Newsletter of the Physical Research Laboratory

THE SPECTRUM

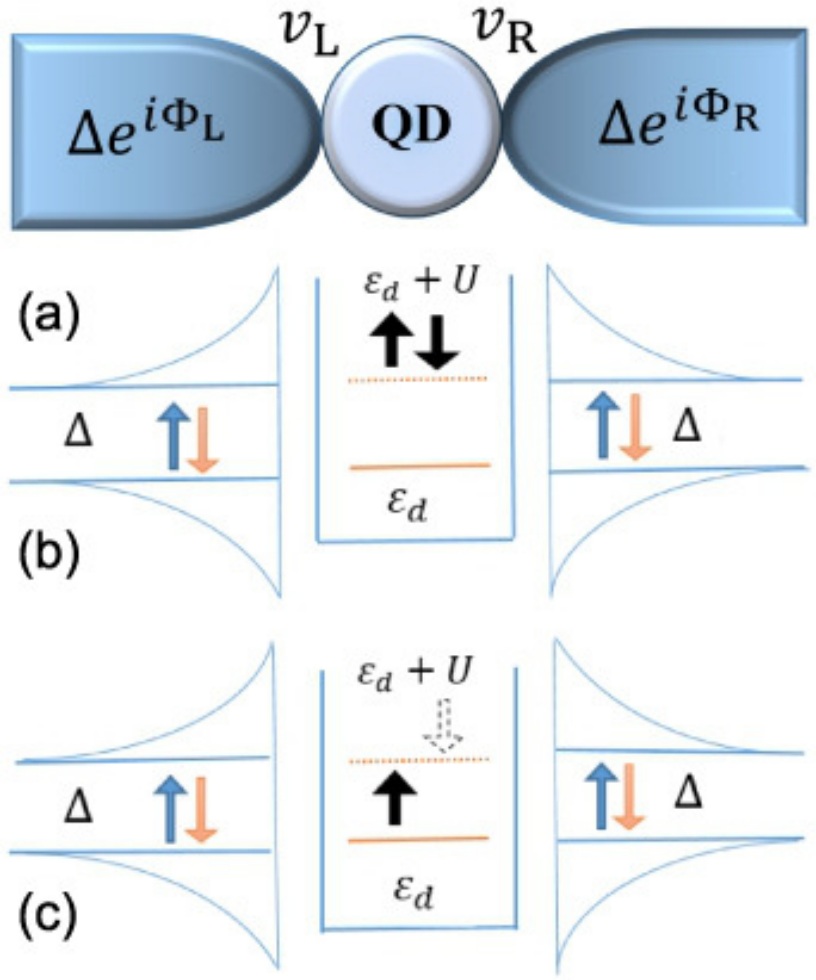


Image of the Month

The schematic diagram of Quantum dot (QD)-based Josephson Junction. QD hosting two electrons at the (b) same site forming a singlet state when Coulomb correlation (U) < junction coupling strength (ν) and (c) different site forming a doublet state for U > ν.

April 2025

Table of Contents

Latitudinal Distribution of Thermospheric Nitric Oxide (NO) Infrared Radiative Cooling During May and October 2024 Geomagnetic Storms....3

Field-free Josephson diode effect in interacting chiral quantum dot junctions....4

Diazotrophs: An overlooked sink of N2O....5

National Science Day celebration at PRL....6

International Women's Day 2025 Celebration at PRL....8

Astrophysical Dust and Ices Workshop 2025 9

Indo-German Solar Physics Workshop: "Two Eyes on the Sun – Aditya-L1 and Solar Orbiter....10

बाईसवां पीआरएल अमृत राजभाषा व्याख्यान....11

Vikram Discussion on Neutrino Astrophysics....13

One-Day Hindi Workshop Organized by Udaipur Solar Observatory/Physical Research Laboratory for TOLIC Member Offices....14

PRL Football Tournament 2025: A Celebration of Sportsmanship and Team Spirit....16

Dance and Scientific Interfaces: Exploring Cosmic Enigmas Through Performance Special Lecture by Prof. Sharada Srinivasan....18

A Journey in Archaeometallurgy – by Prof. Sharada Srinivasan - 5th Bibha Chowdhuri Memorial Lecture and 102nd PRL ka Amrut Vyakhyan....19

PRL Monthly Publications Digest....20

Visitors....22

Awards & Honours....23

New Joinees....24

Obituary....26

The Author

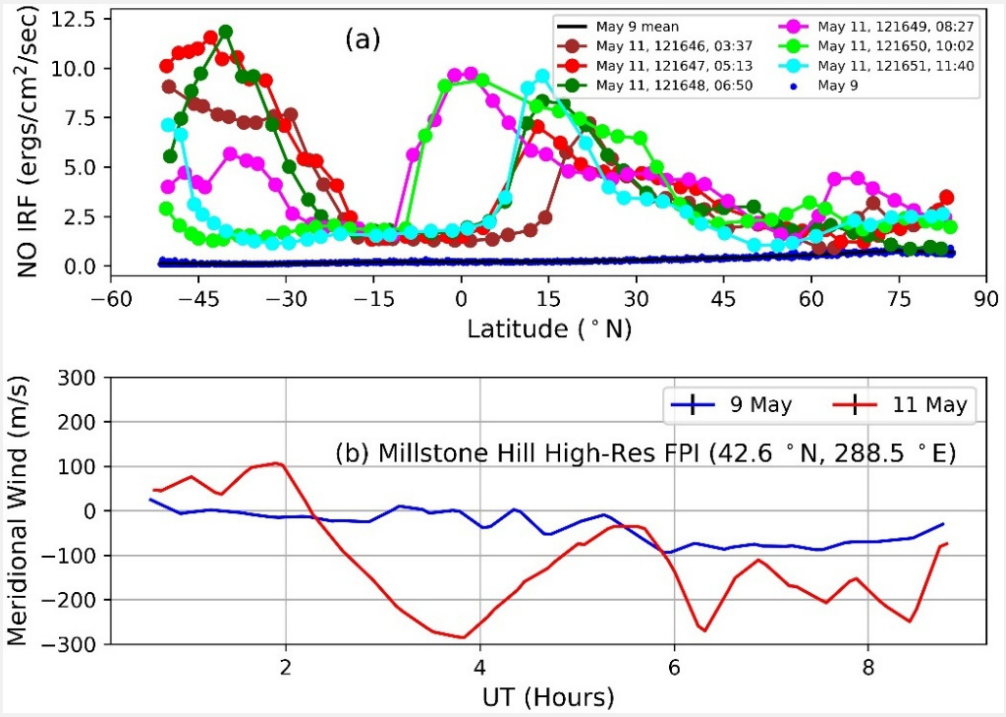
Alok Kumar Ranjan

Latitudinal Distribution of Thermospheric Nitric Oxide (NO) Infrared Radiative Cooling During May and October 2024 Geomagnetic Storms

(***Alok Kumar Ranjan*** *and Duggirala Pallamraju)*

The infrared emissions by Nitric oxide (NO) serve as a significant heat sink for the thermosphere and facilitate its recovery from the enhanced density during geomagnetic storms. During geomagnetic storms, the increased precipitation of energetic electrons and ions facilitate the production of NO in the high latitude regions. The investigations were carried out during the two recent severe geomagnetic storms (10-11 May, and 10-11 October 2024). During the May 11 event, the peak NO infrared radiative cooling events shifted from the high latitudes (30-83 ^{o}N) to low latitude (10 ^{o}S-30 ^{o}N) regions (Figure (a)) in early morning, which is favorable for storm induced equatorward meridional winds. The FPI (Fabry Perot Interferometer) measured wind intensity in lower thermosphere captured the storm induced equatorward meridional wind on May 11 (Figure (b)). The strength of the equatorward meridional wind on May 11 (red colored line) increased significantly up to about 290 ms^{-1}. It is interpreted that this strong wind brought the NO rich air toward low latitudes, causing an increase in the NO IRF (Infrared Radiative Flux) in equatorial regions as observed in Figure (a). For the October 11 event, most of the enhanced emissions were observed in solar local noon and located in 70-180 ^{o}E and 5-40 ^{o}S. The southern magnetic pole is also located between the same longitude region, where equatorward meridional winds are more enhanced compared to other longitude regions during geomagnetic storms. The effect of storm induced meridional winds on enhanced thermospheric NO radiative cooling were further confirmed by observation of depleted O/N_2 ratio in the same region. The contribution of energetic solar radiation to the post storm NO radiative cooling in low latitude regions was also discussed in this study.

