpc with a median of 469 kpc). Our study attempts to identify remnant candidates down to the flux density limit of 6.0 mJy at 325 MHz, and yields an upper limit on the remnant fraction (f_{rem}) to be around 5%. The discovery of remnants will help us to understand the factors that govern the evolution of radio galaxies in their final phase and to assess the amount of energy that these dying sources feed back into their host galaxies and the intergalactic medium. This work is published in the *Astrophysical Journal* and a related press release is featured in the *Hindustan Times* (<https://www.hindustantimes.com/cities/pune-news/astronomers-discover-elusive-dying-radio-galaxies-using-deep-radio-surveys-101677444198313.html>).

Source/Reference of the Work: <https://doi.org/10.3847/1538-4357/acaf01>

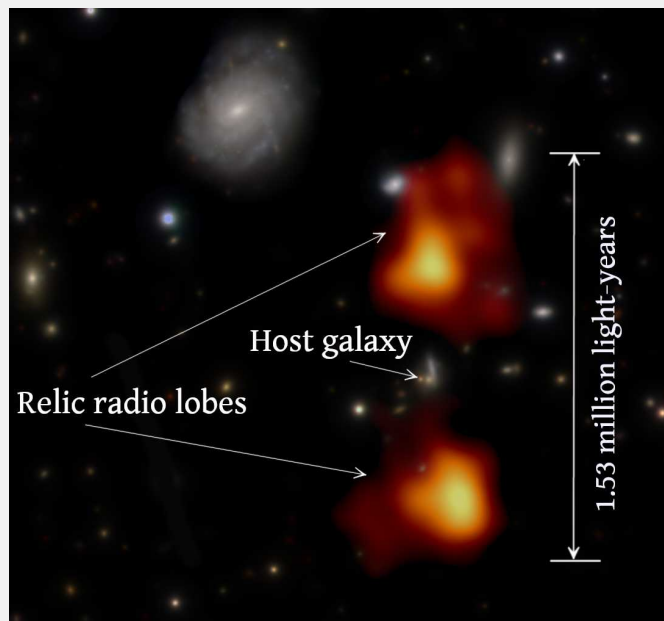


Figure Caption: 325 MHz GMRT radio image of a remnant radio galaxy hosted in a galaxy located at a distance of 4.26 billion light-years (redshift 0.26) with a total radio size of 1.53 million light-years. The false colour radio emission is overlaid onto the optical image from the Subaru telescope.

Characterization of gravity waves in three dimensions in the daytime thermosphere using combined optical and radio measurements and of horizontal neutral winds

(Sunil Kumar, Subir Mandal, and Duggirala Pallamraju)

The Author



Sunil Kumar

Atmospheric gravity waves (GWs) are mostly generated in the lower atmosphere due to different factors, such as, orography, convection, wind shear, etc. These GWs carry energy away from their source regions while propagating upward and play a crucial role in the coupling and energetics of the atmosphere. Therefore, the study of GW dynamics in the Earth's upper atmosphere (UA) is extremely important for a detailed understanding of the atmosphere. As the neutrals and plasma share the same space in the UA, these GWs also leave their imprint on the variations in plasma density through ion-neutral collisions. Monitoring fluctuations in natural airglow emissions is an established method to characterize neutral GWs in the UA. The horizontal propagation characteristics (time periods, wavelengths, and propagation directions) of GWs are derived using the large field-of-view (622 km) observations of OI 630.0 nm dayglow emissions obtained by Multiwavelength Imaging Spectrograph using Echelle grating (MISE) from Ahmedabad. Vertical wavelengths of the GWs are obtained using plasma density observation from collocated digisonde. The horizontal information of the GWs and model-derived horizontal winds has been used as input into the GW dispersion relation to estimate vertical wavelengths, which show a good match with the digisonde-derived vertical wavelengths. As the three-dimensional information of GWs are present, the magnitude of horizontal neutral winds is estimated using GW dispersion relation. These estimated neutral winds match very well with the observed winds from the MIGHTI onboard ICON satellite as shown in figure for 7 days. This is first-ever study of the measurements of three-dimensional GWs behavior in the daytime. Further, deriving the daytime neutral winds based on the measured GWs parameters is also a new feature that has been presented in this work.

Source/Reference of the work: <https://doi.org/10.1029/2022JA030954>

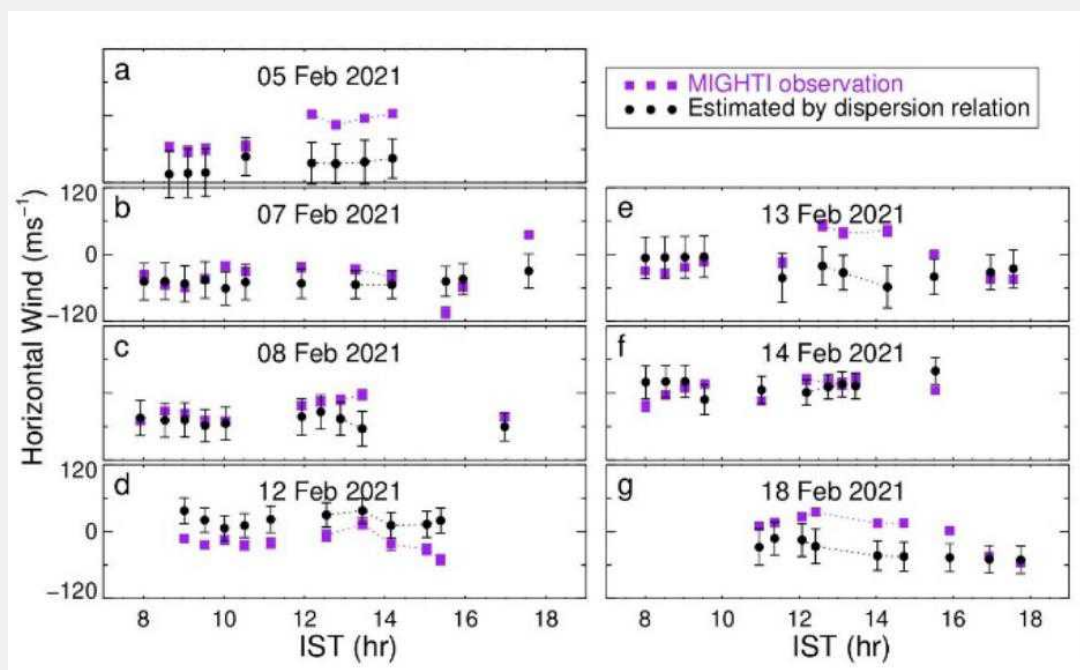


Figure Caption: Panel (a) Estimated horizontal wind magnitude and observed wind (MIGHTI) from ICON satellite in the direction of wave propagation for 5 Feb 2021 are shown in black dots and purple squares, respectively. Panels (b), (c), (d), (e), (f), and (g) are similar to (a) but for 7, 8, 12, 13, 14, and 18 Feb 2021, respectively.