Source/Reference of the Work: https://doi.org/10.1029/2024JA033559



(a) Sounding of the Atmosphere using Broadband Emission Raiometry (SABER) observed orbital variation of NO IRF in early morning on May 9 (geomagnetic quiet day), and May 11, (b) The meridional wind measurements by FPI on May 9 and May 11, 2024. The 6 digit number (e.g., 121,646) in Figure (a) shows the orbit number in northern hemisphere, and time (e.g., 03:37) shows UT (hours) near equator.

Field-free Josephson diode effect in interacting chiral quantum dot junctions

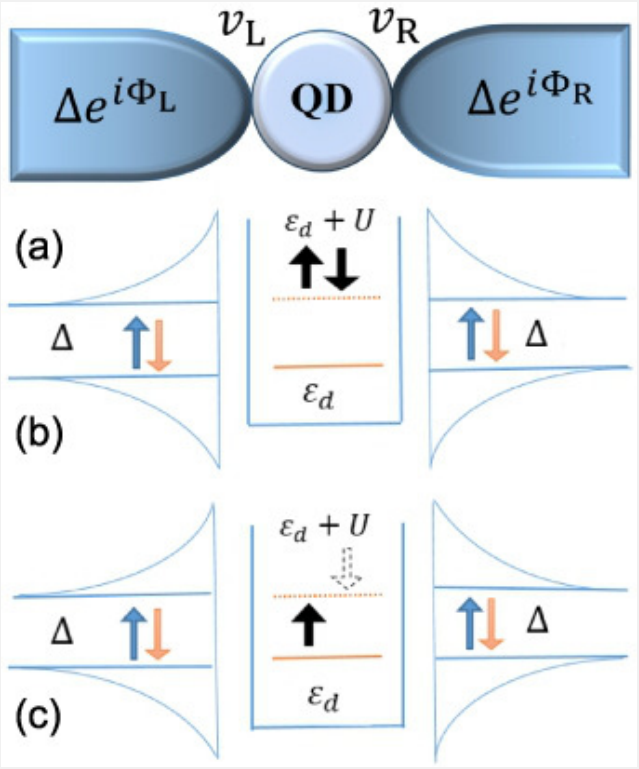
(***Debika Debnath***, *Paramita Dutta*)

The Author

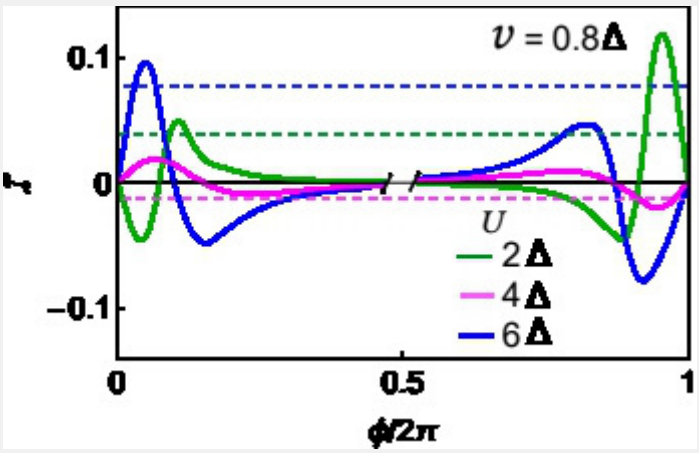
Debika Debnath

When two superconductors are connected through a weak barrier, it develops a Josephson junction (JJ) where the Josephson current (JC) flows from one lead to another due to the finite superconducting phase difference (Δϕ) between the two superconducting leads. Recent breakthroughs showed that the supercurrent flow in the JJ can be different in the forward and backward direction by simultaneous breaking of the inversion and time reversal symmetry of the system. In the literature, magnetic field or magnetic element has been widely used to get Josephson diode effect (JDE). We show JDE without any magnetic field. This field-free diode effect is possible in an interacting quantum dot (QD) when we break the inversion symmetry of the system for which we use finite distorsion. In our present work, we have considered an interacting quantum dot (QD) as a weak barrier in between two s-wave superconducting leads (Figure, left). A finite Coulomb correlation strength in the QD generates an intrinsic magnetic moment, which we have explored to use as a potential element to break the time-reversal symmetry of the system. Using a model Hamiltonian, we have calculated the difference in the forward and backward currents in the JJ. Our study on the Josephson current and the rectification coefficients in the interacting QD-based JJ shows the sign-changing behavior of the diode rectification coefficient with the Coulomb correlation and the lead-to-dot coupling strength, and found the maximum magnitude of the rectification coefficient ~ 72% for moderate interaction strength (Figure, right). Though the diode effect in a semiconductor p-n junction is a well-established phenomenon in the literature, the finite current rectification in Josephson junction makes it a potential switching component in superconductor based devices.

Source/Reference of the Work: https://doi.org/10.1088/1361-648X/adbeaf



The schematic diagram of QD-based JJ. QD hosting two electrons at the (b) same site forming a singlet state when Coulomb correlation (U) < junction coupling strength (ν) and (c) different site forming a doublet state for U > ν.



Josephson current as a function of superconducting phase difference (ϕ) for different Coulomb correlation strengths at constant QD to superconductor coupling strength ν=0.8.

The Author

Shreya Mehta

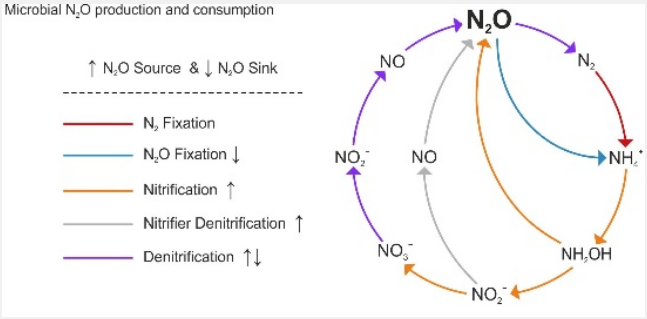
Diazotrophs: An overlooked sink of N_2O

*(Himanshu Saxena, **Shreya Mehta**, Sipai Nazirahmed, Jitneder Kumar, Sanjeev Kumar, Arvind Singh)*