Latitudinal Movement of OI 630.0 nm Nightglow Brightness and Equatorial Electric Fields

(Sovan Saha and Duggirala Pallamraju)

The Author



Sovan Saha

Airglow emissions act as tracers to the altitudes of the upper atmosphere from where they originate. Equatorial electrodynamics, such as equatorial electrojet (EEJ) and equatorial ionization anomaly (EIA) play important roles in the plasma distribution over the low-latitudes. This can cause the presence of larger plasma density over the low-latitudes as compared to equator, known as crest of EIA. The distribution of plasma affects the airglow emissions as well. OI 630.0 nm nightglow emissions which emanate from around 250 km altitude have been measured using an optical instrument HiTIES from Gurushikhar, Mt. Abu (24.6°N, 72.7°E, 19°N Mag). HiTIES is a slit spectrograph and has a field-of-view of 54°.

The latitudinal movement of the crest of the EIA has been monitored using the OI 630.0 nm nightglow emissions. The EIA crest is found to shift in the poleward direction after the sunset and has been shown to be directly related to the strength of the sunset time equatorial electrodynamics (fig 1). Later in the night, after 20 LT, a clear movement of the crest back towards the equator, known as the reversal of EIA, has been observed. The speeds of the reverse movement have been calculated. The ionospheric electric fields follow the condition of $\oint \mathbf{E} \cdot d\mathbf{l} = 0$, where \mathbf{E} is the electric field at a given location and $d\mathbf{l}$ is the element of length along the dip-latitude. Simultaneous variations in the daytime electrojet strength over Jicamarca in the American sector have been compared with the simultaneous nighttime reversal speeds of the EIA over the Indian sector, which show a remarkable relationship with each other (fig 2). The electrojet strength acts as proxy for the daytime equatorial electric field, whereas, the electrojet is absent during nighttime due to decrease in conductivity in the ionospheric E-region. Our result showed indirect experimental evidence of the relation between the reversal in EIA and the nighttime westward equatorial electric field. It is hereby proposed that the reversal speed derived from the nightglow emissions can serve as a proxy for the determination of nighttime electric field in that longitude, which is otherwise extremely difficult to measure.

Source/Reference of the Work: <https://doi.org/10.1016/j.jastp.2022.105965>

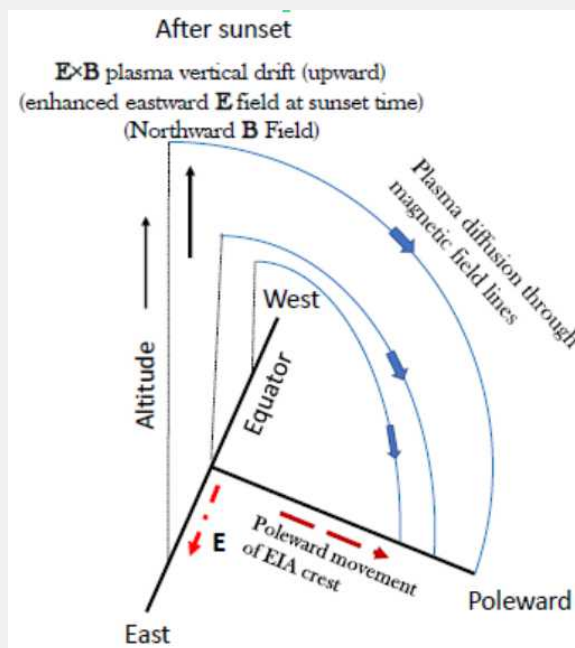


Figure Caption: Zonal eastward electric field increases at sunset time, so as plasma lifts higher altitudes, poleward movement of EIA crest seen

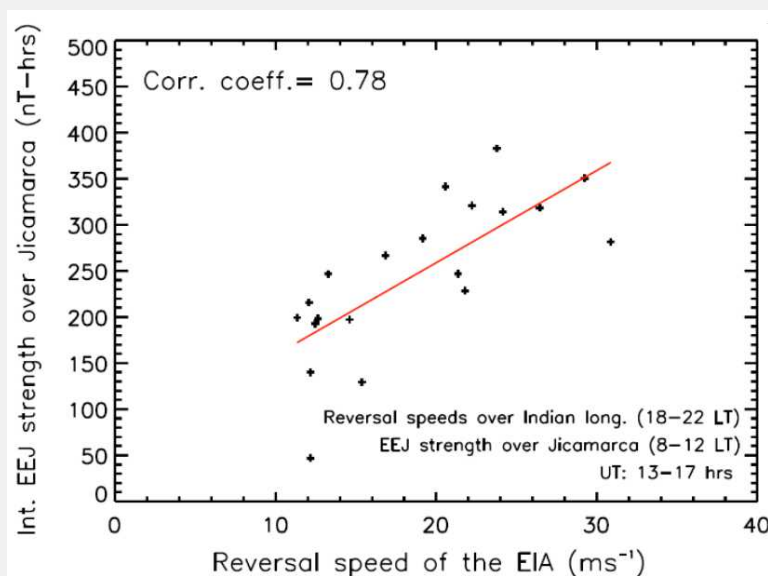


Figure Caption: Integrated EEJ variation for the duration 8–12 LT over Jicamarca is compared with the reversal speed of EIA over Indian sector for the year 2014.

4th PRL Conference on Condensed Matter Physics (PRL CCMP 2023)

The 4th PRL Conference on Condensed Matter Physics, a three day national conference was held at PRL Navrangpura campus from 6-8 February 2023. to discuss recent developments in condensed matter physics, particularly superconductivity, topological quantum matters, strongly correlated systems, and material science with space applications. The conference was held in person. This is a biennial conference organized PRL. It is one of regular focused meetings for the overall development of the community especially for the students and other young researchers. There were 100 participants including faculty members, scientists, postdoctoral fellows, Ph.D. students, and Master students from various research institutes, IITs, IISERs, Universities and colleges across India. There were 4 keynote talks by senior faculty members, 15 invited talks by senior and young faculty members, and 5 contributed talks by young faculty members and senior Ph.D. students on the above-mentioned topics. There was a marathon display poster session where all poster presenters flashed their posters/presentations in two minutes. This session was very popular among the participants since they utilized it to attract the audience to visit their posters during the poster sessions. There were two dedicated poster sessions with sufficient time for interactions. A competition on poster presentation was held and judged by six faculty members including theorists and experimentalists and experts of different fields. There was an evening talk on air pollution and Climate change. The meeting was well-appreciated by all the participants including seniors.



Inauguration of PRL CCMP 2023

The key points of the discussions according to the major topics of the conference are as follows:

Superconductivity: Vortex pinning, NbSe₂, Higher-Order topological superconductors, twisted bilayer graphene.

Topological Quantum matters: Non-abelian anyons, transport in Dirac semimetal, topological defects in Graphene, Moire systems, quantum geometric effects, SSH model with a non-orientable bulk.

Strongly correlated systems: Density of states of insulators, non-Kramers quantum Spin-Ice.

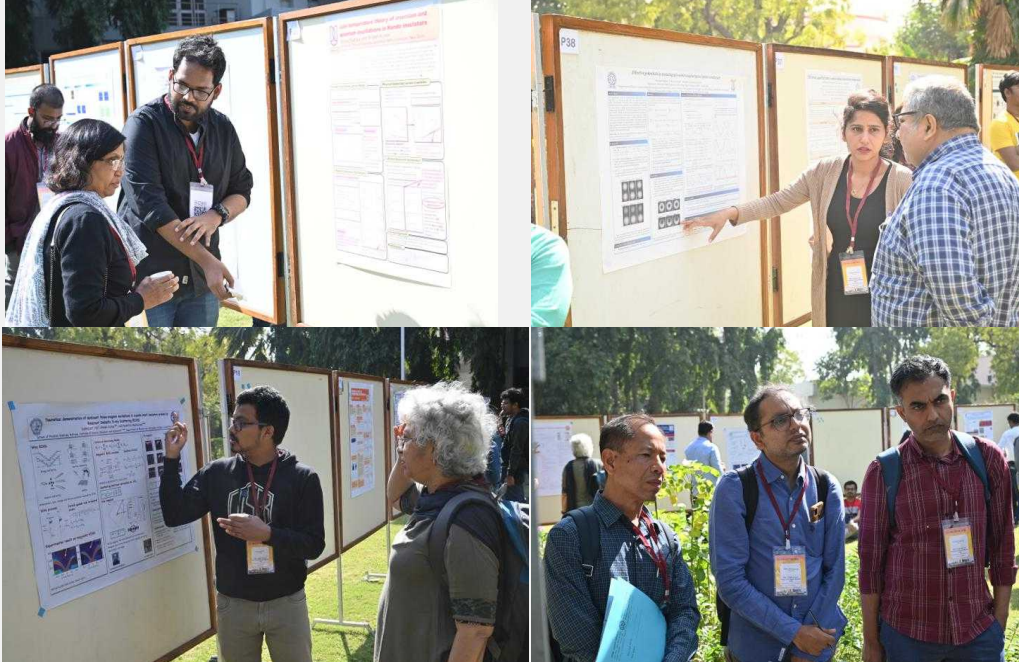
Material science: Twisted bilayer graphene, antiferromagnet/non-magnet heterostructure, vander Waals ferromagnet, Quantum Materials beyond the realms of Gross-Pitaevskii Equation.

Others: Dipolar bosons in a multilayer optical lattice, oceans of water deep in the Earth's mantle, ultracold gasses.

During the valedictory session of the conference, four students were awarded Wolfram Award for top four poster presentations. The winners and the titles of their presentations are as follow.

1. **Ms. Ritwika Majumder**, NISER Bhubaneswar India - Monte-Carlo exploration of generalized Kitaev model on a square lattice.

2. **Mr. S. Roy**, IIT Madras, India - Domain Wall Effects in Unconventional Superconductors
3. **Mr. Basabendra Roy**, IISER Kolkata India - Competing ultrafast energy relaxation mechanisms in a zero hysteresis strongly correlated system.
4. **Mr. Debashish Mondal**, IOP Bhubaneswar - Generation of multiple anomalous Majorana modes in realistic model systems.



PRLCCMP 2023 poster session



Registrar, PRL, Dean, PRL, top four poster award winners, Co-convenor, Convenor of PRL CCMP 2023, and Director, PRL

We thank all PRL family members for their invaluable support and sponsors Wolfram Inc., Balani Group and IOP publishing for partial financial support in making the event successful. We also thank all the participants of PRL CCMP for making this 4th meeting a memorable and successful event.

7th National Symposium on Shock Waves (NSSW-2023)

The 7th National Symposium on Shock Waves (NSSW-2023) was organized at the Physical Research Laboratory (PRL) during 15-17 February 2023. The broad objective of this symposium was to disseminate and nurture the “Science and Technology of Shock Waves and related area” in the country as well as globally, under the aegis of The Society for Shock Wave Research (India).

Prof Anil Bhardwaj, Director, PRL, welcomed the delegates of the symposium, that was inaugurated by Shri S. Somanath, Secretary, DOS and Chairman, ISRO through his pre-recorded video message.

The symposium had 140 participants including 4 plenary speakers, 28 invited speakers, and rest oral presenters including MSc and PhD students, post-doctoral fellows, scientists and faculties for various laboratories including DRDO laboratories, and academic institutes including IITs, IISc and universities.



(Top left) Lamp lighting session. (Top right) Virtual inauguration by Shri S. Somanath, Secretary, DOS and Chairman, ISRO. (Bottom) Participants of NSSW - 2023.

In this symposium researchers deliberated on variety of topics related shock waves, ranging from the fundamental science of shock waves, its interactions and flow; to interdisciplinary applications for blast, biomedical, chemistry, astrochemistry and planetary sciences.

Specific topics deliberated in NSSW-2023 included research from the trisonic to hypersonic, simulations of shocks experienced in hypervelocity impacts events in the solar system and the shocks in the interstellar medium. The dedicated session on the biomedical applications of shock waves was highly appreciated by the participants. In another session, the applications of shock waves to real time problems were discussed. Five best paper awards and an award for interdisciplinary research were given to the research students attending NSSW-2023.

Public lecture on “Indian Planetary and Space Missions”

As a part of 7th National Symposium on Shock Waves (NSSW-2023), a public lecture on “Indian Planetary and Space Missions” was delivered by Prof Anil Bhardwaj, Director, PRL on 15th February 2023. This public lecture was attended with great interest and curiosity not only by the delegates of the symposium, but also the shock wave research community and general public with prior online registration. An interactive question and answer session followed the lecture.



(Top) Prof. Anil Bharadwaj, Director, PRL delivering public lecture in NSSW - 2023.
(Bottom) Glimpse from NSSW - 2023

Science Express Reached Pune

PRL launched the flagship program "Science Express" in 2018 with the aim of promoting science and technology education among rural communities in India. The initiative has so far reached over 25,000 students, primarily in rural areas, through the demonstration of over 25 science experiments.

From 13th to 16th February 2023, the Science Express team visited MahEduFest 2023, organized by the IndoScience Education Trust and NM Foundation in Lokseva eSchool & Junior College at Pashan Pune. This five-day fest featured three of India's most prominent space and science institutions, namely the Indian Space Research Organisation (ISRO), PRL, and Institute for Plasma Research (IPR).