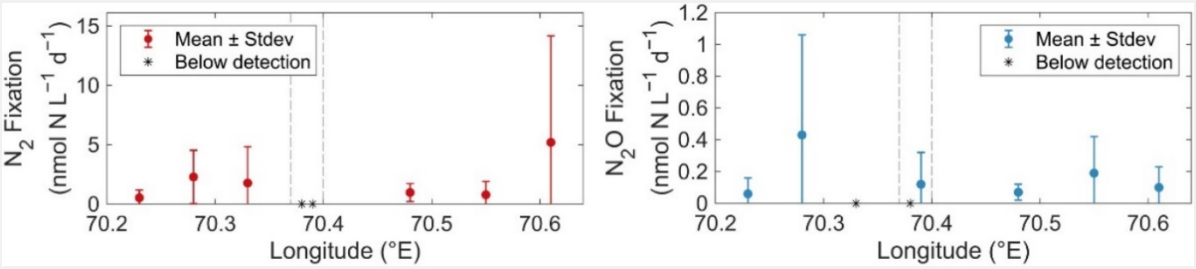
The greenhouse gas nitrous oxide (N_2O) is an important contributor to global warming, where the ocean is the second-largest source of N_2O after soils. However, the ocean's role as an N_2O sink is severely overlooked. Besides denitrification (a process in which microbes convert N_2O to N_2), scientists have discovered that diazotrophs that fix triple-bonded N_2 gas to NH_4^+ are susceptible to fix N_2O molecules (Figure, top). Thus, assimilatory N_2O fixation by diazotrophs appears a novel N_2O consumption pathway. The coastal Arabian Sea has global implications due to its significant contribution toward nitrogen loss and N_2O-driven global warming. Understanding the process of N_2O consumption is therefore critical, especially in the face of human impacts. Thus, we investigated diazotrophic N_2O consumption and examined the anthropogenic influence on N_2O dynamics in the coastal northeastern Arabian Sea.

Our findings reveal that the coastal region, excluding the near-fishery harbor waters, acted as a minor net sink for N_2O (98% saturation), contrary to previous reports and in parallel contrast to the global N_2O flux estimations. Interestingly, N_2O fixation remains active in the near-fishery harbor eutrophic waters unlike N_2 fixation (Figure, bottom), and thus, can meaningfully contribute to reducing N_2O emissions. To our counter intuition, N_2O fixation however appears to be an insignificant source of bioavailable nitrogen to primary production based on the current in situ concentrations of N_2O. Our study reveals the significance of N_2O fixation in the context of CO_2, yielding global N_2O fixation estimates equivalent to 0.3 Tg C y^{-1} global ocean net primary production. The established negative feedback of N_2O fixation with N_2O concentrations, and by extension to N_2O emissions, additionally underscores the potential of N_2O fixation as a natural climate regulator. Future research and marine N_2O budgets should thus incorporate N_2O fixation as an N_2O sink, as it holds the potential in climate mitigation strategies.

Source/Reference of the Work: https://doi.org/10.1029/2024GL114117



Microbial production and consumption pathways of N_2O



N_2 and N_2O fixation rates. Data between the vertical dashed lines represent stations near the fishery harbor.

National Science Day celebration at PRL

PRL celebrated National Science Day (NSD) 2025 with great zeal and enthusiasm on 1st March, 2025, bringing together a lively community of students, educators, and science enthusiasts. National Science Day commemorates the discovery of the Raman Effect by Nobel Laureate Sir C.V. Raman, and PRL has always been at the forefront of honouring this day with educational and inspiring events. The objective is not only to celebrate the spirit of science but also to instill a passion for scientific inquiry among young minds.

This year, the event welcomed an impressive participation of 168 students, 79 teachers, and numerous accompanying parents from across Gujarat. NSD 2025 was especially memorable due to the introduction of several new and creative activities, making it a refreshing and enriching experience for everyone involved. The carefully curated program aimed to strike a balance between competition, collaboration, creativity, and communication. Each student had the opportunity to participate in two diverse activities, one from Group A and one from Group B, allowing them to explore different dimensions of science in an enjoyable and engaging way.

Group A Activities:

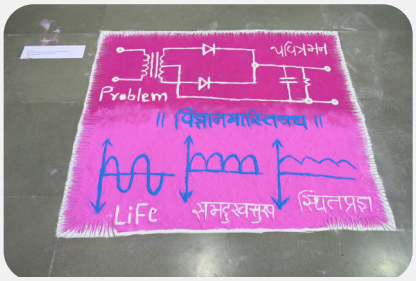
- Quiz Competition – A lively test of knowledge and teamwork that attracted 118 participants.
- Science Model Competition – A showcase of innovation and design, with 35 students presenting original working and conceptual models.

Group B Activities:

- Science Rangoli Competition – A unique fusion of art and science, featuring 10 beautiful entries.
- Science Cartoon (SciToon) Competition – A platform for creative scientific expression through illustrations, with participation from 102 students.
- Impromptu Speech Competition – A spontaneous and thought-provoking challenge taken up by 71 students, reflecting their understanding and communication skills in science.

To encourage and inspire educators, an exclusive session titled "Innovations in Teaching" was arranged for accompanying teachers. One teacher presented a creative and engaging approach to teaching Pascal's Triangle, offering insights into innovative pedagogy that fosters better understanding in students.
Adding further excitement to the celebration, PRL staff and research fellows presented a live science skit titled "Mission ग्रह प्रवेश". The performance, blending theatrical storytelling with scientific themes, captivated the audience and highlighted the importance of science communication in an entertaining format.
Another highlight of the day was an interactive hands-on STEM session, conducted by Mr. Jay Thakkar and Ms. Jasmine Anandani from the Centre for Creative Learning (CCL), IIT Gandhinagar. Their engaging talk and activities received overwhelming appreciation from both students and faculty. For those interested in further exploring hands-on science, CCL @ IITGn is open for individual and group visits. Interested visitors can contact them via email at [ccl@iitgn.ac.in], and more information is available on their website: https://ccl.iitgn.ac.in/resources.
A total of 62 prizes were distributed across the various competitions, recognizing and encouraging excellence, creativity, and participation. Among these were the prestigious Aruna Lal Scholarships—five scholarships awarded to outstanding 11th standard science students. An entrance test for these scholarships was conducted on 19th January 2025, and it saw enthusiastic participation from science students across Gujarat.

The tremendous success of NSD 2025 is a testament to the dedicated efforts, meticulous planning, and teamwork of the PRL organizing committee and volunteers. The joy, curiosity, and engagement seen on the faces of students, teachers, and parents alike reaffirm PRL's commitment to nurturing scientific temper in societ



Glimpses from the event

International Women's Day 2025 Celebration at PRL

PRL celebrated International Women's Day 2025 with a series of events focused on awareness, empowerment, and recognition. The celebrations began with an interactive Health & Hygiene session on 7th March, led by Dr. Shital Patel, attended by women staff across all PRL campuses. A notable feature of this session was the open discussion with cleaning staff, where they shared challenges related to washroom upkeep and explored practical solutions.

A Poster Making Competition on the theme **"Role of Women in the Economy"**, in line with the UN's IWD theme, received enthusiastic participation. The posters were displayed at the KRR foyer on the main celebration day, 18th March.

On 18th March, women staff members received a complimentary lunch and tokens of appreciation. The event featured a video tribute to Women at PRL, followed by a thought-provoking montage act, "Perspectives", performed by PRL staff, exploring various viewpoints related to women around us.

A special cultural performance by artists from Raah Foundation—a non-profit supporting specially-abled individuals, especially visually impaired girls in performing arts—was a highlight of the day. As a gesture of support towards the visually impaired girls, Prof. Anil Bhardwaj, Director, presented a cheque of ₹25,000 to the Raah Foundation.