The program was inaugurated by Shri A.S. Kiran Kumar, former Chairman of ISRO and Secretary Department of Space, who is currently a member of the Space Commission. The exhibition was attended by other notable figures, including Shri Pramod Kale, Ex-Director of Vikram Sarabhai Space Centre (VSSC) & Space Applications Center (SAC), Prof. D. Pallam Raju, Senior Professor & Dean at PRL, and Shri Ravi Kumar, Head of Outreach Division at IPR, along with many other senior scientists from ISRO and principals of various schools.

During the event, the PRL team presented a range of experiments covering topics such as Lenz Law, Anti-Gravity, Rocket Stability, Light Bending, Light Blocks, Optical Cloaking, Polarization, Bernoulli's Law, Electric Motor and Peltier Effect, Twinkling of Stars, Lighting Detector, Liquid Nitrogen experiments, and Payload Model for ISRO Space missions. Additionally, public lectures were organized for school children, providing an opportunity for them to interact with eminent scientists.

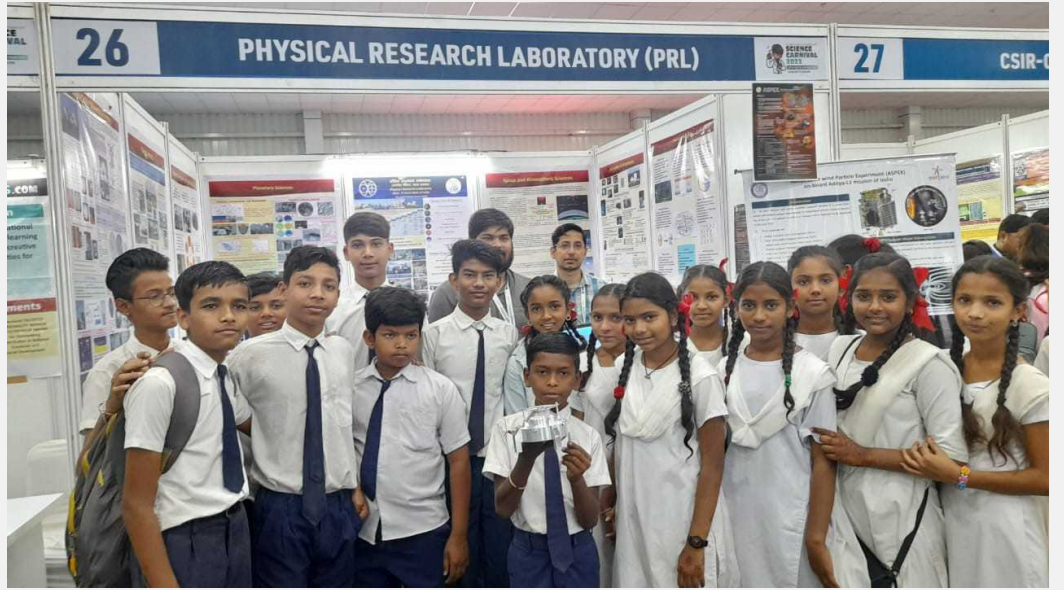
More than 12,000 students from over 45 schools attended the PRL exhibition and gained valuable insights into the world of science and technology. The success of this event demonstrates the effectiveness of the Science Express program in promoting scientific curiosity and inspiring the next generation of scientists and innovators in India.



(Top left) Shri A. S. Kiran Kumar, former Chairman ISRO and Secretary, DOS interacting with Science Express team. (Top right) Students from various schools engaging in discussion on one of the scientific models. (Bottom) Science Express Pune team.

Science Carnival 2023 at Science City, Ahmedabad

Physical Research Laboratory (PRL) recently participated in the National Science Day (NSD) Science carnival at Science City, Ahmedabad. The event took place from 28th February to 4th March 2023 and witnessed participation of more than one lakh students. The NSD is celebrated in India on 28th February every year to commemorate the discovery of the Raman effect by Sir C.V. Raman. PRL presented eight posters at the Science carnival,



which provided an overview of the research work being carried out in each division. These posters highlighted the progress made in various fields of research at PRL including astronomy, geosciences, atmospheric sciences, and solar physics. In addition to the posters, PRL also showcased three working models. The first model was a Langmuir Probe, which is an instrument used to measure plasma parameters such as density, temperature, and electron energy distribution. The second model showcased the functioning of a Fabry Perot Etalon, which is an optical device used to measure the wavelength of light. The third model was an engineering model of the ASPEX payload, which was designed by PRL for the Aditya-L1 mission. The PRL's exhibition was widely appreciated by the visitors. The exhibit was also covered by the Divyabhaskar newspaper, which highlighted the importance of the ASPEX payload and the research work being carried out at PRL. The participation of PRL in the NSD Science carnival has been a huge success. The event provided an excellent platform to PRL to showcase research activities to a wider audience and raise science spirit among students. The success of the event also imply the importance of such exhibitions in promoting scientific research and creating awareness regarding the latest developments in science and technology.



PRL participated in National Science Day - Science Carnival at Science City, Ahmedabad.



PRL Ka Amrut Vyakhyaan



PKAV-77

Prof. Mahesh Anand

School of Physical Sciences, The Open University, Milton Keynes, UK

Vyakhyaan Title: Apollo to Artemis: The Science and Exploration of the Moon

Date: 22 February 2023.

Abstract: The Moon's pull on our imagination is unrivalled, as best demonstrated by the Apollo programme. Fifty years on, humanity stands at the crossroads of technological advancement and scientific knowledge, ushering in a new era of human and robotic space exploration. Scientific discoveries relating to the history of water and other associated volatiles on and in the Moon have renewed global interest in lunar exploration. Thus, the Moon is becoming a favourite target for established and emerging space-faring nations and commercial entities. In addition to national pride and scientific curiosity, the renaissance in lunar exploration is also driven by an increased realisation of the Moon as a technology testbed for exploring more distant bodies such as Mars and asteroids.

The possibility of utilising the Moon and its constituents as resources for sustaining an extended presence on its surface has heralded an era of 'New Space' by attracting private and commercial bodies towards lunar exploration, guided by scientific insights derived from continuing research on lunar samples. Our vision of the future sees a sustainable presence of humans based on the lunar surface. For this, the natural resources present there must be explored and utilised. The coming decades are likely to witness the realisation of living on the Moon, enabled by research that is commonly termed lunar in situ resource utilisation (ISRU).



Prof. Mahesh Anand delivering PKAV-77 at PRL

Swachhta Pakhwada 2023

The Swachhta Pakhwada was celebrated at Physical Research Laboratory (PRL) from 1st to 15th February 2023 as per the directives received from Director CEPO/ Nodal Officer, SAP on “Swachhta Action Plan 2023-24”, wherein, it states that “Swachhta Pakhwada” is to be organized from 1st to 15th February 2023 in the Department of Space and DOS Centres/Units with the main focus on “Hygiene and Sanitation”.

As a part of Swachhta Pakhwada, PRL members undertook the Swachhta Pledge/Shapath on 01.02.2023. All the staff members were advised to commit to eliminate the excessive and uncontrolled use of plastic in day-to-day official work as accumulation of plastic waste is posing a threat to the global environment.

As a part of Swachhta Pakhwada Campaign, fogging and fumigation was done during the Pakhwada period in all the campuses of PRL as well as residential colonies. Further, it would continue as routine activity throughout the year.

In order to maintain cleanliness and hygiene, cleaning of water bodies like GLR & OHT, sewer lines and artificial ponds at the office campuses as well as residential colonies took place at regular intervals. A cleanliness drive was carried out at Mt. Abu campus. During the Swachhta Pakhwada- 2023, a special emphasis was given for weeding out of records/ disposal of non-useful furniture/ instruments which are beyond economic repair, for which all Division Chairs & Heads had taken lead and action was taken with proper procedure of weeding out.

PRL is dedicated to promoting and spreading the message of cleanliness, hygiene and sanitation. At PRL's campuses in Ahmedabad, Mount Abu, and Udaipur, including observatory sites, we prioritize in maintaining a clean and green environment. We believe that a clean and healthy environment is essential for the well-being of all living beings.

Our commitment to cleanliness extends beyond the physical infrastructure of our campuses. PRL members are also committed to contributing to the cause of cleanliness in their personal and professional lives. We encourage and promote responsible waste management practices, including reducing, reusing, and recycling waste wherever possible. We also educate and raise awareness among our staff and students on the importance of cleanliness and hygiene.



USO Outreach activities: February, 2023

1. Visit of Students from Government Meera Girls College, Udaipur

A group of students along with faculty from Government Meera Girls College, Udaipur, visited Udaipur Solar Observatory on 03/02/2023. The group included Bachelor and Master students and visited the facilities on the island. They were informed about different aspect of solar observations, solar activity, and back-end instrumentation.

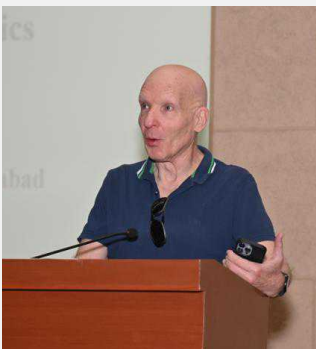


2. Visit of Students from B. N. University, Udaipur

A group of students along with faculty from Faculty of Science, B. N. University, Udaipur, visited Udaipur Solar Observatory on 23/02/2023. The group included B.Sc. and M.Sc. Physics students. The group visited the Island observatory, GONG and e-Callisto facilities of the observatory. They were informed about different aspect of the Sun, solar activity, and the multi-wavelength observations of the solar atmosphere.



THEORETICAL PHYSICS COLLOQUIUM



TPC-7

Prof. Yuval Gefen

Department of Condensed Matter Physics,
The Weizmann Institute of Science, Rehovot 76100, Israel

Title: Measuring Entanglement in Electronic Interferometers

Date: 7 February 2023.

Abstract: This talk relied on two fundamental themes of quantum physics: the statistics of identical particles, and entanglement. The former was thrust into the limelight, given the theoretical and experimental search for anyonic (fractional) statistics. The latter is a pillar of quantum mechanics: quantum entanglement prevents us from obtaining a full independent knowledge of a subsystem. Can one, theoretically and experimentally, focus on and isolate statistics-induced entanglement? Here the speaker addressed this question, addressing the case of fermions.

National Science Day 2023 @ PRL

The Physical Research Laboratory recently celebrated National Science Day (NSD) 2023 in two phases, with a variety of events and activities taking place. In Phase 1, PRL members visited 19 different centres across Gujarat and conducted a screening test for the Aruna Lal Scholarship on 22 January 2023. This year, two new centres were added, and the test covered 163 schools in the state, with 868 students appearing for the test. Encouragingly, 44% of these students were girls. Along with the screening exam, the PRL team demonstrated science experiments at 11 centres, with 22 experiments being covered through live feeds from other centres, and ~5000 students visited the science express. In addition, the Vikram Sarabhai Protsahan Yojana (VIKAS) Scholarship exam was also conducted at 19 centres in Gujarat.

In Phase 2, the students shortlisted from the screening exam were invited to visit PRL and participated in various competitions on Saturday, 25 February 2023. Over 150 students and 60 teachers / accompanying parents visited PRL on this day. Some of the selected students were interviewed for the Aruna Lal scholarship. The significant activities arranged for students and teachers were:

- 1) Posters and models competition,
- 2) On-the-spot quiz competition in digital format,
- 3) Talk on 'Introduction to science at PRL',
- 4) Talk on 'Cyber Safe Behavior - See Yourself in Cyber',
- 5) Interaction with PRL scientists,
- 6) Science experiments demonstrations,
- 7) Visits to the workshop and library,
- 8) Live observation of the featureful Sun through a telescope,
- 9) Science cartoon competition,
- 10) Virtual tour of Mt Abu Observatory and Udaipur Solar Observatory.

To mark the platinum jubilee celebrations, 75 prizes were awarded, including 5 Aruna Lal Scholarships for 2023. The students, teachers, and accompanying parents enjoyed the activities and actively participated, making for a successful and enjoyable celebration of National Science Day.



Frontiers in Geosciences Research Conference (FGRC-2023)

The 2nd Frontiers in Geosciences Research Conference (FGRC-2023) was conducted at PRL from 1-3 February, 2023. The primary objectives of the conference were to bring the Geoscience community of India on a common platform for dissemination of recent scientific findings, planning the future course of Geosciences research in India, enhancing collaborations and knowledge exchange and jointly addressing societal issues using modern technology. The conference witnessed an overwhelming participation of four generations of Geoscience researchers from all over India. In this conference, there were more than 300 participants from nearly 88 different universities and institutes, which included research scholars, post-doctoral fellows, and scientists. They all presented their work with great enthusiasm and interacted with each other to develop future collaborations.

The inaugural session was graced by Shri A. S. Kiran Kumar (Chairman PRL Council of Management) along with Prof. Anil Bhardwaj (Director, PRL). FGRC-2023 started with a plenary lecture by Dr. V.K. Gahalaut (CSIR-NGRI). Additionally, there were invited talks on various topics by eminent scientists. The sessions covered various aspects of Geoscience research ranging from the core of the Earth to atmosphere on different spatial and temporal scales. The key highlights of the major themes are:

- **Solid Earth Geochemistry and Geochronology** - Isotopic and geochemical studies of Bundelkhand and Bastar cratons, peridotites from Ladakh region, origin and migration of Paleo-Brahmaputra, early geodynamic processes and oxidation events.
- **Marine and Terrestrial Biogeochemistry + Oceanographic Processes** - Ventilation of the Oxygen Minimum Zone and dissolved manganese distribution in the Arabian Sea, Carbon sequestration efficiency of ureolytic bacteria using stable isotopes, soil carbon dynamics, preservation of soil organic carbon using machine learning approach.
- **Climate of the Past, Present and Future** - Results covering time range from modern to the geological past (Ediacaran-Cambrian transition interval), various archives viz. limestone, marine, and lacustrine sediment cores and sequences, soil sediments, and speleothems. Among computational techniques, down-scaling of the data using machine learning and remote sensing of tree species was presented.
- **Hydrogeology and Hydrometeorology** - Submarine groundwater discharge, isotopic variability of precipitations, cold and thermal springs, landslide hazard zonation, Sr isotopes and Arsenic contamination in groundwater, groundwater dynamics, subsurface dielectric properties, high-mountain hydrology and atmospheric vapour in Aravalli.
- **Land, Ocean, Atmosphere Interactions** - Vapour isotopes during typhoons, paleocenography during late quaternary, nutrient supply in north Indian ocean, black carbon in Antarctica, Tsunami early warning, surface heat flux during earthquakes, himalayan weathering, trace gas and ozone chemistry and sulphur isotope studies.