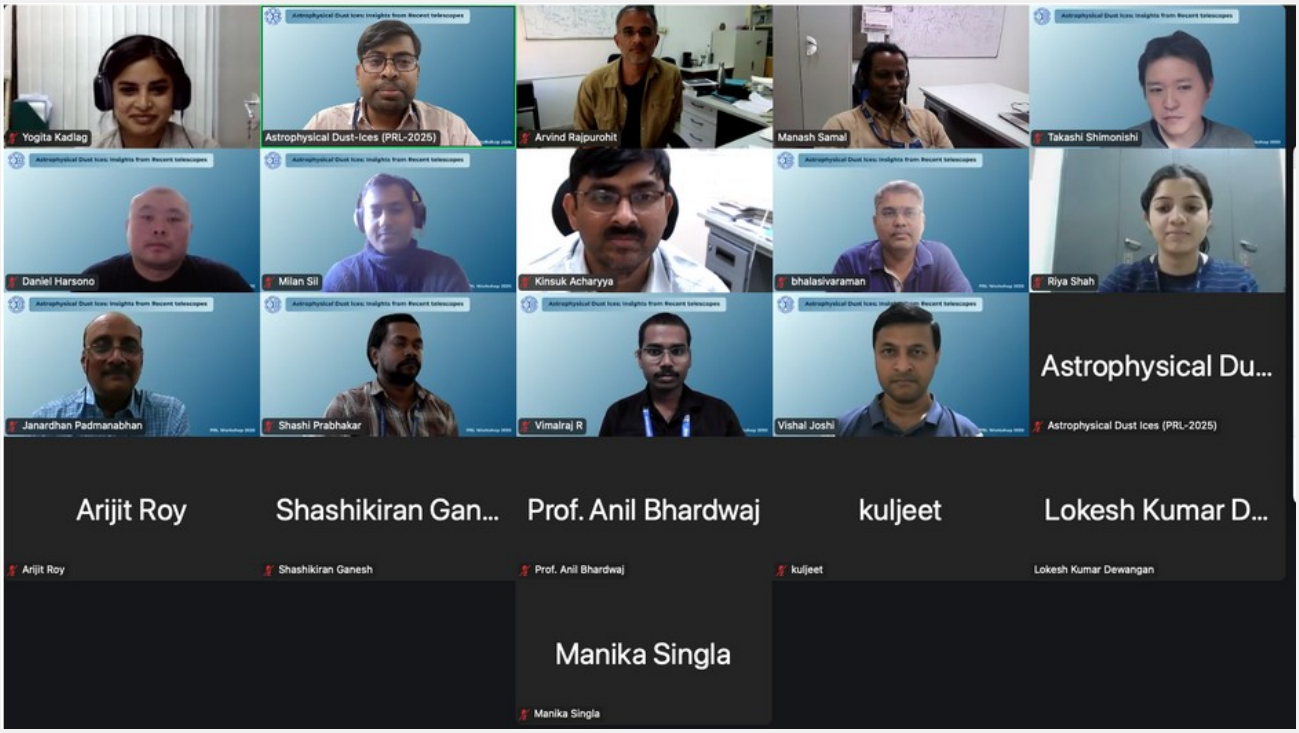
The event concluded with a prize distribution ceremony for the poster competition, a vote of thanks, and high tea. The celebration was streamed live to PRL's Udaipur and Mount Abu campuses.

Glimpses from the event

Astrophysical Dust and Ices Workshop 2025

The one-day Workshop on "Astrophysical Dust and Ices: Insights from Recent Telescopes" was organized by PRL, Ahmedabad, on 10th March, 2025. Conducted online, this event aimed to bridge the gap between astrophysics, astronomy, and astrochemistry communities. The workshop witnessed overwhelming interest with 842 registrations representing 451 institutes, exceeding the attendee limit of 500 participants. Ultimately, 351 participants including researchers, academics, and students attended the workshop across 20 countries spanning five continents. Certificates were distributed to about 160 attendees who met the criterion of attending at least three hours of the sessions. There were about 20 -30 panelists in the `Zoom' webinar from various institues across the globe, including, faculties from PRL.

The workshop discussed topics ranging from observations of molecular cores, protostars, protoplanetary disks, dust in M-Dwarf stars, and exoplanetary atmospheres, to the capabilities of instruments such as JWST, ALMA, and PRL's Mount Abu Observatory facilities, alongside findings from the PRL Astrochemistry Laboratory. This workshop marked a significant first step in encouraging knowledge-sharing and promoting impactful scientific results by utilizing the existing facilities and expertise within PRL. Looking ahead, the workshop also discussed continuing to strengthen interdisciplinary collaborations through similar workshops, enhanced interactions, and impactful deliverables.



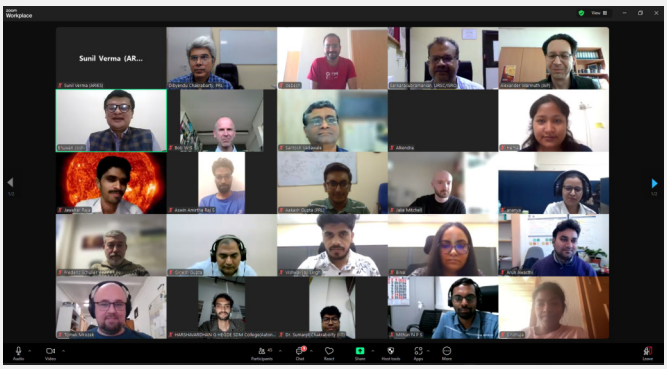
Glimpses from the event

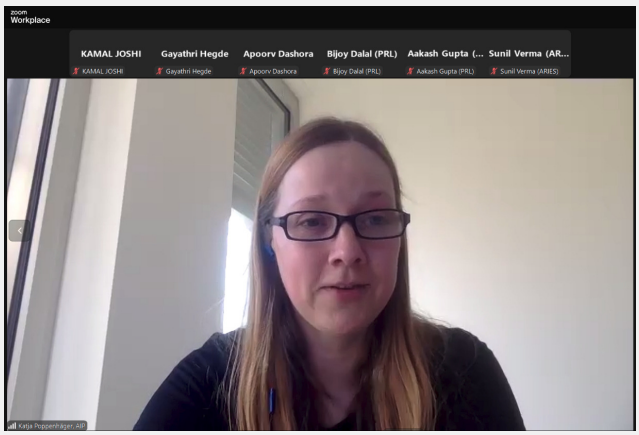
Indo-German Solar Physics Workshop: "Two Eyes on the Sun – Aditya-L1 and Solar Orbiter

The Indo-German Solar Physics Workshop, titled “Two Eyes on the Sun – Aditya-L1 and Solar Orbiter”, was held online on March 19, 2025. This one-day event was jointly organized by the Udaipur Solar Observatory (USO), PRL, and the Solar Physics Group at the Leibniz Institute for Astrophysics Potsdam (AIP), Germany. The workshop was coordinated by the Principal Investigators (PIs) of the Indo-German DST–DAAD collaborative project, Prof. Bhuwan Joshi and Dr. Alexander Warmuth.
The workshop began with inaugural addresses by the Directors of the two organizing institutes, Prof. Anil Bhardwaj and Prof. Katja Poppenhaeger, who emphasized the importance of international collaboration in advancing solar research.

The scientific program featured eight invited talks, showcasing ongoing research and prospects using data from Aditya-L1, Solar Orbiter, XSM/Chandrayaan-2, and other contemporary solar observatories. The sessions highlighted the synergistic potential of these missions in advancing our understanding of the Sun, with a particular emphasis on coordinated observations and multi-wavelength diagnostics.

With 118 participants, the workshop fostered vibrant discussions and facilitated valuable exchanges of ideas, further strengthening Indo-German collaboration in solar physics.