Six students won the best presentation award in different themes; we extend our congratulations to them. The winners are:

- Abhishek Kumar Pandey from IISER Bhopal – **Solid Earth Geochemistry and Geochronology**
- Deepak Kumar Rai from PRL Ahmedabad – **Marine and Terrestrial Biogeochemistry**
- Tapas Kumar Mishra from CSIR-NIO Goa – **Oceanographic Processes**
- Sunil Kumar Das from IIT Bhubaneswar – **Climate of the Past, Present and Future**
- Swagatika Chakra from PRL Ahmedabad – **Hydrogeology and Hydrometeorology**
- Shreya Keshri from IISER Pune – **Land, Ocean, Atmosphere Interactions**

We thank the PRL family for their invaluable support in making the event successful. We also thank all the participants for making FGRC-2023 a memorable event.



Award winners of FGRC-2023



Shri A. S. Kiran Kumar (Chairman, PRL Council of Management) with Prof. Anil Bhardwaj (Director, PRL), Prof. Sunil Kumar Singh (Director, CSIR-NIO) and Prof. Ravi Bhushan (Chairman, Local Organizing Committee, FGRC-2023).



FGRC-2023 Poster session



FGRC-2023 Group Photo

Inter-Area PRL Football Tournament



An Inter-area Football competition was organised. There were six teams in all. 1) AMOPH, 2) Theoretical Admin Services (THEPH), 3) PSDN, 4) Astronomy, 5) SPASC and 6) GSDN. The top two teams progressed to the finals following a single round - robin stage of matches. The tournament was inaugurated on January 31, 2023, by Director PRL with Registrar PRL, where the ceremonial cake was cut, the dignitaries were honoured with a T-shirt, and the previous year's victors presented the trophy. The league stage games took place in the early morning hours on weekends and in the evenings on weekdays. Throughout the 15 league games, more than 72 players (men and women) gave captivating and suspenseful performances. All participants were competing for a position in the finals and were not ready to yield a single inch of ground to the opponents. However, as a rule of the game, PSDN and Astronomy divisions played the final on 19 February 2023. The astronomy division won the finals with a scoreboard of 3-2. The finals were kicked off by Director and Dean PRL.

Director and Dean PRL presided over the award ceremony after the final whistle. The team members' contribution was given to the ground personnel as a token of appreciation for their efforts.

Referees of matches were felicitated. High tea was served after the winning trophy was given to the Astronomy division. For each league match, there were 90 on average spectators, while during the knockout rounds, there were 120. The recipients of the individual awards were: 1.) Fan of the Tournament: Dr Anshika Bansal (THEPH) 2. Dr Aravind K's (ASTRO) goal vs GSDN was awarded Goal of the Tournament 3.) Dr Aravind K. received the Golden Boot (ASTRO), and Mr Deepak K Painkra won Player of the Tournament. 5.) Mr N JSSV Prasad was the awardee of the tournament's top goalkeeper (ASTRO).

Points Table

Team	Played	Won	Draw	Lost	Points
A&A	5	4	1	0	13
PSDN	5	3	1	1	10
THEPH	5	2	1	2	7
SPASC	5	2	0	3	6
GSDN	5	1	1	3	4
AMOPH	5	1	0	4	3

Annual Badminton Tournament for the year 2022-23

As part of the celebrations for Azadi ka Amrit Mahotsav, the PRL (Physical Research Laboratory) Staff Welfare Committee organized the annual Badminton Tournament for the 2022-2023 season on the 4th and 5th of February, 2023. The tournament provided a platform for PRL staff members to showcase their skills and compete against one another in a friendly and competitive atmosphere.

The tournament was inaugurated by Dr. Anil Bhardwaj, the Director of PRL, who wished all the participants good luck and encouraged them to play with sportsmanship and camaraderie. The event saw enthusiastic participation and the matches were closely contested with thrilling displays of athleticism and skill. The tournament witnessed many nail-biting, fun-filled, and highly competitive games spanning various formats like Singles, Doubles, Team events, and Lucky Doubles. This year, the overall participation in the tournament was overwhelming, with around 50 participants taking part in various events, spanning nearly all the areas of PRL including participants from Udaipur Solar Observatory, Udaipur.

The Badminton Tournament was a highly anticipated event, with a large number of enthusiastic spectators turning up to support their favorite participants. The cheering and applause from the crowd added to the excitement and created a lively atmosphere throughout the two-day event.

Overall, the Badminton Tournament was a grand success, with players and spectators alike enjoying the competitive yet friendly spirit of the event. It was a wonderful example of how sports can bring people together and create a sense of community and camaraderie. The PRL Staff Welfare Committee is to be commended for organizing such a well-run and exciting event.



EVENT CATEGORIES	Result of the Tournament		
	Winner	Runner up	Third Place
Women Singles	RICHA PRASHANT KUMAR	SHIVANI BALIYAN	BIREDDY RAMYA
Open Singles (Men)	SANDEEP ROUT	AMIT PANDEY	A. SHIVAM
Open Doubles (Men)	SANDEEP ROUT ARAVIND K.	R. P. SINGH DHARMENDRA KAMAT	ATUL ASHOK MANKE RAM LAKHAN AGRAWAL
Lucky Doubles	ARVIND K. ATUL ASHOK MANKE	ROHAN EUGENE LOUIS LOVEJEET MEENA	—
Team Event	ASTAS SANDEEP ROUT ARAVIND K. NEELAM PRASAD SANJAY BALIWAL	SPASC R. P. SINGH DHARMENDRA KAMAT JACOB SEBASTIAN ATUL ASHOK MANKE	PSDN VIKAS SONI SRIRAG NAMBIAR



(Top) Glimpses from the tournament.

(Left) The final point table.

USO-SWC Badminton Tournament

The USO-SWC organised a Badminton Tournament for its staff and their CHSS dependents on 26th February 2023 at the Vaikuntha Sports Academy, Udaipur. There were a total of 17 participants and four event categories that included Women’s Singles, Junior’s Singles, Singles, and Doubles. The event started at 10:00 am and concluded at 5:30 pm. Lunch and refreshments were served to the participants at the venue. The results of the different events were as follows -

Junior’s Singles	Women’s Singles
Winner : Mstr. Revant Ankala	Winner : Ms. Bireddy Ramya
Runner-up : Mstr. Shaun Kenneth Louis	Runner-up : Mrs. Sushmita Meena
Singles	Doubles
Winner : Dr. Rohan Eugene Louis	Winners : Prof. Shibu K. Mathew & Dr. Rohan Louis
Runner-up : Mstr. Revant Ankala	Runner-up : Mr. Lovjeet Meena & Mr. Sandeep Dubey



(Top) The final point table.
(Bottom) Glimpses from the tournament.

PRL Monthly Publications Digest (February 2023)**Astronomy & Astrophysics Division [4]**

1. Devaraj R., A. Caratti o Garatti, Dewangan, Lokesh Kumar, et al., , 2023, Near-infrared Polarimetry and H₂ Emission toward Massive Young Stars: Discovery of a Bipolar Outflow Associated to S235 e2s3, The Astrophysical Journal; DOI: 10.3847/1538-4357/acb68e , Date of Publication: 28/02/2023
2. Mallick, K., Dewangan, Lokesh Kumar, et al., 2023, Structure and Kinematics of Sh2-138-A Distant Hub-filament System in the Outer Galactic Plane, The Astrophysical Journal; DOI: 10.3847/1538-4357/acb8bc , Date of Publication: 28/02/2023
3. Sushant Dutta, Veeresh Singh, C. H. Ishwara Chandra, Yogesh Wadadekar, Abhijit Kayal, Ian Heywood, 2023, Search and Characterization of Remnant Radio Galaxies in the XMM-LSS Deep Field, The Astrophysical journal, vol. 944, pp. 176, Date of Publication: 22/02/2023
4. Birendra Chhotaray, G. K. Jaisawal, Neeraj Kumari, Sachindra Naik, Vipin Kumar and Arghajit Jana, 2023, Optical and X-ray studies of Be/X-ray binary 1A 0535+262 during its 2020 giant outburst, Monthly Notices of the Royal Astronomical Society, 518, 5089-5105, Date of Publication: 01/02/2023

Atomic Molecular and Optical Physics Division [1]

1. Yan-Mei Yu, B. K. Sahoo and Bing-Bing Suo, 2023, Highly charged ion (HCI) clocks: Frontier candidates for testing variation of fine-structure constant, Front. Phys. 11 (2023); Date of Publication: 06/02/2023

Geosciences Division [2]

1. M. Atif Khan, Sanjeev Kumar, Rajdeep Roy, Satya Prakash, Aneesh A. Lotliker, S. Kumar Baliarsingh, 2023, Effects of tidal cycle on greenhouse gases emissions from a tropical estuary, Marine Pollution Bulletin, Date of Publication: 22/02/2023
2. Sangeeta Verma, Abdur Rahman, Rayees Ahmad Shah, Rahul Kumar Agrawal, M.G. Yadava, Sanjeev Kumar, 2023, Late Holocene fire and precipitation history of the Kashmir Himalaya: Inferences from black carbon in lake sediments, Palaeogeography, Palaeoclimatology, Palaeoecology (Palaeo3), Date of Publication: 01/02/2023

Space and Atmospheric Sciences Division [7]

1. Kuldeep Pandey, D. Chakrabarty, A. Kumar, Anil Bhardwaj, S. Biswal, G.C. Hussey, A.K. Yadav, 2023, Characteristics of X-class flares of solar cycles 23 and 24 in X-ray and EUV bands, Advances in Space Research,

Date of Publication: 28/02/2023

2. Ravindra P. Singh, Duggirala Pallamraju, Pradip Suryawanshi, Shashank Urmalia, 2023, Studies of atmospheric waves by ground-based observations of OH(3-1) emission and rotational temperature using PRL airglow InfraRed spectrograph (PAIRS), Journal of Atmospheric and Solar-Terrestrial Physics, Date of Publication: 21/02/2023
3. Sunil Kumar, Subir Mandal, Duggirala Pallamraju, 2023, Daytime three-dimensional gravity waves and neutral winds derived using combined optical and radio measurements, Journal of Geophysical Research - Space Physics, Date of Publication: 20/02/2023
4. Duggirala Pallamraju, Pradip Suryawanshi, Shashank Urmalia, Sunil Kumar, Sovan Saha, Ravindra Pratap Singh, Pankaj K. Kushwaha, Mohit Soni, 2023, CDAP: A portable CCD-based daytime airglow photometer for investigations of ionosphere-thermosphere phenomena, Journal of Atmospheric and Solar-Terrestrial Physics, Date of Publication: 15/02/2023
5. Sourita Saha, Som Sharma, Abha Chhabra, Prashant Kumar, Niranjana K. Kondapalli, Dharmendra Kamat & Shyam Lal, 2023, Atmospheric Boundary Layer Over Ahmedabad, Western Indian Region: Impact of COVID-19 Nationwide Lockdown, Pure and Applied Geophysics, Date of Publication: 15/02/2023
6. A. Kumar, D. Chakrabarty, B. G. Fejer, G. D. Reeves, D. Rout, S. Sripathi, G. K. Seemala, S. Sunda, A. K. Yadav, 2023, A Case of Anomalous Electric Field Perturbations in the Equatorial Ionosphere During Postsunset Hours: Insights, JGR Space Physics, Date of Publication: 15/02/2023
7. K. Ansari, and S. Ramachandran, 2023, Radiative effects of absorbing aerosol types over South Asia, Science of The Total Environment, Date of Publication: 01/02/2023

Planetary Sciences Division [3]

1. Biraja P Das, Amit Basu Sarbadhikari, Yash Srivastava, N G Rudraswami, and Dipak Kumar Panda, 2023, Petrogenesis of HED clan meteorites: Constraints from crystal size distribution, Journal of Earth System Science, Date of Publication: 15/02/2023
2. Anil Bhardwaj, 2023, The Earth, the Moon, Mercury, Saturn and Its Rings, and Asteroids. In: Bambi, C., Santangelo, A. (eds) Handbook of X-ray and Gamma-ray Astrophysics. , In: Bambi, C., Santangelo, A. (eds) Handbook of X-ray and Gamma-ray Astrophysics. Springer, Singapore., Date of Publication: 06/02/2023
3. D. Ray, S. Ghosh, M. Paliwal, S. Mishra and J. Jha, 2023, The Miller 03356 IVA iron: Insights into the formation mechanism of microplexite, Planetary and Space Science, Date of Publication: 01/02/2023

Theoretical Physics Division [1]