Glimpses from the event

बाईसवा पीआरएल अमृत राजभाषा व्याख्यान (पर्व)

"पीआरएल अमृत राजभाषा व्याख्यान (पर्व)" का 22वां व्याख्यान 19 मार्च, 2025 को आयोजित किया गया। इस अवसर के प्रमुख वक्ता श्री गौरव सेठ, सह–संस्थापक और सीईओ, पियर्साइट स्पेस थे।

श्री गौरव सेठ ने भारतीय अंतरिक्ष विज्ञान एवं प्रौद्योगिकी संस्थान (आईआईएसटी) से स्नातक की उपाधि प्राप्त की। इसके बाद उन्होंने भारतीय अंतरिक्ष अनुसंधान संगठन (इसरो) में नौ साल तक काम किया, जहाँ उन्होंने विभिन्न अंतरग्रहीय और पृथ्वी अवलोकन मिशनों के डिजाइन और निष्पादन में महत्वपूर्ण भूमिका निभाई। अब वे पियर्साइट स्पेस के सह–संस्थापक और सीईओ हैं, जो एक भारतीय अंतरिक्ष प्रौद्योगिकी स्टार्टअप है जो लगातार पृथ्वी अवलोकन के लिए विशेष सिंथेटिक एपर्चर रडार सिस्टम विकसित करने पर केंद्रित है।

व्याख्यान का शीर्षक था "स्पेसटेक में मेरी उद्यमशीलता यात्रा"।
श्री सेठाया कि भारतीय अंतरिक्ष प्रौद्योगिकी में उनकी उद्यमशीलता की यात्रा एक अत्यंत पुरस्कृत और विनम्र अनुभव रही है। पियर्साइट स्पेस के सीईओ के रूप में, उन्हें भारत के पहले समुद्री–केंद्रित उपग्रह समूह के निर्माण के लिए एक प्रतिभाशाली टीम के साथ काम करने का सौभाग्य मिला, जिसका उद्देश्य अवैध मछली पकड़ने, तेल रिसाव और समुद्री सुरक्षा जैसी महत्वपूर्ण चुनौतियों का समाधान करना है।

उन्होंने आगे बताया कि पियर्साइट शुरू करने के लिए इसरो में उनका कार्यकाल सीखने, दृढ़ता और सहयोग की यात्रा रही है। जबकि वे फंडिंग जुटाने और वैश्विक मान्यता प्राप्त करने जैसे मील के पत्थर हासिल करने के लिए भाग्यशाली रहे हैं, यह यात्रा चुनौतियों को स्वीकार करने और वैश्विक अंतरिक्ष–तकनीक पारिस्थितिकी तंत्र में सार्थक योगदान देने के अपने दृष्टिकोण के प्रति प्रतिबद्ध रहने के बारे में भी रही है। श्री सेठ ने अपने अनुभवों से अंतर्दृष्टि साझा की और दूसरों को भारतीय अंतरिक्ष प्रौद्योगिकी की अपार संभावनाओं की गहराई का पता लगाने के लिए प्रेरित किया।
एक आकर्षक प्रश्नोत्तर के माध्यम से, श्रोताओं को विषय के बारे में अधिक जानने और नए दृष्टिकोण प्राप्त करने का अवसर मिला।

The 22nd lecture of "PRL Amrut Rajbhasha Vyakhyaan (PARV)" was held on 19th March, 2025. The eminent speaker for the occasion was Shri. Gaurav Seth, Co-founder and CEO of PierSight Space.

Shri. Gaurav Seth graduated from the Indian Institute of Space Science and Technology (IIST). He then worked for nine years at the Indian Space Research Organisation (ISRO), where he played a key role in the design and execution of various interplanetary and Earth observation missions. He is now Co-founder and CEO of PierSight Space, which is an Indian space technology startup focused on developing specialized synthetic aperture radar systems for persistent Earth observation.

The title of the Vyakhyan was “स्पेसटेक में मेरी उद्यमशीलता यात्रा”.

Shri. Seth shared that his entrepreneurial journey in Indian space technology has been an extremely rewarding andhumbling experience. As CEO of PierSight Space, he had the privilege of working with a talented team to build India’s first maritime-focused satellite constellation, which aims to address critical challenges such as illegal fishing, oil spills and maritime security.

He further added that his tenure at ISRO to start PierSight has been a journey of learning, perseverance, and collaboration. While they have been fortunate to achieve milestones such as raising funding and receiving global recognition, the journey has also been about embracing challenges and staying committed to their vision of contributing meaningfully to the global space-tech ecosystem. Shri. Seth also shared the insights from his experiences and inspired others to explore the depths of the immense potential of Indian space technology.

Through an interesting Q&A, listeners were able to learn more about the topic and get fresh viewpoints.

ऑनलाइन उपलब्ध है: https://www.youtube.com/live/mSakuWIzzsQ?

Vikram Discussion on Neutrino Astrophysics

The Vikram Discussions on Neutrino Astrophysics (VDNA), organized by the theoretical physics division of PRL during 19-21 March 2025, was aimed at focused discussions within the expansive field of neutrino astrophysics. Neutrinos interact solely via the weak force. This unique property allows them to travel over vast galactic and intergalactic distances, carrying with them crucial information about astrophysical events.

Over the past fifty years, the theoretical and experimental studies of neutrinos have significantly advanced, with immense progress in understanding its properties via the observation of the phenomenon of neutrino oscillations. The field of neutrino astrophysics and cosmology, in particular, has seen rapid growth over the last two decades, driven by advancements in theory and experiment alike.

The VDNA's core goal was to critically evaluate the current state of neutrino astrophysics. The discussions sought to highlight areas where further progress could be made and to identify strategies for reinforcing ongoing efforts. Additionally, VDNA aimed to open new investigative pathways, offering fresh opportunities to create synergies between theoretical and experimental work in the field.

The scientific program encompassed extensive discussions with a total of 10 sessions averaging 1.5 hours each. Approximately 50% of the schedule was reserved for focused discussions. The agenda featured 11 comprehensive talks, each of 45 minutes duration, alongside 7 shorter presentations ranging from 15 to 30 minutes. The event was attended by 17 invited participants from outside institutions and 28 participants from PRL.

The attendees included both early-career and senior researchers, all possessing specialized expertise and active research interests in the domain of neutrino astrophysics.

Glimpses from the event

One-Day Hindi Workshop Organized by Udaipur Solar Observatory/Physical Research Laboratory for TOLIC Member Offices

On 20th March, 2025, the Udaipur Solar Observatory (USO)/Physical Research Laboratory (PRL), Udaipur, successfully organized a One-Day Hindi Workshop for the member offices of the Town Official Language Implementation Committee (TOLIC), Udaipur. The workshop saw participation from 33 attendees representing 19 TOLIC member offices. To ensure broader outreach, the inaugural session, official language session, and scientific session were also broadcast live for PRL members based in Ahmedabad and at the Mount Abu Observatory Campus.

The event commenced with the National Song. Prof. Bhuwan Joshi, Deputy Head-I, USO, then introduced the achievements of PRL Director, Prof. Anil Bhardwaj, and invited him to deliver the inaugural address. In his address, Prof. Bhardwaj warmly welcomed the Member Secretary of TOLIC, Udaipur, along with all participants. He highlighted the scheduled lectures to be delivered by the Member Secretary and Prof. Joshi and emphasized the ongoing development of Hindi as the official language at USO/PRL, commending the efforts made in this direction.
Following the inaugural address, Prof. Shibu K. Mathew, Head, USO welcomed the TOLIC Member Secretary, Shri Giriraj Paliwal, with a floral bouquet. Subsequently, Mrs. Rumkee Dutta, Assistant Director (Official Language), PRL, addressed the gathering, sharing the key achievements and initiatives of the Hindi Section at USO/PRL. Dr. Brajesh Kumar, Professor at USO, introduced the Chief Guest Shri Paliwal and provided an overview of the upcoming sessions.

Official Language Session

In this session, Shri Giriraj Paliwal, Member Secretary, TOLIC, Udaipur delivered a lecture on “Parliamentary Official Language Committee Review Process: An Introduction.” He elaborated on the review mechanisms employed by the committee and also expressed sincere appreciation to USO for hosting this important workshop.

Scientific Session

Prof. Bhuwan Joshi conducted a detailed session on “Our Sun and Space Weather.” He began with a brief overview of PRL and USO's evolution before diving into topics such as sunspots, solar flares, Aditya L-1, and the influence of solar magnetic activity on space weather. His presentation, supported by an engaging slideshow, sparked a lively Q&A session where he also touched upon the technical aspects of the recent return of astronaut Sunita Williams from a nine-month space mission. The session received overwhelming appreciation from participants, who requested similar sessions in the future.
Shri Abhishek Upadhyay, Junior Translation Officer, then thanked all participants—both in-person and virtual—and formally concluded the official language and scientific sessions. A group photo session followed, after which the participants embarked on a guided tour of the Island Observatory.

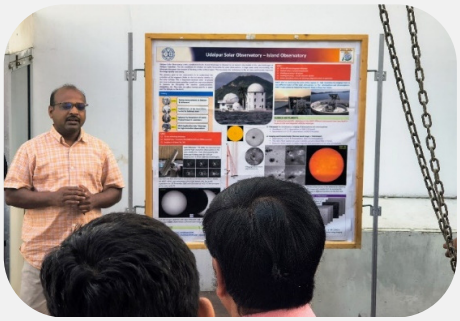
Solar Observation Session

The observation session began with Dr. A. Raja Bayanna (Scientist/Engineer-SF) introducing participants to the MAST and SPAR telescopes via informative posters. The participants were divided into two groups. Mr. Ravi Chaurasia, PhD Scholar, explained the SPAR telescope's functioning, while Dr. Bayanna and Ms. Bireddy Ramya (Scientist/Engineer-SE) demonstrated the working of the 50cm-MAST. Attendees also observed live solar phenomena under the guidance of Prof. Shibu K. Mathew, Head of USO and other Scientific staff members.

Closing Session

In the concluding session, Shri Abhishek, Senior Administrative Officer, delivered the vote of thanks. He acknowledged Prof. Anil Bhardwaj, Director, PRL for his unwavering support in promoting the Hindi language at USO-PRL. Special thanks

were also extended to Prof. Shibu K. Mathew, the workshop speakers, Prof. Brajesh Kumar, Dr. A. Raja Bayanna, Ms. Bireddy Ramya, and all USO team members involved in organizing the event. Shri Abhishek concluded by expressing heartfelt gratitude to all participants.



Glimpses from the event

PRL Football Tournament 2025: A Celebration of Sportsmanship and Team Spirit

The PRL Football Tournament 2025 was held from 21st March to 1st April, 2025, bringing together teams from six divisions of PRL in a spirited contest for glory. The participating divisions were: Atomic, Molecular and Optical Physics (AMOPH), Theoretical Physics & Administration (THEPH & ADMIN), Planetary Sciences Division (PSDN), Astronomy and Astrophysics (ASTAS), Space and Atmospheric Sciences Division (SPASC) and Geosciences Division (GSDN). The tournament followed a group-stage and knock-out format, with the top two teams from each group advancing to the semifinals, culminating in an exciting final match.

The tournament was inaugurated on 26th January 2025 by the Director of PRL, with an electrifying exhibition match between Director VI and Dean VI. The match ended in a thrilling 3-2 victory for Director XI, who was awarded the Exhibition Match Shield. The inauguration ceremony included team introductions, a ceremonial cake-cutting, and the unveiling of the exhibition trophy, setting the tone for the competitive spirit ahead.

Group Stage Standings:

Position	Group A									Group B							
	Team	P	W	D	L	F	A	GD	Points	Team	P	W	D	L	F	A	GD	Points
1	THEPH & ADMIN	2	2	0	0	5	1	+4	6	PSDN	2	2	0	0	1	0	+1	6
2	SPASC	2	1	0	1	3	2	+1	3	GSDN	2	1	0	1	2	1	+1	3
3	ASTAS	2	0	0	2	1	6	-5	0	AMOPH	2	0	0	2	0	2	-2	0

From the group stage, THEPH & ADMIN, SPASC, PSDN, and GSDN advanced to the semifinals.

- **Semifinal 1:** Planetary Sciences Division (PSDN) vs Space and Atmospheric Sciences Division (SPASC)
- The match ended 1-1 in regular time, with PSDN triumphing 4-2 on penalties.
- **Semifinal 2:** Theoretical Physics & Admin (THEPH) vs Geosciences Division (GSDN). GSDN secured a convincing 2-0 victory, booking their place in the finals.

The grand finale was held on 1st April 2025, between **Geosciences Division (GSDN)** and **Planetary Sciences Division (PSDN)**—both eyeing their first-ever tournament title.

The ceremony began with the presentation of PRL football jerseys to the Director and Dean. Upholding tradition, Arvind Singh Rajpurohit, last year's Best Player and part of the winning team, ceremonially placed the previous year's trophy on the presentation table. The Director of PRL handed over the match ball to the officials, officially marking the beginning of the final match.

The game remained goalless for the first 45 minutes, with both teams showcasing exceptional skill and determination. Around 20 minutes into the second half, PSDN broke the deadlock with a decisive goal. Despite relentless pressure from GSDN, PSDN held their nerve in the final tense moments and emerged victorious, clinching their first PRL Football trophy.

Following the final, a trophy and awards ceremony was held to recognize outstanding performances throughout the tournament:

- **Player of the Tournament:** Rohit Meena (GSDN)

- **Golden Boot (Top Scorer):** Bhavesh Kuli (SPASC)
- **Goalie of the Tournament:** Soumik Kar (PSDN)
- **Organiser's Fan of the Tournament:** Kapil Bharadwaj (A&A), Vimlesh (AMOPH)
- **Emerging Player of the Tournament:** Tirtha (PSDN)

Glimpses from the event

Dance and Scientific Interfaces: Exploring Cosmic Enigmas Through Performance Special Lecture by Prof. Sharada Srinivasan

An engaging talk with illustrations titled Dance and Scientific Interfaces: Exploring Cosmic Enigmas Through Performance was delivered by Prof. Srinivasan, on 26th March' 2025. This talk explored how the medium of dance has been used—both in antiquity and in contemporary contexts—to interpret and express the mysteries of the cosmos.

The session began with a focus on the symbolic richness of the Chola-period Nataraja bronze, illustrating how this iconic form, paired with traditional Bharatanatyam repertoire, has long conveyed metaphors of cosmic creation, destruction, and the cyclical nature of existence. Through insightful commentary and video inserts, Prof. Srinivasan demonstrated how dance served as a philosophical medium to embody the enigma of the universe in ancient times.

The talk then transitioned to a modern reinterpretation of these ideas through Danse e-Toile, an interactive, internet-streamed performance in which Prof. Srinivasan herself was a performer. This contemporary work incorporated adaptations of the traditional Bharatanatyam repertoire and delved into themes of quantum duality and the convergence of classical and quantum realities. It offered a compelling example of how ancient forms can evolve to engage with present-day scientific metaphors and digital media.

Prof. Srinivasan, a seasoned Bharatanatyam exponent, has previously presented her work at esteemed venues including the Royal Academy of Arts, London (2007) and Space City, Toulouse (2009), among others across India and abroad. Her unique approach—bridging art and science—left the audience with much to reflect upon regarding the timeless relevance of classical art forms.

Glimpses from the event

A Journey in Archaeometallurgy – by Prof. Sharada Srinivasan - 5th Bibha Chowdhuri Memorial Lecture and 102nd PRL ka Amrut Vyakhyan

The 5th Bibha Chowdhuri Memorial Lecture and 102nd PRL ka Amrut Vyakhyan was held on 26th March' 2025. This talk paid tribute to one of India's earliest women physicists, Dr. Bibha Chowdhuri. A pioneering cosmic rays and particle physics researcher, Dr. Chowdhuri was associated with the PRL during its formative years. She made significant contributions to science, and the lecture series was instituted by PRL to honour her scientific legacy and to inspire future generations, particularly by highlighting the achievements of women in scientific research

.

The speaker for this year's memorial lecture was Prof. Sharada Srinivasan, a globally renowned archaeometallurgist and art historian whose work seamlessly blends science, archaeology, and cultural heritage. After completing her BTech from IIT Bombay and master's at the University of London. She later earned her PhD from University College London, where she focused on South Indian bronze sculptures. Prof. Srinivasan is known for her pioneering contributions to the study of ancient Indian metallurgy through modern scientific techniques. She has been widely recognized for her work, receiving the Padmashri in 2019 by Govt. Of India and being elected an International Honorary Member of the American Academy of Arts and Sciences in 2021.

In her lecture, Prof. Srinivasan explored the field of archaeometallurgy, which studies ancient metalworking techniques and the role of metals in past societies. She highlighted how the integration of archaeology, chemistry, and materials science provides a deeper understanding of historical metallurgical practices. Drawing from her extensive research on Indian antiquity, she presented case studies on medieval bronze sculptures, mining practices, and both ferrous and non-ferrous metallurgy.

She illustrated how advanced techniques such as electron probe microanalysis and lead isotope ratio analysis are used to investigate ancient artefacts' origins, composition, and technological sophistication. Her talk demonstrated how scientific analysis can offer insights into not just technological traditions, but also the aesthetic and ritual significance of metals in Indian culture. Prof. Srinivasan's presentation was a rich and engaging tribute to the memory of Dr. Bibha Chowdhuri, celebrating the confluence of science, heritage, and interdisciplinary scholarship.

Glimpses from the event

Available online at: *https://www.youtube.com/live/7ePYATD9RvQ?si=3JKBS5ZBsdgBY54D*

PRL Monthly Publications Digest (March 2025)

Astronomy & Astrophysics Division [01]
1. Neeraj K. Tiwari, Santosh V. Vadawale, N. P. S. Mithun, 2025, A novel optical design for wide-field imaging in X-ray astronomy, Experimental Astronomy, Date of Publication: 14/03/2025.

Atomic, Molecular and Optical Physics [04]
1.Malika Singhal, Madhusmita Panda, O. Annalakshmi, Naveen Chauhan, 2025, On the sensitivity normalization for blue stimulated luminescence of quartz, Radiation Physics and Chemistry, Date of Publication: 26/03/2025.

2.Tanya Sharma, Rutvij Bhavsar, Jayanth Ramakrishnan, Pooja Chandravanshi, Shashi Prabhakar, Ayan Biswas, R. P. Singh, 2025, Enhancing Key Rates of QKD Protocol by Coincidence Detection Date of Publication: 17/03/2025.

3.Paulramasamy Morthekai, Malika Singhal, Suchinder K. Sharma, Sudhakar Sivasubramaniam, Muthalankurichi Kamarasu, Priyanka Singh, Naveen Chauhan, Kamlesh Kumar, Sheikh Ali Nawaz, Nitesh Khonde, 2025, Investigating historical attribution: luminescence dating of bricks from a submerged structure in southeastern India, Frontiers in Environmental Archaeology, Date of Publication: 11/03/2025

4.YanMei Yu and B. K. Sahoo, 2025, Application of general-order relativistic coupled-cluster theory to estimate electric-field-response clock properties of Ca+ and Yb+, Phys. Rev. A 111, 032801 (2025); https://doi.org/10.1103/PhysRevA.111.032801, Date of Publication: 03/03/2025.

Space & Atmospheric Sciences Division [02]
1.Alok K. Ranjan, and Duggirala Pallamraju , 2025, Latitudinal Distribution of Thermospheric Nitric Oxide (NO) Infrared Radiative Cooling During May and October 2024 Geomagnetic Storms, Journal of Geophysical Research-Space Physics, Date of Publication: 14/03/2025.

2.Sovan Saha, Duggirala Pallamraju, Sunil Kumar, V. Lakshmi Narayanan, and Surendra Sunda, 2025, Cross-equatorial Travelling Ionospheric Disturbances and Changes in Background ionospheric densities over Indian longitudes during Geomagnetic Storm of 20-21 December 2015, Advances in Space Research, Date of Publication: 08/03/2025.

Theoretical Physics Division [01]
1.Debika Debnath and Paramita Dutta, 2025, Field-free Josephson diode effect in interacting chiral quantum dot junctions, Journal of Physics: Condensed Matter, Date of Publication: 21/03/2025.

Planetary Sciences Division [04]
1.Varun Sheel, S. Uttam and S.K. Mishra, 2025, Electric fields due to charged dust within a vortex, Physics of Plasmas, Date of Publication: 27/03/2025.

2.Shiv Kumar Goyal, Neeraj Kumar Tiwari, Arpit R. Patel, M. Shanmugam, Santosh V. Vadawale, Dibyendu Chakrabarty, Jacob Sebastian, Bijoy Dalal, Piyush Sharma, Aveek Sarkar, Aaditya Sarda, Tinkal Ladiya, Abhishek J. Verma, Nishant Singh, Sushil Kumar, Deepak Kumar Painkra, Prashant Kumar, Manan S. Shah, Pranav R. Adhyaru, Hiteshkumar L. Adalja, Swaroop B. Banerjee, K. P. Subramanian, Bhas Bapat, M. B. Dadhania, Abhishek Kumar, P. Janardhan & Anil Bhardwaj, 2025, Aditya Solar Wind Particle Experiment on Board Aditya-L1: The Supra-Thermal

and Energetic Particle Spectrometer, Solar Physics, Date of Publication: 21/03/2025.

3.Durga Prasad K, Chandan Kumar, Ambily G, Kalyana Reddy P, Sanjeev K. Mishra, Janmejay Kumar, Dinakar Prasad Vajja, Aasik V, Tinkal Ladiya, Arpit Patel, Murty S.V.S., Anil Bhardwaj & Amitabh , 2025, Higher surface temperatures near south polar region of the Moon measured by ChaSTE experiment on-board Chandrayaan-3, Nature Communications Earth & Environment, Date of Publication: 06/03/2025.

4.Nizy Mathew, K. Durga Prasad, Fazil Mohammad, V. Aasik, Dinakar Prasad Vajja, M. Ram Prabhu, M. Satheesh Chandran, K. P. Subhajayan, Kiran John Antony, P. P. Pramod, Chandan Kumar, Dona Mathew, R. Suresh, U. A. Subramanian, V. Sathiyamoorthy, Manu V. Unnithan, V. Preethakumari, Vinitha Ramdas, Ajay Salas, P. S. Ajeeshkumar, Neha Naik, Vinu Paul, P. Kalyana Reddy, G. Ambily, K. Kannan, M. B. Dhanya, Sanjeev Mishra, P. T. Lali, K. Sunitha, Samik Jash, Tanmay Singhal, Janmejay Kumar, Manoj Kumar Mishra, R. Renju, C. Suresh Raju & Anil Bhardwaj , 2025, Thermal conductivity of high latitude lunar regolith measured by Chandra's Surface Thermophysical Experiment (ChaSTE) onboard Chandrayaan 3 lander, Nature Scientific Reports, Date of Publication: 04/03/2025.

Geosciences Division [02]

1.Amzad Hussain Laskar, Pratheeksha Nayak, Aishwarya Singh, Rahul Kumar Agrawal, Ranjan Kumar Mohanty, Manan S. Shah, M.G. Yadava , 2025, A new graphitization setup for radiocarbon dating using accelerator mass spectrometer at Physical Research Laboratory Ahmedabad, Nuclear Inst. and Methods in Physics Research, B, Date of Publication: 31/03/2025.

2.Saxena, H., S. Mehta, S. Nazirahmed, J. Kumar, S. Kumar and A. Singh, 2025, Diazotrophs: An Overlooked Sink of N2O, Geophysical Research Letters, Date of Publication: 18/03/2025.

Visitors

1. Prof. Paulo Roberto Fagundas of Universidade do Vale do Paraiba (UNIVAP), Brazil visited Physical Research Laboratory, Ahmedabad from 05.03.2025 to 14.03.2025 in connection with Scientific discussion on the upper atmosphere and space weather studies, and strengthen the collaboration activities between PRL and UNIVAP, Brazil.

2. On 07.03.2025, three (3) faculty members and twenty (20) Undergraduate and Postgraduate students from Madhav University in Pindwara, Sirohi, Rajasthan visited Udaipur Solar Observatory for educational purposes.

3. Prof. Aroh Barjatya from Embry-Riddle Aeronautical University, USA visited Physical Research Laboratory, Ahmedabad from 11.03.2025 to 12.03.2025 for Scientific discussion and interaction with PRL Scientists and Research Scholars.

4. Dr. Olga Stroh Vasenov from Laser Components GMBH, Werner-von-Siemens, Deutschland, Germany visited the Physical Research Laboratory, Ahmedabad on 12.03.2025 for technical discussion on single photon detectors, specialized optics and lasers for application in quantum communication.

5. Mr. Timothy John Purdy, Mr. Bounds Stephen Edwin and Mr. Detrick Demond Branston from GONG, National Solar Observatory (NSO), Boulder, USA have visited Udaipur Solar Observatory, Uaipur from 18.03.2025 to 30.03.2025 in connection with upgradation and maintenance of the GONG Solar Telescope installed at USO.

6. Prof. Sourin Das from Indian Institute of Science Education & Research, Kolkata has visited PRL, Ahmedabad on 21.03.2025 for divisional seminar.

7. Dr. Aabhaas Vineet Malik and Dr. Indrakshi Raychowdhury both from Birla Institute of Technology and Science, Pilani have visited PRL, Ahmedabad on 25.03.2025 for interaction with PRL Scientists and divisional seminar.

8. Fifty (50) students from IIT, Bombay have visited Udaipur Solar Observatory, Udaipur on 30.03.2025 in connection with educational purposes.

9. During March 2025, the following personnel have visited Infrared Observatory, PRL, Mount Abu:- one IPS Officer from Nasik and one IPS Officer from M.P, District Forest Officer and along with five others from Mount Abu, IGP from Jaipur, a Professor from Brazil, three DOS/ISRO staff members, three BARC/TIFR staff members, eight Defense personnel, one hundred and three students and fifty three General Public.

Awards & Honours

(1) **Dr. Anshu Kumari**, Reader, Udaipur Solar Observatory, PRL was awarded the **ANRF PM Early Career Research Grant**.

(2) **Dr. Yogita Kadlag**, Assistant Professor, Geosciences Division, PRL, was awarded the **ANRF PM Early Career Research Grant**.

(3) **Mr. Wafikul Khan**, Senior Research Fellow, Atomic, Molecular and Optical Physics Division, PRL was awarded the **Early Career Researcher Award** for his oral presentation in the **"International Conference on Sustainability: Science, Technology, Education and Policy (S2: STEP 2025) and 6th Indian Planetary Science Conference (IPSC 2025)"** held at IIT Roorkee during 4-7 March, 2025.

(4) **Mr. Dibyendu Misra**, Senior Research Fellow, Planetary Sciences Division, PRL was awarded the **Early Career Researcher Award** for his poster presentation in the **"International Conference on Sustainability: Science, Technology, Education and Policy (S2: STEP 2025) and 6th Indian Planetary Science Conference (IPSC 2025)"** held at IIT Roorkee during 4-7 March, 2025.

(5) **Mr. Satyandra Mohan Sharma**, Senior Research Fellow, Planetary Sciences Division, PRL was awarded **Consolation Prize** for his oral presentation in the **"International Conference on Sustainability: Science, Technology, Education and Policy (S2: STEP 2025) and 6th Indian Planetary Science Conference (IPSC 2025)"** held at IIT Roorkee during 4-7 March, 2025.

(6) **Ms. Gayatri Sharma**, Project Associate, Planetary Sciences Division, PRL was awarded **Consolation Prize** for her poster presentation in the **"International Conference on Sustainability: Science, Technology, Education and Policy (S2: STEP 2025) and 6th Indian Planetary Science Conference (IPSC 2025)"** held at IIT Roorkee during 4-7 March, 2025.

(7) **Ms. Ambily G.**, DST - INSPIRE Senior Research Fellow, Planetary Sciences Division, PRL was awarded **Consolation Prize** for her poster presentation in the **"International Conference on Sustainability: Science, Technology, Education and Policy (S2: STEP 2025) and 6th Indian Planetary Science Conference (IPSC 2025)"** held at IIT Roorkee during 4-7 March, 2025.

Hearty welcome to our new members

Name: DR. ABBAS TINWALA

Designation: POST DOCTORAL FELLOW

Date of Joining: 17.02.2025

Division: THEORETICAL PHYSICS DIVISION

Name: DR. MANOJ MANDAL

Designation: POST DOCTORAL FELLOW

Date of Joining: 06.03.2025

Division: ASTRONOMY & ASTROPHYSICS DIVISION

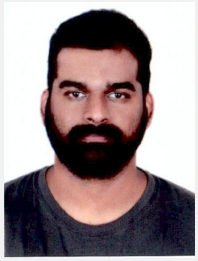
Name: DR. BRATATI BHAT

Designation: POST DOCTORAL FELLOW

Date of Joining: 10.03.2025

Division: ATOMIC, MOLECULAR & OPTICAL PHYSICS DIVISION

Hearty welcome to our new members



Name: DR. AJAY RATHEESH

Designation: POST DOCTORAL FELLOW

Date of Joining: 24.03.2025

Division: ASTRONOMY & ASTROPHYSICS DIVISION

Name: DR. SOUGATA BISWAS

Designation: POST DOCTORAL FELLOW

Date of Joining:27.03.2025

Division: THEORETICAL PHYSICS DIVISION

OBITUARY

Late Dr. D.P. Agrawal
Senior Professor

Date of Birth	15.03.1933
Date of Joining PRL	14.11.1962
Date of Retirement	31.03.1993
Date of Death	23.03.2025

Teary Eyes for our Departed Member

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 Saiguhan	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://x.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.threads.net/@prl1947

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