1. Nabarun Chakrabarty, Partha Konar, Rishav Roshan, Sudipta Show, 2023, Thermally corrected masses and freeze-in dark matter: A case study, Phys. Rev. D 107, 035021, Date of Publication: 21/02/2023

Udaipur Solar Observatory [2]



1. Yogesh Kumar Maurya, Ramit Bhattacharyya and David Iain Pontin, 2023, Magnetic reconnections as the underlying cause of spontaneous generation and annihilation of three-dimensional magnetic nulls, *Physics of Plasmas* 30, 022901 (2023), Date of Publication: 01/02/2023
2. Louis, Rohan E.; Mathew, Shibu K.; Bayanna, A. Raja; Beck, Christian; Choudhary, Debi P., 2023, Sustained Heating of the Chromosphere and Transition Region Over a Sunspot Light Bridge, *The Astrophysical Journal*, 942, 62, Date of Publication: 01/02/2023`

Awards & Honours


1. **Dr. Jayesh P Pabari**, Associate Professor, Planetary Sciences Division of PRL, has been nominated as a **member of the Committee for creating a Database for DSC Members at Gujarat Technological University, Ahmedabad** for the EC / Electrical / IC / Biomedical Engineering disciplines for a period of three years.
2. The project entitled, "Defining river health of dryland rivers by developing a process-based hydro-geomorphic model" a CRG proposal in collaboration among IIT-Gn, IISER-Bhopal and Physical Research Laboratory, has been selected for support by the **Science and Engineering Research Board (SERB) for Core Research Grant (CRG)** for three years. In this proposal, Collaborator **Dr. R D Deshpande**, Senior Professor, Geosciences Division, PRL has conceived the possible role of stable isotopic investigation for examining the health of dryland rivers. Such rivers are very important for water resources in semi-arid and arid regions. **Mr. Virendra Kumar Padhya**, Scientist/Eng-SD, Geosciences Division of PRL is the Co-PI in this project.
3. **Computer Networking and Information Technology (CNIT)** team of PRL has been **appreciated by the State Cyber Crime Cells CID Crime & Railways, Gujarat State Gandhi Nagar** for their active participation in online reels competition, for sharing their creative ideas and knowledge and for helping people become aware of cybercrime.
4. **Dr. Arvind Singh**, Associate Professor, Geosciences Division of PRL has been **Invited to join AGU's Diversity, Equity, Inclusion, and Accessibility (DEIA) committee.**
5. **Mr. Jigarbhai A Raval**, Scientist/Engineer-SF and Head, Computer Networking and Information Technology (CNIT) of PRL has been nominated as **Deputy Chief Information Security Officer of DOS/ISRO, Expert Committee Member of the PM Gati Shakti (PMGS)-National Master Plan platform** and **Member of Advisory Committee, GSFC University, Vadodara.**
6. The work of **Dr. Karanam Durga Prasad**, Scientist/Engineer-SF, Planetary Sciences Division of PRL on "A Comprehensive 3D thermophysical Model of the Moon" has been **reported as research highlight in Nature India.**
7. The study of **Dr. Amit Basu Sarbadhikari**, Associate Professor and **Mr. Yash Srivastava**, SRF, Planetary Sciences Division of PRL on "A changing thermal regime revealed from shallow to deep basalt source melting in the Moon" has appeared as the **ISRO's Latest News on the ISRO website.**
8. The proposal by **Dr. Goutam K Samanta**, Professor, Atomic Molecular and Optical Physics Division of PRL, on "Indigenous development of compact, hands-free, stable, bright entangled photon sources at 810 nm" has been

approved for support by the **Department of Science & Technology (DST) - Technology Development Program (TDP) project.**

9. Mr. Yash Srivastava, SRF, Planetary Sciences Division of PRL has received the **2023 Lunar and Planetary Institute (LPI) Career Development Award** to attend the 54th Lunar and Planetary Science Conference (LPSC) scheduled during March 13-17, 2023, in Woodlands, Texas, USA.

 **Cyber Security Awareness** 
Jigar Raval, CNIT Division, PRL

Beware!! Your Bank Account Balance Do Not Disappear like Mr. India.!!!



**Think
B4U
Click/Share**

Report Cyber Crime Incidents on - www.cybercrime.gov.in OR Call on - 1930

OBITUARY



**Late Shri K.C. Zala
Technical Assistant-B**

Date of Birth 01.06.1948

Date of Superannuation 31.05.2008

Date of Death 03.02.2023



**Late Shri A. J. Shroff
Engineer-SE**

Date of Birth 13.10.1940

Date of Superannuation 31.10.2000

Date of Death 06.02.2023

Teary Eyes for the Departed Members

Compiled, Designed and Published by

The Newsletter Team

Prof. Navinder Singh Chair
Dr. Amitava Guharay Co-Chair

Data Collection and Proofreading Team

Dr. Satyendra Nath Gupta Member
Dr. Yogita Uttam Kadlag Member
Dr. Sanjay Kumar Mishra Member
Dr. Rohan Eugene Louis Member
Dr. Paramita Dutta Member
Mr. Senthil Babu T J Member
Dr. Manash Ranjan Samal Member

Formatting and Editing Team

Mr. A Shivam Member
Dr. Pragya Pandey Member
Ms. Shreya Pandey Member
Mr. Kushagra Upadhyay Member
Mr. BS Bharath Saiguan Member
Mr. Jacob Sebastian Member
Mr. Shivansh Verma Member
Ms. Shreya Mishra Member
Ms. Shivanshi Gupta Member
Ms. Jyoti Limbat Member
Mr. Rutuj Gharate Member
Ms. Srishti Sharma Member
Mr. Abhishek Kumar Member

For any suggestions or query, please contact us at: newsletter@prl.res.in

Follow PRL on Social Media



<https://twitter.com/PRLAhmedabad>



<https://www.facebook.com/PhysicalResearchLaboratory>



https://www.youtube.com/c/PRLAhmedabad_webinars



<https://www.instagram.com/prl1947/>



<https://www.linkedin.com/in/prl-ahmedabad-89600122b>



<https://www.kooapp.com/profile/prlahmedabad>

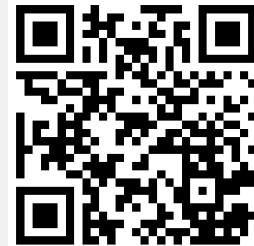
PRL Contact



<https://www.prl.res.in/prl-eng/home>



Website (English)



Website (Hindi)

Physical Research Laboratory
(A unit of Dept. of Space, Govt. of India)
Navrangpura, Ahmedabad - 380009
Phone: (079) 26314000
Fax: (079) 26314900
E-Mail: director@prl.res.in

भौतिक अनुसंधान प्रयोगशाला
(भारत सरकार, अंतरिक्ष विभाग की यूनिट)
नवरंगपुरा, अहमदाबाद - 380009
दूरभाष: (079) 26314000
फैक्स : (079) 26314900
ई - मेल: