Newsletter of the Physical Research Laboratory

THE SPECTRUM

Image of the Month

PRL participants in Science Express at Science City, Ahmedabad

May 2026

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Presolar Grains Reveal Migration and Origin of Solar System

The Author

Antariksha Mitra

Kuljeet K. Marhas, Manish N. Sanghani, Scott R. Messenger, ***Antariksha Mitra****, and Ritesh K. Mishra*

Meteorites, the space rocks that fell to Earth and preserve material from the time our Solar System formed and contains tiny particles called presolar grains - stardust formed from stars that existed before the Sun. These grains carry chemical “fingerprints” that reveal their stellar and galactic origins.

In this study, silicon carbide (SiC) presolar grains were analysed for isotopes of carbon (C), nitrogen (N), and chromium (Cr). Most grains formed in the winds of low-mass asymptotic giant branch (AGB) stars, as indicated by their C and N ratios. However, their Cr isotopic composition is close to solar values, even though Cr is mainly produced in supernovae. This suggests that much of the chromium was inherited from earlier generations of stars and not significantly altered later. One grain shows strong enrichment in ^{54}Cr, pointing to either a very low-metallicity star or preserved supernova material, indicating a complex and multi-stage formation histories.

Strikingly, models of Galactic Chemical Evolution (GCE) show that these grains originated from different regions of the Milky Way - some from the outer Galaxy (~14–16 kpc) and others from the inner regions (~6–8 kpc). This mixed origin implies large-scale movement of material across the Galaxy. Consequently, it suggests that our Solar System may have formed much closer to the Galactic centre and later migrated outward (~8.5 kpc), challenging the traditional view of a static birth location.

Source/Reference of the Work: https://doi.org/10.3847/1538-4357/ae2bf6

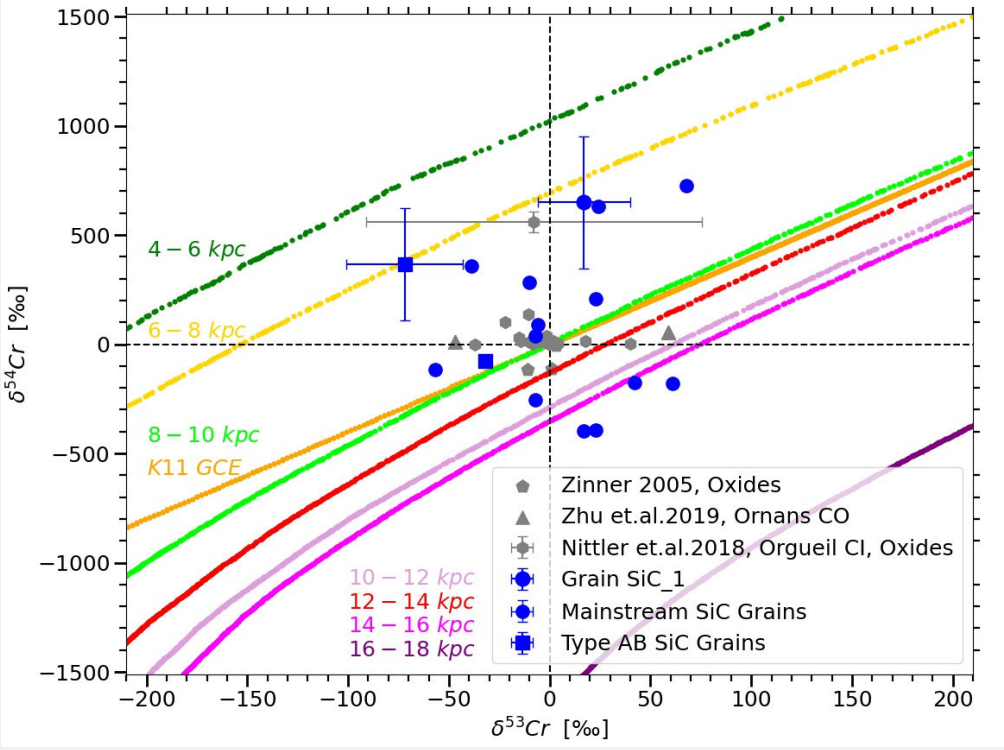
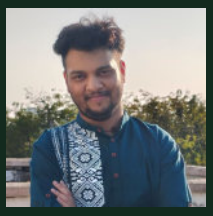


Figure Caption: Anomalies in chromium isotopes relative to solar for the 14 grains in this study, compared with GCE model predictions. The orange line represents the C. Kobayashi et al. (2011) model, and the other curves correspond to MCMC GCE simulations at different galactocentric annuli.

Unveiling an Hourglass-Shaped Magnetic Field toward IRDC G351.77-0.53

The Author



Omkar Jadhav

Jadhav, O. *R. , Dewangan, L. K., I. I. Zinchenko, Thushara G. S. Pillai, Patricio Sanhueza, A. K. Maity, Ram K. Yadav, Saurabh Sharma*

Filamentary structures are ubiquitous in the interstellar medium (ISM) and are closely associated with both low- and high-mass star formation, serving as sites where dense cores form and subsequently collapse into stars. However, the role of magnetic fields (B-fields), and their interplay with gravity and turbulence in regulating filament evolution, remains poorly understood. In this work, SOFIA/HAWC+ 214 μm polarimetric observations are examined toward the infrared dark cloud G351.77-0.53 (hereafter G351; distance ~2.0 kpc), which exhibits ongoing star formation along its filamentary structure. The SOFIA/HAWC+ polarimetry reveals that the B-fields are predominantly oriented perpendicular to the filamentary cloud, with an estimated strength of ~147±60 μG and a mass-to-flux ratio close to unity, indicating that the cloud is in a transcritical state. In the central region, an hourglass-shaped B-field morphology with strengths up to ~0.8 mG is identified. Such a morphology indicates that the magnetic field lines are being distorted by gravitational contraction, implying a strong coupling between the magnetic field and the collapsing gas. This feature is often interpreted as evidence that magnetic fields play a dynamically important role in regulating cloud collapse and star formation.

Source/Reference of the work : https://doi.org/10.1093/mnras/stag536

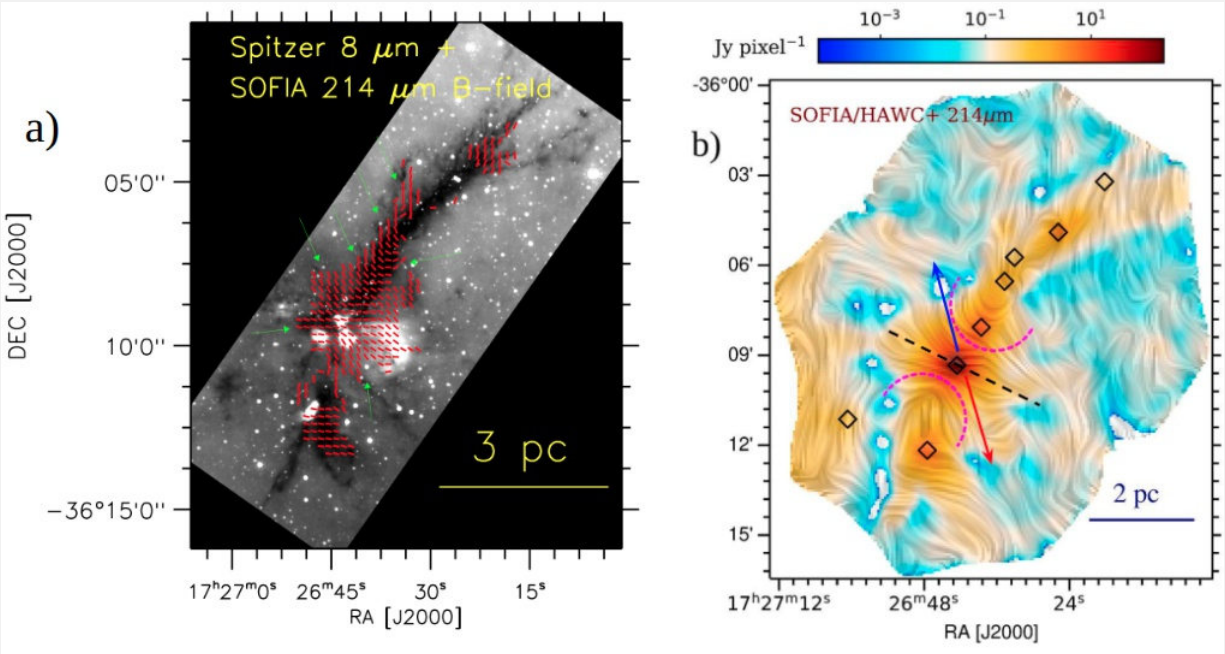


Figure Caption: a) Spitzer 8 micron map overlaid with magnetic field orientations from SOFIA/HAWC+ 214 μm polarization data. b) Line Integral convolution map showing SOFIA/HAWC+ 214 μm magnetic field.

Impacts into the lunar permanently shadowed regions

The Author

S. Vijayan

S. Vijayan, *V. Rama Subramanian, Rishav Sahoo, M. Nehavarthini, Das Bivas, R. Aditi, U. Thahira, K. B. Kimi, R. Ragav, M. Jaya Krishna, S. Bhalamurugan, V. Thirukumaran & Anil Bhardwaj*

Moon's permanently shadowed regions (PSRs) are capable of preserving water-ice and other frozen volatiles for billions of years if temperatures remain sufficiently low. Water ice is preserved on the PSRs of Moon's south pole, which have witnessed multiple impacts. Estimates suggest that the cumulative area covered by PSRs in the lunar south polar region is ~22,234 km sq. It is unclear how impacts disturb the volatiles present within PSRs. Here, we mapped the extent of craters within PSRs located between 85° and 90°S. A small-scale crater population model was developed, and we estimated ~24 million craters of 1–20 m diameter in PSRs >1 km sq. We report that ~74% of PSRs are unaffected by impacts. However, the impact gardening process, including vertical mixing of ice with ejecta, may influence them and help preserve potential ice deposits. From iSALE-2D simulations in a PSRs-like environment, we found that craters >200 m can excavate/redistribute shallow ice, allowing it to get trapped within cold traps, while ice is lost within crater cavities. The study implies that small craters within the PSR likely disturbed the buried ice, and gardening in crater-free PSRs facilitates vertical mixing of ice, which is a potential target for future lunar missions like Chandrayaan-5/LUPEX mission.

Source/Reference of the Work: https://doi.org/10.1038/s44453-026-00032-1

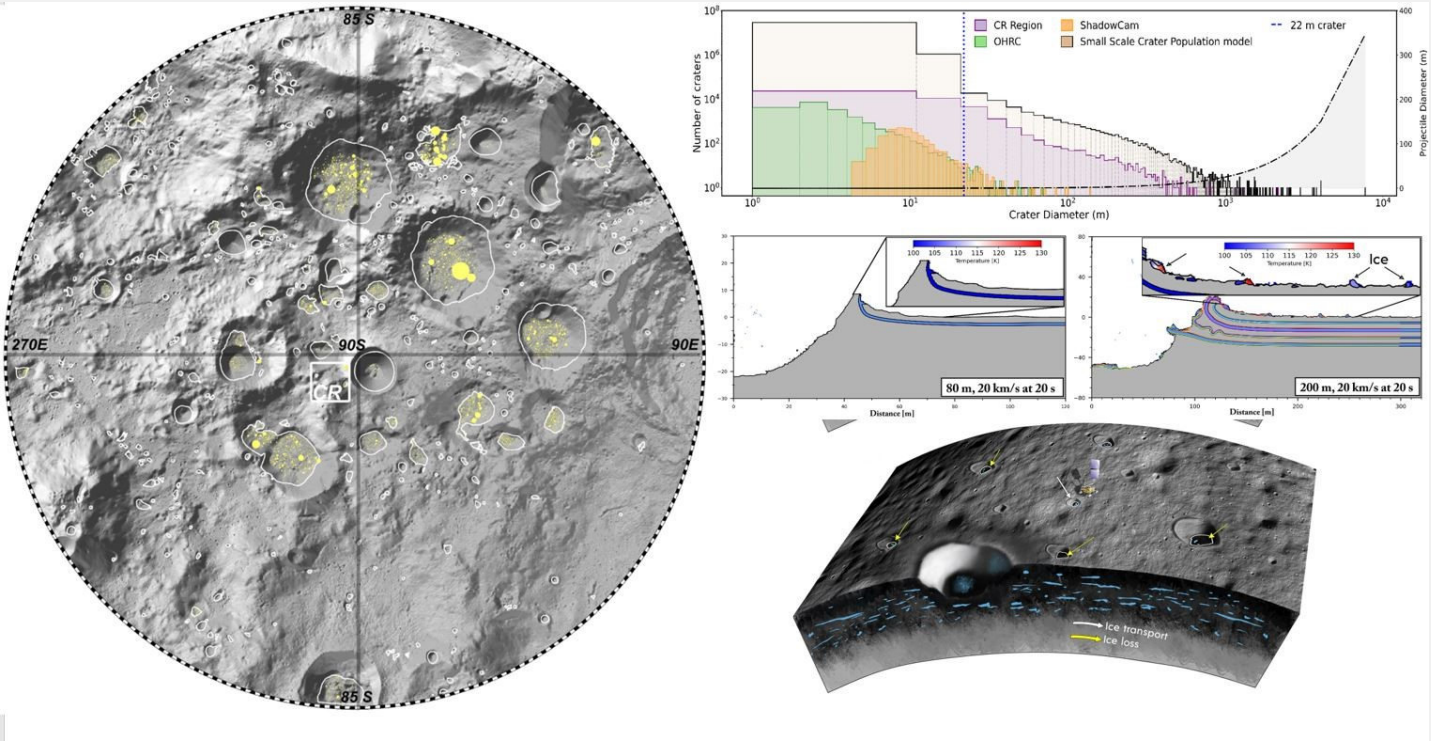


Figure Caption: Left: Lunar South polar image with PSR region. Right Top :Crater distribution on South pole with respect to their projectile diameter. Right Centre: iSALE-2D simulation showing the impacts craters excavating the ice within PSR. Right Bottom: Chandrayaan-5/LUPEX mission rocer examining the PSR that are free from craters.

Source Variability and Atmospheric Processing of NH_X using $\delta^{15}N$: Linkages with WSOC Fluorescence Indices

***Chandrima Shaw**, Neeraj Rastogi, Devaprasad. M, Sanjeev Kumar*

The Author

Chandrima Shaw

NH_X (gaseous NH_3 and particulate NH_4^+), is one of the most important reactive nitrogen species in the atmosphere, playing important roles in nitrogen cycling, aerosol formation, air quality, and ecosystem productivity. The Indo-Gangetic Plain (IGP), recognized as one of the global hotspots of NH_3 emissions, experiences severe air pollution during the post-monsoon period due to extensive crop-residue burning and agricultural activities. However, studies investigating the sources of NH_3 and its partitioning to NH_4^+ over this region remain limited. In this work, we have investigated the major sources of NH_3 and the factors governing its partitioning to NH_4^+ over a semi-urban site (Patiala) in the northwestern IGP during the post-monsoon period using stable isotope ($\delta^{15}N$) and Bayesian mixing model. We also investigated the concurrent ageing of inorganic and organic aerosols by coupling $\delta^{15}N$-NH_4^+ with fluorescence indices of water-soluble organic carbon (WSOC). Source apportionment revealed that overall agricultural emissions and biomass burning were the dominant sources of NH_3, although their relative contributions varied significantly with wind speed. Calm conditions favoured greater contributions from local combustion-related sources (biomass burning and coal-fired power plants), whereas stronger winds enhanced the influence of regional agricultural emissions. High relative humidity and low temperature favoured NH_3-NH_4^+ partitioning. However, this effect was mostly evident during calm conditions, since stronger winds enhanced atmospheric mixing and thus masked the meteorological influence. Significant relationships between $\delta^{15}N$-NH_4^+ and WSOC fluorescence indices indicated the combined influence of common sources and the simultaneous ageing of ammonium and organic aerosols under similar atmospheric conditions. Such findings are important for developing effective mitigation strategies over NH_3 hotspots and for improving understanding of NH_X dynamics, their effects on secondary organic aerosols formation, and controlling factors.

Reference of the work: https://doi.org/10.1016/j.envpol.2026.128152

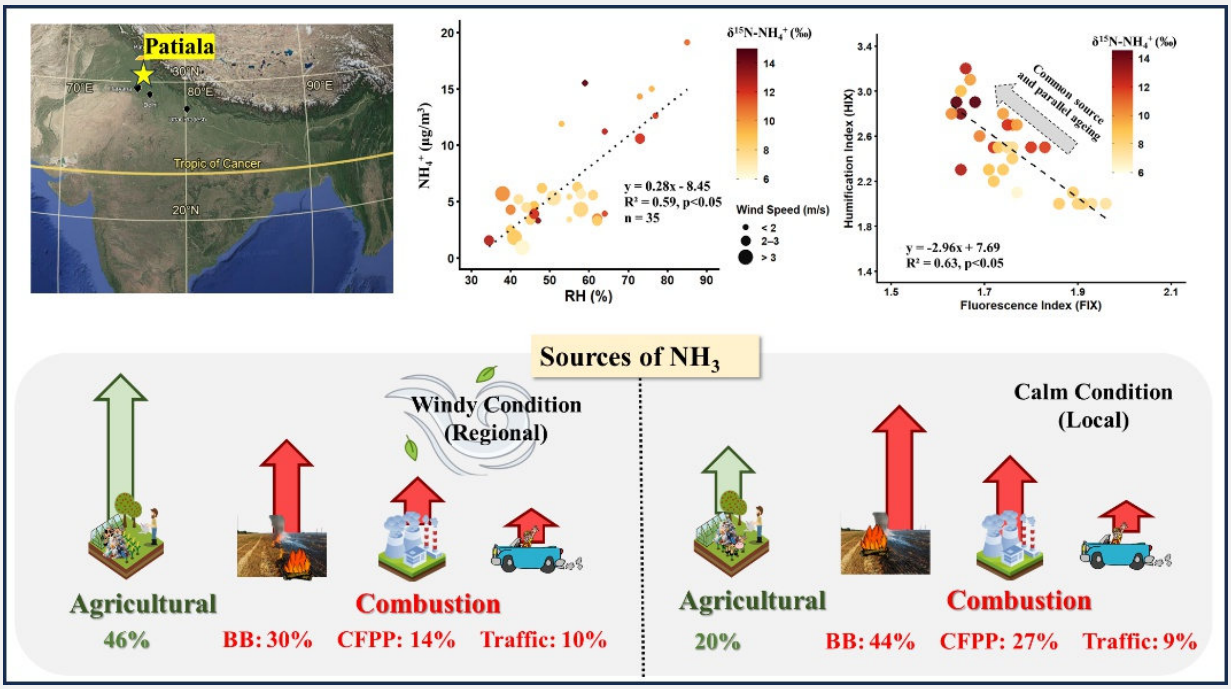


Figure caption: Graphical abstract depicting NH_3 sources, meteorological controls on NH_3-NH_4^+ partitioning, and the concurrent ageing of inorganic and organic aerosols over Patiala during the post-monsoon period.

Proximity-induced superconductivity and exotic phase in altermagnet-based heterostructures

The Author

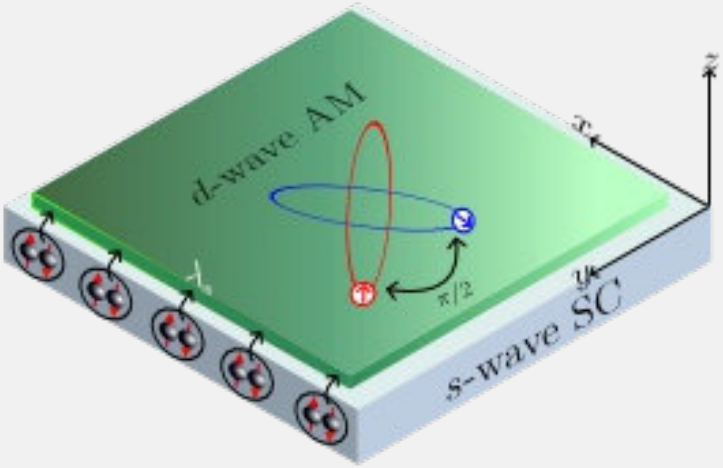
Paramita Dutta

Ohidul Alam, Amartya Pal, ***Paramita Dutta****, Arijit Saha*

The recent research has introduced a new class of magnets named as an altermagnet (AM) which shares the properties of both ferromagnet and antiferromagnet. AMs show spin-configuration and zero net-magnetization similar to antiferromagnet along with some unique features. These are promising magnets for spin-based applications in future quantum devices. In the present work, the question `what happens when an AM is placed in proximity to an ordinary superconductor which hosts only spin-singlet Cooper pairs' has been addressed. This close proximity not only allows superconducting properties to leak into the AM layer but also generates exotic Cooper pairs (like spin-triplet Cooper pairs) into this heterostructure which was not present in the substrate superconductor. The classification of the induced Cooper pairs has been done according to their parity, frequency, and spin. Moreover, to realize unconventional superconductivity, an additional layer responsible for a special effect called Rashba spin-orbit coupling (RSOC) is introduced into the heterostructure, and the emergence of both weak and strong topological superconducting phases with some special properties has been found. These findings highlight the role of AM–SC hybrid setup as a versatile platform for realizing unusual Cooper pairs and engineering unconventional superconductivity in two dimensions.

Source/Reference of the Work: https://doi.org/10.1103/7h2t-wmyr

(a)



(b)

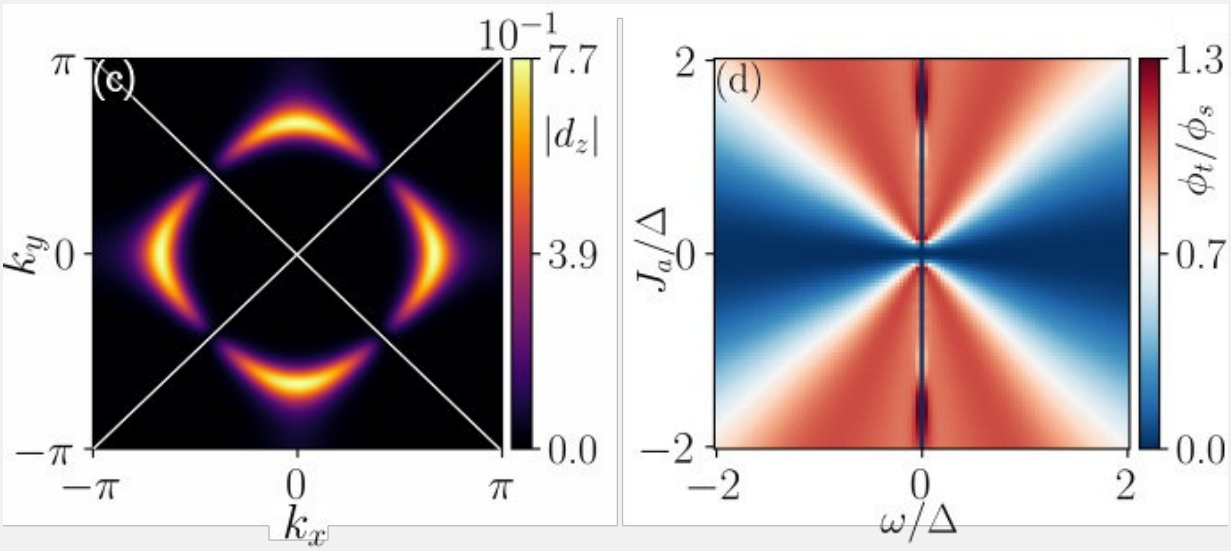


Figure: (a) Schematic figure showing AM placed on an ordinary superconductor. (b) Amplitude of triplet Cooper pairs in the momentum space (kx-ky). (c) Ratio of triplet to singlet Cooper pairs as a function of the altermagnet parameter (Ja) and energy (ω).

First quantitative results on the response of green and red line dayglow emissions to Solar flares of different magnitudes

The Author

Komal

Komal *and Duggirala Pallamraju*

Solar flares release sudden bursts of energy that significantly affect Earth's upper atmosphere. They are classified into X, M, C, and B classes according to the magnitude of soft X-ray flux (0.1–0.8 nm), with X-class flares being the most energetic (~10-4 W/m^2), while each lower class decreases by an order of magnitude. The enhanced X-ray flux increases ionization and electron density in the Earth's upper atmosphere, thereby modifying the photochemical and dynamical processes governing ionosphere–thermosphere behavior. Since airglow emissions are highly sensitive to variations in the atmospheric composition, density, and temperature, they provide valuable diagnostics of upper atmospheric dynamics. In this statistical study, we analyzed more than 100 solar flare events ranging from C- to X-class flares and quantified the enhancement in green-line and red-line dayglow emissions obtained using MIGHTI/ICON satellite. The green-line emission exhibits two prominent peaks: centered around 100 km and 135 km, while the red-line emission originates from higher altitudes centred around 220 km. Our results show that green-line emissions increase dramatically during intense X-class flares, even by twofold on occasion, whereas the red-line enhancement is 20% or lower. We also find that the dayglow response depends not only on flare intensity but also on factors such as flare duration and its location on the solar disk. Flares originating near the disk center affect the atmosphere differently compared to those from the limb, due to differences in the distances of propagation of the flare through the solar atmosphere. Not only does this study identify the key factors controlling the dayglow emission brightness due to solar flares of different classes, but it also arrives at empirical relationships that can be used to quantitatively estimate the dayglow enhancements due to solar flares.

Reference of the Work: https://doi.org/10.1029/2025GL121614

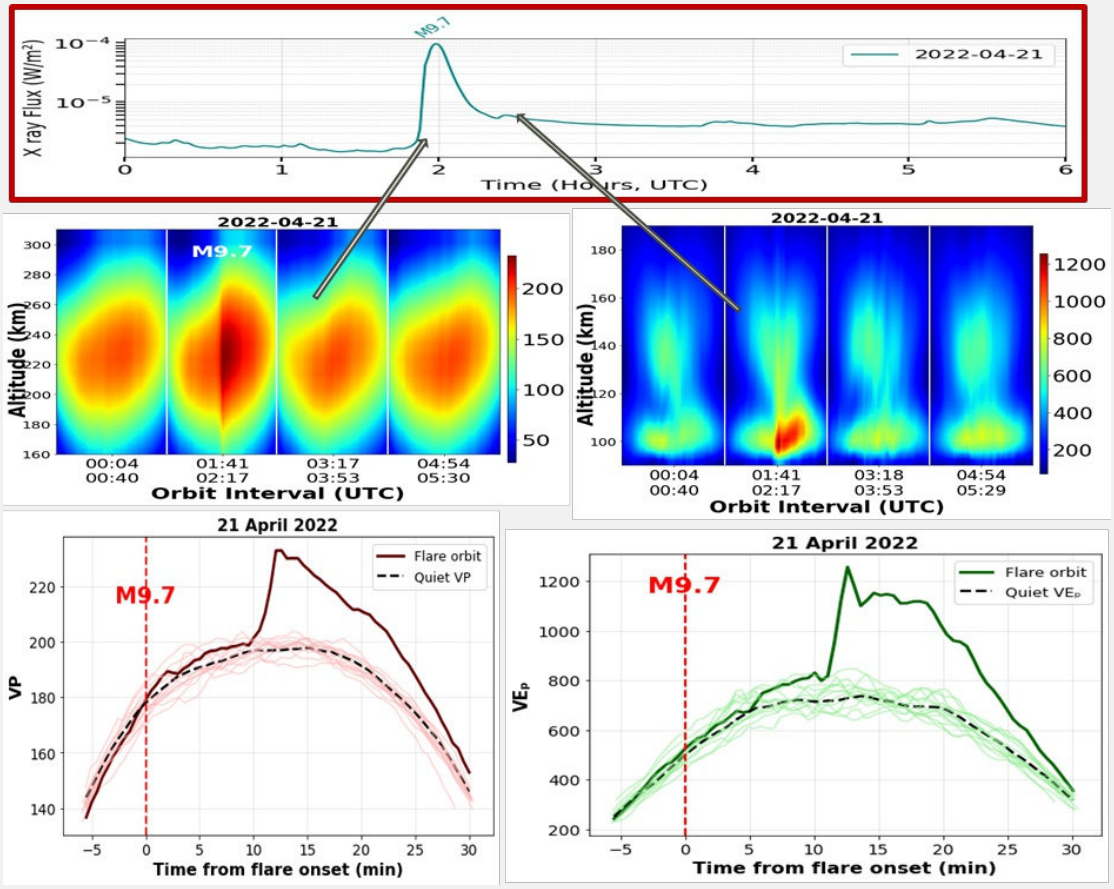


Figure Caption : (1) X-ray flux measured by GOES (top two pannels) for 21st April 2021 (2) MIGHTI measured VER altitude map of red line (left) and green line (right) for the same day. A clear signature of flare M 9.7 can be seen in both dayglow emissions. The bottommost row shows the Peak VER value of emission profiles in MIGHTI daytime orbits for same day (flare orbit is in dark color). The flare orbit clearly shows an intense rise in emissions compared to non-flare orbits.

Listening to Echoes from the Dawn of the Dark Age

The Author

Partha Konar

Partha Konar, *Sudipta Shaw*

In a groundbreaking study, this research has proposed a novel way to track "freeze-in" dark matter (DM), a form of invisible matter that interacts so weakly with other standard model particles that it would remain undetected by all conventional direct or indirect DM detection experiments. Unlike the popular "WIMP" candidates currently under tension from null experimental results, these feebly interacting particles are born through the decay of heavy states in the early universe. This new strategy shifts the focus from direct particle detection to the dark echoes left behind: a unique signature of high-frequency gravitational waves generated as an unavoidable byproduct of graviton bremsstrahlung during the dark matter's creation.

The findings reveal that this specific gravitational wave signature exhibits a distinct peak frequency of approximately 1011 Hz, a hallmark that remains constant regardless of dark matter's mass. While current experiments like LIGO cannot yet reach these frequencies, the study highlights that proposed high-frequency (MHz-GHz) techniques, such as resonant-cavity and advanced quantum sensors, offer a promising window for observing these signals. By measuring this unique spectral slope in the (Hz - KHz) range and its excess over the standard cosmic background, future experiments may finally unravel the conditions of the "baby universe" and provide a definitive probe of the elusive freeze-in paradigm.

Source/Reference of the Work : https://doi.org/10.1103/8vjm-1g58

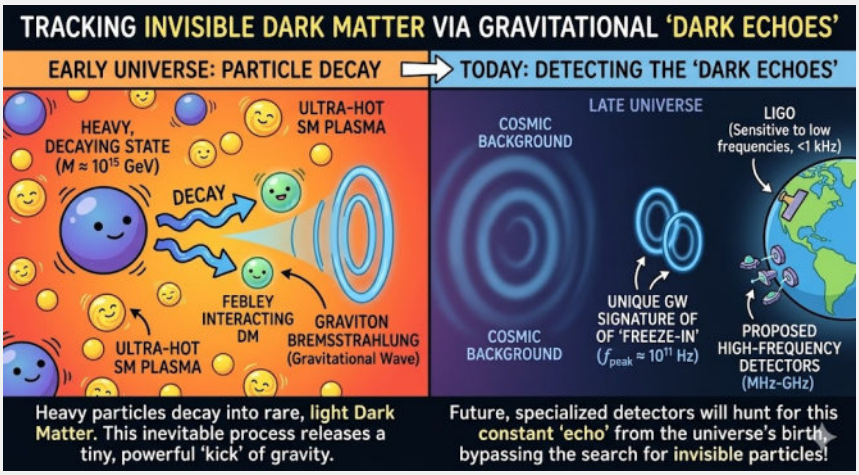


Figure caption: Cartoon picture describing the proposal for the production of Gravitational Waves during Freeze-in Dark Matter production at the early phase of the Universe, and possible detection channels now.

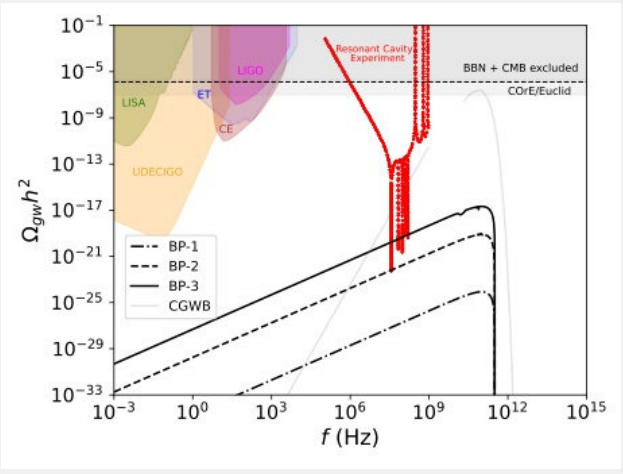


Figure caption: Gravitational Wave spectrum energy densities are shown as a result of graviton bremsstrahlung during DM freeze-in production for three benchmark points. This signal would coexist with the gravitational wave produced by SM scattering in the bath, known as the cosmic gravitational wave background (CGWB). The future sensitivity ranges of space-based experiments and ground-based laser interferometer experiments are indicated by the colour-shaded regions.

PRL participation in Science Carnival 2026 at Science city Ahmedababd

This year Gujarat Council of Science City (GCSC), working under the aegis of the Department of Science & Technology, Government of Gujarat organized a five-day Science Carnival (Festival of Science) during 27th to 29th March 2026 to mark the celebration of National Science Day based on this year's National science day theme “Women in Science”. The three-day event was inaugurated by the state's Chief Secretary M. K. Das. The event drew thousands of students from schools and colleges across the state as part of National Science Day celebrations. This event featured exhibitions on AI and robotics workshops, a drone show, science quizzes and science experiments from everyday things. Special exhibitions have also been included on important topics like environment and climate change. The Science Carnival 2026 included scientific event with a series of scientific activities and demonstrations from premier research institutes such as PRL, SAC, IPR, ISR, IOCL, CSIR and others along with private entities and schools. It also included lectures from eminent scientists from various national institutes meant for school students. In total more than 90 scientific institutions and innovators have presented their research.

In this Science Carnival, Physical Research Laboratory (PRL) has put up a stall on the innovations and science being carried out at PRL. In this, PRL has displayed prototypes of SWISS, APXS and XSM instruments onboard Chandrayaan 2 and 3 respectively, a model displaying working principle of 14C Dating, Tree ring dating method and stalagmite dating methods. In addition to this, research activities of PRL in different research domains are conveyed via posters. Over these 3 days, about 20 researchers from PRL including, SRFs, PDFs, scientists and faculties interacted with the visitors, conveyed the importance of research in basic sciences, PRL contribution to the nation and tried to motivate them towards science. The PRL exhibit was also visited by the state's Chief Secretary M. K. Das and SAC director Shri Nilesh M. Desai. In this event, the PRL exhibit was visited by over 300 visitors. A lot of enthusiasm is observed especially in the case of Bachelor and Master’s students to learn about advanced research.

Figure 2: PRL's scientists explaining the models/posters to students at the Science Carnival 2026 at Science City Ahmedabad

In summary, the Science Carnival was an excellent platform to inspire students and startups. The PRL team effectively utilized this opportunity by interacting with visitors, explaining the models and posters, and encouraging students to pursue scientific research and innovation. It was a valuable and enriching experience for the PRL team.

Sadhana Saptah at Physical Research Laboratory

Physical Research Laboratory (PRL), Ahmedabad, actively participated in the nationwide observance of Sadhana Saptah, organized by the Government of India from 2nd to 8th April 2026 under the Mission Karmayogi. This initiative is part of the Government's broader effort to transform civil services through continuous capacity building, fostering a mindset shift from "rule-based" to "role-based" functioning.

Sadhana Saptah serves as a dedicated period for reflection, self-discipline, and professional development. It encourages government employees to align personal growth with organizational goals, emphasizing values such as accountability, service orientation, and adaptability in a rapidly changing work environment. At PRL, the week was marked by structured activities aimed at enhancing awareness and engagement with the principles of Mission Karmayogi.

Workshop on **"Mission Karmayogi: Rule to Role"**

PRL conducted a workshop conducted mentored by Dr. Arvind Kumar Singh, Senior Scientist, Space Applications Centre (SAC), Ahmedabad, on 6 April 2026 at the KRR Auditorium, PRL. The session was inaugurated by Prof. Anil Bhardwaj, Director, PRL, who highlighted the importance of Mission Karmayogi in shaping a more responsive and efficient scientific and administrative workforce. He emphasized the need for institutions like PRL to actively engage with such national initiatives and encouraged all employees to make full use of the online courses and training modules offered by the Government of India.

In this workshop, Dr. Singh provided a comprehensive overview of the evolution and vision of Mission Karmayogi. He discussed:

- The conceptual foundation of shifting from rigid rule-based systems to dynamic role-based responsibilities
- The phased implementation of the program across Government of India institutions
- The importance of continuous learning and competency development
- The role of civil servants and scientists in delivering better outcomes to stakeholders

Dr. Singh also elaborated on how the program integrates technology-driven learning platforms with behavioral and attitudinal transformation. He emphasized that the success of Mission Karmayogi depends not only on participation in this talk and taking courses but also in internalizing the philosophy of Karmayogi in the day-to-day work.

The session was interactive, with several participants raising queries about ongoing courses, certification processes, and practical implementation. Dr. Singh addressed these questions in detail, making the session both informative and engaging.

The event witnessed broad participation, with all PRL Ahmedabad employees attending in person, while staff from the Mt. Abu Observatory and Udaipur Solar Observatory joined online. The total participation was approximately 286 employees, reflecting strong institutional engagement.

Figure: Few glimpses of the event

PRL Annual Table Tennis Tournament 2025-26

The PRL Annual Table Tennis Tournament 2025-26, organized by the Staff Welfare Committee (SWC) on April 12, 2026, was an electric display of table tennis prowess. This season's tournament brought together PRL students, faculty, and staff for an intense competition at the AGETA Sports Academy in Memnagar, Ahmedabad. The event featured highly competitive categories, including Open Singles, Women's Singles, Open Doubles, and Lucky Doubles.

In the individual events, Mr Anirban Ghosh (AMOPH) showcased exceptional skill in winning the Open Singles title. The Women Singles category saw Ms. Garima Arora (PSDN) take the top spot, while the veteran and defending champion Prof. Goutam K. Samanta (AMOPH) secured the Open Doubles title alongside Mr. Pradeep K. Sharma (ADMIN). The Lucky Doubles final was a highlight of the day, with the pair of Prof. Goutam K. Samanta (AMOPH) and Mr. Anirban Ghosh (AMOPH) claiming the victory. The matches were filled with thrilling rallies and competitive spirit, showcasing both individual talent and institutional camaraderie.

While matches were not played on a division-versus-division basis, the performance of every participant was carefully tracked, with points calculated to determine the Team Championship based on a weighted system: 5 points for a winner, 3 for a runner-up, and 1 for third place, with doubles points split equally between divisions. The AMOPH division emerged as the dominant force, securing the Team Championship with a total of 15 points. The PSDN division took the runner-up spot with 6.5 points, while SPASC and ADMIN shared third place with 4.5 points each.

Figure: Participants of the tournament

Celebration of Ambedkar Jayanti

The 135th Birth Anniversary of Bharat Ratna Dr. B R Ambedkar was celebrated at Reserved Class Employees' Association Office at PRL Main Campus on 14.04.2026 (Tuesday). The programme was started with the lighting of Diya. Dr. Anil Bhardwaj, Director, PRL, Dr. D Pallam Raju, Dean, PRL and other members paid floral tribute to the great sculptor of Indian Constitution. Dr. Anil Bhardwaj, Director, PRL spoke about the work of Dr. Ambedkar for upliftment of Socially and Economically Backward classes. Dr. D Pallam Raju, Dean, PRL spoke about the belief and great vision of the Dr. Ambedkar. The programme was coordinated by PRL Reserved Class Employees' Association.

Figure: Celebration of Ambedkar Jayanti at PRL.

Fire Service Week - 2026

National Fire Service Week is observed across India every year from 14th April to 20th April. This week is dedicated to paying homage to the brave firefighters who sacrificed their lives in the line of duty during the tragic incident that occurred on 14th April 1944. The observance serves as a reminder of the importance of fire safety, preparedness, and prevention measures across all sectors.

In line with this observance, industries and organizations commemorate the occasion by organizing Fire Service Day/Week activities such as training sessions, mock drills, and emergency preparedness rehearsals to enhance awareness and readiness in handling fire-related emergencies.

As part of the Fire Service Week-2026 and with a view to sensitizing PRL members on fire safety and prevention, a training programme on “Fire Safety and Prevention” was organized at the PRL Main Campus on Wednesday, 15th April 2026.

The session was conducted by Shri Bijay Bahadur Singh Yadav, Assistant Commandant (Fire), CISF. During the programme, he provided detailed insights into various types of fires, their causes, and essential preventive measures. He also elaborated on the different types of fire extinguishers available within the premises and explained their appropriate usage based on the class of fire.

In addition to the theoretical session, a practical demonstration was carried out by the CISF team. The demonstration included hands-on training on the correct usage of fire extinguishers and techniques to effectively control fire, ensuring the safety of both personnel and property.

A similar activity was organized at the Thaltej campus on 22.04.2026, where the CISF team conducted a practical demonstration focused on fire safety and emergency response. The session included step-by-step guidance. Participants were given the opportunity to engage in hands-on practice, enabling them to build confidence in handling emergency situations. All PRL members of the Thaltej campus participated enthusiastically.

A total of 80 PRL members participated in the programme. The session was highly interactive, informative, and well-received by all attendees, contributing significantly to enhancing fire safety awareness.

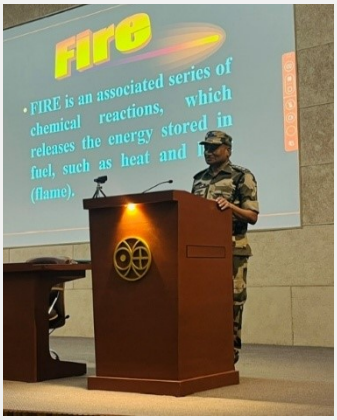


Figure: Glimpses of the event

2nd CNIT Division Nukkad "Chai Pe Byte"
Cyber Security Awareness + Browser based Hindi Plugin

CNIT NUKKAD
CHAI PE BYTE
SIP IDEAS – SHARE BYTES – BUILD BONDS

The 2nd CNIT Division Nukkad – “Chai Pe Byte” of the year 2026 on “Cyber Security Awareness + Browser based Hindi Plugin” was held on April 20, 2026 in hybrid mode during 10:00hrs to 11:30hrs. In the session, 90% discussion was in Hindi and 10% discussion was in the English.

The “Chai Pe Byte” initiative by the CNIT Division is designed to foster a culture of knowledge sharing, experience exchange, and collaborative problem-solving. Its core aim is to identify and address IT-related challenges faced by users, while strengthening the connection between the CNIT Division and PRL colleagues. By creating an informal yet focused platform for dialogue, the initiative contributes to enhancing the effectiveness and efficiency of PRL’s IT resources and infrastructure.

Figure : Participants of the event

Prof. Namit Mahaan, Chair, IT-Cyber Security Committee, PRL, warmly welcomed all the participants in the 2nd session of CNIT Division Nukkad – Chai Pe Byte and briefed the objective of the session. The main objective of the session were:

1. Sharing of learning and experience from the attended Cyber Security Training Programs
2. Development of Browser based Hindi Plugin

He also emphasized the collective approach in cyber security domain to mitigate the attacks. He also told to keep the activity reports and help documents on the intranet website. So, user can refer to them very quickly for further help.

Mr. Prashant Jangid, Ms. Srishti Sharma, Mr. Vaibhav Rathore, and Mr. Alok Shrivastava collectively delivered an insightful session on the topic of ransomware attacks and the precautionary measures that individuals and organizations can adopt. They explained the nature of ransomware, how it infiltrates systems, and the devastating impact it can have on data security and business continuity. The speakers emphasized the importance of proactive defense strategies, such as maintaining updated antivirus software, practicing safe browsing habits, and regularly backing up critical data. They also highlighted the role of user awareness in preventing ransomware infections, stressing that informed users are the first line of defense against such cyber threats.

Mr. Girish Padia presented a detailed talk on “Incident Response,” focusing on how users should act during a cyber incident. He explained that timely and appropriate user behavior is crucial in minimizing damage and aiding recovery. Mr. Girish emphasized that cooperation with cybersecurity experts and authorized agencies is essential, as it enables them to investigate, contain, and remediate the incident effectively.

Mr. Tejas Sarvaiya delivered a comprehensive talk on “Guidelines on Information Security for Government of India Organizations.” He outlined the key points of the official guidelines and policies designed to safeguard sensitive information within government institutions. His presentation covered the importance of adhering to standardized security practices, implementing robust access controls, and ensuring compliance with national cybersecurity frameworks. Mr. Tejas stressed that these guidelines are not only regulatory requirements but also essential measures to protect national interests and maintain public trust.

In essence, all the three talks reinforced that cybersecurity is both a technical and human responsibility, requiring vigilance, structured response, adherence to policy, and openness to innovation. This combination of awareness and practical knowledge equips participants to be more resilient in the face of evolving digital threats.

Mr. Vaibhav Rathore conducted an interactive session on the “Browser-Based Hindi Plugin.” He demonstrated how the in-house developed plugin integrates with Firefox to provide seamless English-to-Hindi translation within the PRL intranet. By enabling smooth English-to-Hindi translation, it empowers users to work more comfortably in the official Rajbhasha language, thereby strengthening communication and accessibility. Beyond its linguistic value, the plugin’s integration with advanced GPU computing resources highlights how cutting-edge technology can be harnessed for efficient performance. In essence, this innovation not only supports Hindi language promotion but also reflects the institution’s commitment to combining inclusivity with technical excellence.

There was a discussion related to various real life cyber security incidents experienced by participants.

All the participants actively participated in the event and appreciated the efforts of the CNIT division. All the participants have jointly prepared the report. CNIT team sincerely thank all the colleagues who attended the session and shared their valuable inputs and experience. CNIT team thank Mr. Pradeep Chauhan for providing Online VConsol Meeting link for USO and Mount Abu participants.
The collaborative efforts of the participants and the CNIT division made the session a success, laying a strong foundation for achieving the objectives of the session.

The CNIT members sincerely thank the Director, PRL, for his constant guidance and motivation to initiate such activities in different IT verticals. The CNIT members thank Registrar, PRL, and Dean, PRL for their support. We thank Prof. Bijaya Sahoo, Prof. Varun Sheel, Prof. Namit Mahajan, Dr. Shanmugam for their guidance and support in all the IT related activities and projects. From the bottom our hearts, CNIT members thank all the participants who enthusiastically participated, provided their valuable feedback and encouraged us to conduct similar events in future. CNIT also thank all the PRL users for their cooperation and help.

115 - PRL Ka Amrut Vyakhyaan

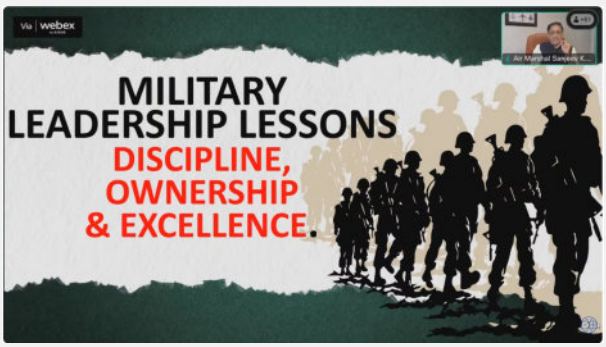
The 115th PRL Ka Amrut Vyakhyaan was delivered by Air Marshal Dr. Sanjeev Kapoor on April 28, 2026, at 4:00 PM (IST). In his inspiring lecture titled “Military Leadership Lessons: Discipline, Ownership & Excellence,” Dr. Kapoor highlighted how the fundamental principles of military leadership are universally relevant, extending far beyond the armed forces into academic, professional, and personal life.

Dr. Kapoor began the Vyakhyaan by explaining the uniqueness of military leadership, where leaders are entrusted with guiding individuals through life-threatening situations based on trust, integrity, shared values, and commitment to a larger purpose. Through a series of remarkable real-life examples, he illustrated how qualities such as discipline, resilience, positive attitude, teamwork, leadership under pressure, and adaptability shape extraordinary individuals and organizations. He narrated inspiring stories of national heroes including Vikram Batra, celebrated for his fearless leadership during the Kargil War; Arun Khetarpal, whose courage and sense of duty exemplified ownership and sacrifice; Nirmal Jit Singh Sekhon, remembered for his heroic defense of the Srinagar airbase; and Shaitan Singh, whose leadership at Rezang La during the 1962 war demonstrated unwavering commitment under overwhelming odds. He also reflected on the integrity and statesmanship of Kodandera Madappa Cariappa during the 1948 conflict. Beyond the military, he highlighted inspiring personalities such as Deepa Malik, Kamya Karthikeyan, Rishabh Pant, and Lt Cdrs Dilna and Roopa, who achieved remarkable milestones despite facing immense physical and mental challenges. With these examples, he emphasized that grit, determination, resilience, and mental strength are not limited to the armed forces but are qualities that can be developed and applied in every sphere of life.

He also discussed contemporary challenges faced by the younger generation, including discipline versus motivation, wisdom versus information, and effective time management. Describing motivation as the “fuel” and discipline as the “engine” of success, he stressed that lasting achievement depends on consistent discipline rather than temporary inspiration. He cautioned against excessive dependence on social media and digital platforms, noting that while information is easily accessible, wisdom comes from experience, reflection, and meaningful interactions with family and mentors. He encouraged parents and educators to nurture strong values in children and engage them in constructive real-world activities.

Another important message of the Vyakhyaan was the importance of ownership and service. Dr. Kapoor urged the audience to move beyond the mindset of “it is not my job” and instead ask, “where can I contribute?” He emphasized accountability, proactive teamwork, and striving for excellence in every responsibility.

Overall, Dr. Kapoor’s Vyakhyaan was highly inspiring and thought-provoking, conveying timeless lessons on discipline, courage, leadership, teamwork, and personal responsibility.



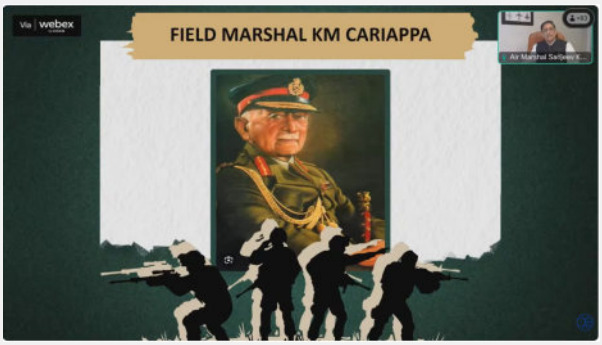


Figure : Snapshot of the presentation

Available online at : https://www.youtube.com/live/8dvhehCeDGw?si=mJ-Igr9Vb4Vuv1Zs

34th PRL Amrut Rajbhasha Vyakhyaan

"PRL अमृत राजभाषा व्याख्यान (पर्व)" का 35वाँ व्याख्यान 29 अप्रैल, 2026 को आयोजित किया गया। इस अवसर पर मुख्य वक्ता पद्म विभूषण प्रोफेसर मुरली मनोहर जोशी थे — जो पूर्व मानव संसाधन विकास मंत्री, पूर्व विज्ञान एवं प्रौद्योगिकी मंत्री, पूर्व महासागर विकास मंत्री, पूर्व गृह मंत्री, पूर्व प्रोफेसर, इलाहाबाद विश्वविद्यालय थे ।

The 34th lecture of "PRL Amrut Rajbhasha Vyakhyaan (PARV)" was held on April 29, 2026. The eminent speaker for the occasion was Padma Vibhushan Professor Murli Manohar Joshi, Former Minister of Human Resource Development, Former Minister of Science and Technology, Former Minister of Ocean Development, Former Home Minister, Former Professor at Allahabad University.

डॉ. मुरली मनोहर जोशी एक प्रख्यात वैज्ञानिक, शिक्षाविद्, विचारक एवं राजनेता हैं, जिन्होंने शिक्षा, विज्ञान एवं राष्ट्रीय नीति निर्माण में महत्वपूर्ण योगदान दिया है। उनका जन्म 5 जनवरी 1934 को दिल्ली में हुआ। उन्होंने इलाहाबाद विश्वविद्यालय से भौतिकी में एम.एससी. तथा पीएच.डी. प्राप्त की और स्पेक्ट्रोस्कोपी के क्षेत्र में विशेष कार्य किया। वे लंबे समय तक प्रोफेसर एवं भौतिकी विभागाध्यक्ष रहे तथा अनेक शोधार्थियों का मार्गदर्शन किया।

Dr. Murli Manohar Joshi is a renowned scientist, educationist, thinker, and politician who has made significant contributions to education, science, and national policy-making. He was born on January 5, 1934, in Delhi. He obtained his M.Sc. and Ph.D. degrees in Physics from the University of Allahabad and conducted specialized work in the field of spectroscopy. He served for a long period as a Professor and Head of the Department of Physics, guiding numerous research scholars.

व्याख्यान का शीर्षक था/"The vyakhyaan was titled "अस्तित्व का संकट-समाधान क्या ? खंडित दृष्टि या एकात्म दृष्टि।"

प्रोफेसर जोशी ने अपने व्याख्यान में आज के विश्व की समस्याओं पर चर्चा की। उन्होंने बताया कि 21वीं शताब्दी में विज्ञान और तकनीक ने बहुत प्रगति की है, फिर भी दुनिया में शांति नहीं है। आज भी विश्व नाभिकीय युद्ध, आतंकवाद, पर्यावरण प्रदूषण, आर्थिक असमानता और नैतिक पतन जैसी समस्याओं से परेशान है। देशों के बीच प्रतिस्पर्धा और हिंसा बढ़ती जा रही है, जो मानव समाज के लिए खतरा बन गई है। उन्होंने कहा कि इन समस्याओं का मुख्य कारण मनुष्य की खंड-दृष्टि है। आज लोग हर समस्या को अलग-अलग भागों में बाँटकर देखते हैं। इसी कारण मनुष्य समाज और प्रकृति को एक साथ नहीं समझ पाता। यह सोच विश्व में एकता और सहयोग को कमजोर करती है।

In his vyakhyaan, Professor Joshi discussed the problems facing the contemporary world. He expressed that while science and technology have made tremendous strides in the 21st century, peace remains elusive. Even today, the world is plagued by issues such as nuclear warfare, terrorism, environmental pollution, economic inequality, and moral decay. Competition and violence among nations are on the rise, posing a grave threat to human society. He asserted that the root cause of these problems lies in humanity's "fragmented vision." Today, people tend to view every problem by breaking it down into isolated parts. Consequently, human beings fail to comprehend the interconnectedness of society and nature. This mindset undermines unity and cooperation within the global community.

प्रोफेसर जोशी ने समग्र-दृष्टि अपनाने की बात कही। इसका अर्थ है कि पूरे विश्व को एक परिवार की तरह देखना। भारतीय संस्कृति का वसुधैव कुटुम्बकम् इसी विचार को दर्शाता है। यदि लोग एक-दूसरे के साथ सहयोग और प्रेम से रहें, तो विश्व में शांति स्थापित हो सकती है।

Professor Joshi expressed for adopting a "holistic perspective." This implies viewing the entire world as a single family. The Indian cultural concept of “Vasudhaiva Kutumbakam” embodies this very idea. If people live together with cooperation and love, peace can be established in the world.

व्याख्यान के बाद एक रोचक प्रश्नोत्तर सत्र हुआ, जिससे श्रोताओं को विषय के बारे में नई और अधिक जानकारी प्राप्त हुई।

Following the lecture, an engaging question-and-answer session was held, which provided the audience with fresh insights and a deeper understanding of the subject.

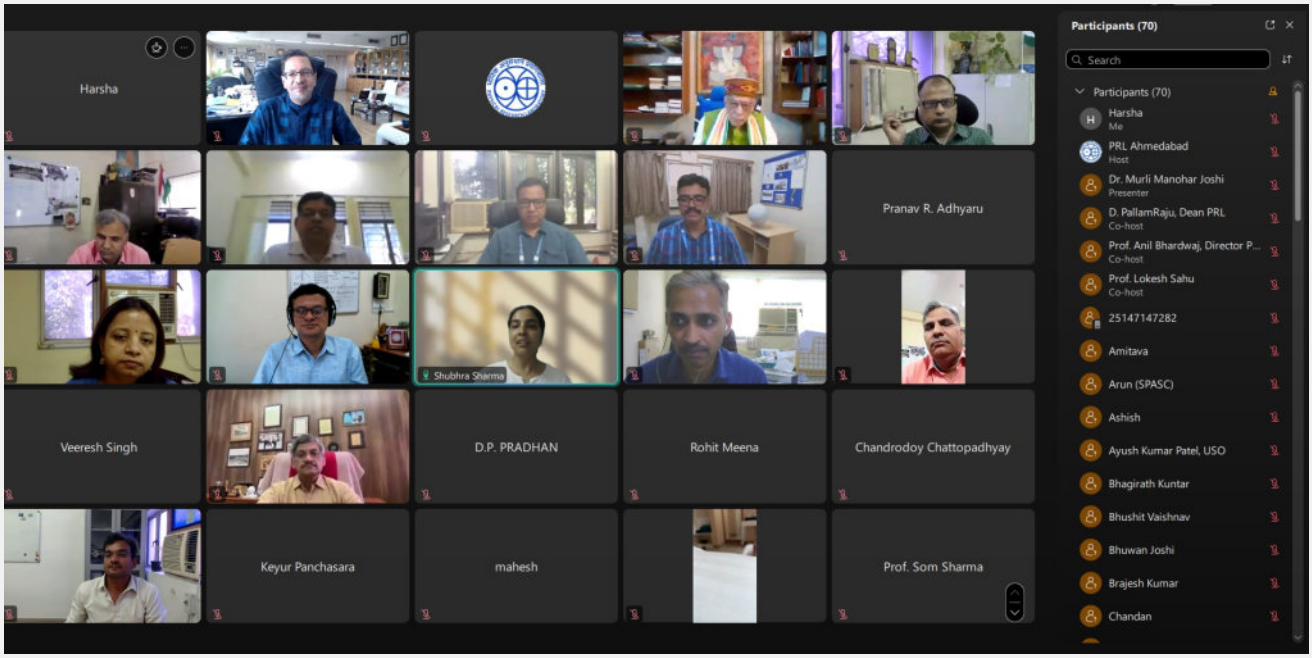


Figure : Snapshot of the presentation

Available online at : https://www.youtube.com/watch?v=jdgKbKh4y-0

PRL's Monthly Publication Digest

Atomic, Molecular and Optical Physics [04]

1. P. Joensson, B. K. Sahoo, S. Caliskan and A. M. Amarsi, 2026, Accurate transition and hyperfine data in Ag I from Multiconfiguration Dirac-Hartree-Fock and Relativistic Coupled-Cluster methods, Astronomy & Astrophysics, Date of Publication: 29/04/2026, Impact Factor: 6.1

2. B. J. Rickey, A. Brinson, A. Chakraborty, A. Dockery, R. F. Garcia Ruiz, J. Karthein, K. Minamisono, A. Ortiz-Cortes, B. K. Sahoo, L. V. Skripnikov, A. R. Vernon and S. G. Wilkins, 2026, Hyperfine structures of 4s, 5s ^2S_{1/2}, 3p ^2P_{1/2, 3/2}, and Mixed ndy ^2D_{3/2, 5/2} states in ^{27}Al, Phys. Rev. A , Date of Publication: 28/04/2026, Impact Factor: 3.0

3. Aloke Jana, Anirban Ghosh, Shyamal Guchhait, Ravi K. Saripalli, N. Apurv Chaitanya, Nirmalya Ghosh, Subhasish Dutta Gupta, and G. K. Samanta, 2026, Paraxial spin-induced vortex generation in epsilon-near-zero materials, Applied Physics Letters, Date of Publication: 10/04/2026, Impact Factor: 3.6

4. Joshua Foley Comer, Ofir Yesharim, Sarika Mishra, Shashi Prabhakar, Eyal Rozenberg, Aviv Karnieli, Ravindra P. Singh, and Ady Arie, 2026, Inverse-design-based experimental generation of high-dimensional spatially entangled light, Optica Quantum, Date of Publication: 03/04/2026, Impact Factor: 10.6

Astronomy & Astrophysics Division [06]

1. Panigrahy, S., Chakali, E., Vázquez-Semadeni, E., Gómez, G. C., Thieme, T. J., Samal, M. R., Li, D., Wang, J.-W., Lai, S.-P., Chen, W.-P., Ojha, D. K., 2026, Evidence for the gravity-driven and magnetically regularized gas flows feeding the massive protostellar cluster in Cepheus A, Science Advances, Date of Publication: 26/04/2026, Impact Factor: 12.5

2. Maiti, Arijit, Mudit K. Srivastava, Vipin Kumar, Bhaveshkumar Mistry, Ankita Patel, Vaibhav Dixit, Ruchi Pandey, and Jay Chitroda, 2026, Development of ProtoPol: a medium-resolution echelle spectro-polarimeter for PRL telescopes, Mt. Abu, India—Part II: the data-reduction pipeline, on-sky characterization and performance verification, and first science results, Journal of Astronomical Telescopes, Instruments, and Systems, Date of Publication: 23/04/2026, Impact Factor: 3.1

3. Kumar, A., Santosh V. Vadawale, N. P. S. Mithun, Tanmoy Chattopadhyay, S. K. Goyal, A. R. Patel, M. Shanmugam , 2026, Development of a one-dimensional position sensitive detector for Compton X-ray polarimeters, Experimental Astronomy , Date of Publication: 16/04/2026, Impact Factor: 2.2

4. Srivastava, Mudit K., Arijit Maiti, Vipin Kumar, Bhavesh Kumar Mistry, Ankita Patel, Vaibhav Dixit, and Kevikumar A. Lad, 2026, Development of ProtoPol: a medium resolution echelle spectro-polarimeter for PRL telescopes, Mt. Abu, India—Part I: the design, development, and laboratory characterization, Journal of Astronomical Telescopes, Instruments, and Systems (JATIS), Date of Publication: 15/04/2026, Impact Factor: 3.1

5. Hoque, A., T. Baug, . Guzman, L. K. Dewangan, Kee-Tae Kim, 2026, The ALMA-QUARKS Survey: Evidence of an Explosive Molecular Outflow in IRAS 15520-5234, The Astrophysical Journal, Date of Publication: 14/04/2026, Impact Factor: 5.4

6. Dash, Priyadarshee P., Prantik Nandi, Sachindra Naik, Narendranath Layek and S. K. Chakrabarti, 2026, Accretion dynamics and coronal geometry in Mrk 530: Insights from 24 years of X-ray monitoring, Monthly Notices of the Royal Astronomical Society, Date of Publication: 07/04/2026, Impact Factor: 4.8

Space and Atmospheric Sciences Division [04]

1. Arun Jangra, Som Kumar Sharma, Dharmendra Kumar Kamat, Shuchita Srivastava, Aniket Patel, Pooja Jindal, Prashant Kumar, Yogesh Kant, Debashis Mitra, Kondapalli Niranjan Kumar, R.P. Singh, Prakash Chauhan, 2026, Long-term characteristics of the atmospheric boundary layer over the Himalayan Foothills using ground-based Lidar and reanalysis data, Atmospheric Research, Date of Publication: 25/04/2026, Impact Factor: 4.4

2. S. Ramachandran, Kamran Ansari and R. Cherian, 2026, Air Pollution to Atmospheric Warming: Effects of Increasing Anthropogenic Aerosols on South Asia's Climate, Earth Systems and Environment, Date of Publication: 06/04/2026, Impact Factor: 4.7

3. Komal and Duggirala Pallamraju, 2026, First Quantitative Results on the Response of Green and Red Line Dayglow Emissions to Solar Flares of Different Magnitudes, Geophysical Research Letters, Date of Publication: 04/04/2026, Impact Factor: 4.6

4. S. Ramachandran and Maheswar Rupakheti, 2026, Composition and radiative forcing of aerosols across the Indo-Gangetic Plain and Himalayas: A seasonal analysis, Atmospheric Environment: X, Date of Publication: 01/04/2026, Impact Factor: 3.4

Geosciences Division [08]

1. Amzad Hussain Laskar, Ranjan Kumar Mohanty, Rahul Kumar Agrawal, Ankur Kumar Dabhi, Sanjeev Kumar, 2026, Stable carbon isotopic tracing of organic matter transformation and soil CO2 sources across tropical sub-humid to semi-arid climates, Organic Geochemistry, Date of Publication: 27/04/2026, Impact Factor: 2.5

2. Hoffmann L.J., L. T. Bach,.....A. Singh et al., 2026, Monitoring, reporting, and verification of marine carbon dioxide removal: Exploring scientific consensus and divergences across continents, Elementa, Date of Publication: 27/04/2026, Impact Factor: 4.5

3. Saranya P, K. Sreelash, T. Akhil, A. Rahman, A. H. Laskar, and S. Kumar , 2026, Eco-hydrological connectivity in soil-vegetation-atmosphere continuum in a tropical biodiversity hotspot, Ecohydrology, Date of Publication: 21/04/2026

4. Das P., K. Maya, D. Padmalal, A. Laskar, A.K. Sudheer, S. Kumar, S. Roy, S. S. Rawat , 2026, Geochemical and isotopic characterisation of thermal springs in the West Coast Geothermal Province, India: Insights into their origin and reservoir dynamics, Applied Geochemistry, Date of Publication: 20/04/2026

5. Gh. Jeelani, S. A. Lone, M Saleem Dar, J. A. Ganai, N. Sharma, S. Kumar , 2026, Nutrient cycling, biogeochemical pathways and eutrophication status of an urban Himalayan lake system, Journal of Hydrology, Date of Publication: 20/04/2026

6. Shaw, C., Rastogi, N., Devaprasad, M., and Kumar, S., 2026, Source Variability and Atmospheric Processing of NHx using δ15N: Linkages with WSOC Fluorescence Indices, Environmental Pollution, Date of Publication: 16/04/2026, Impact Factor: 7.3

7. Anand, M., Chakraborty, A., Moosakutty, S. P., Rajeev, P., Rangu, S., Gupta, T., and Rastogi, N., 2026, Nocturnal evolution of physicochemical characteristics of water-soluble and insoluble organic aerosols in a polluted environment: new insights from a combined online and offline study, Environmental Pollution, Date of Publication: 06/04/2026

8. Siddhartha Sarkar, Ganika. Kushwah, and Sanjeev Kumar , 2026, Shifting flow regimes and water quality regulate CH4 dynamics in anthropogenically perturbed tropical rivers and canals, Environmental Research, Date of Publication: 06/04/2026, Impact Factor: 7.7

Theoretical Physics [02]

1. Partha Konar, Sudipta Show, 2026, Unraveling freeze-in dark matter through the echoes of gravitational waves, Physical Review D (Letter), Date of Publication: 22/04/2026, Impact Factor: 5.3

2. Ohidul Alam, Amartya Pal, Paramita Dutta, and Arijit Saha, 2026, Proximity-induced superconductivity and emerging topological phases in altermagnet-based heterostructures, Physical Review B, Date of Publication: 16/04/2026, Impact Factor: 3.7

Planetary Sciences Division [04]

1. Satyandra M. Sharma, Varun Sheel, 2026, Effect of uncertainties in the electron temperature on the topside Venus ionosphere, ICARUS, Date of Publication: 22/04/2026, Impact Factor: 3.0

2. K. Durga Prasad, G. Ambily, Chandan Kumar, Samadhanam Raju K., Kalyana Reddy P., Amitabh, and Anil Bhardwaj, 2026, In Situ Temperatures, Regolith Properties, and Evidence of Erosion at Chandrayaan-3 Post-hop Location from ChaSTE Twilight Observations, The Astrophysical Journal, Date of Publication: 10/04/2026, Impact Factor: 5.4

3. Trinesh Sana, Sanjay K. Mishra, 2026, Lunar subsurface charging: GCR and SEP effects, Physics of Plasmas, Date of Publication: 07/04/2026, Impact Factor: 2.2

4. Vijayan S, Rama Subramanian V, Rishav Sahoo, Nehavarthini M, Bivas Das, Aditi R, Thahira U, Kimi KB, Ragav R, Jaya Krishna M, Bhalamurugan S, Thirukumaran V, Anil Bhardwaj, 2026, Impacts into the lunar permanently shadowed regions, Npj Space Exploration, Date of Publication: 02/04/2026

Visitors

1. A Project staff from Indian Institute of Technology Bombay visited Udaipur Solar Observatory (USO), Udaipur on 01.04.2026 to explore its various scientific facilities.

2. Dr. S. Somanath, Former Chairman, Space Commission & Secretary, DOS and Advisor (Space Technology) to Government of Andhra Pradesh, Chancellor, Chanakya University, Bengaluru visited Udaipur Solar Observatory (USO), Udaipur on 05.04.2026 to see its various scientific facilities and interact with the observatory staff.

3. A Postdoctoral Fellow from University of Electro Communications, Tokyo, Japan visited Physical Research Laboratory, Ahmedabad on 23.04.2026 for giving a seminar and interaction with members.

4. In April 2026, a total of One hundred and twelve (112) personnel, including officials from DOS/ISRO, representatives from other Government Organizations, Students from various Colleges and Schools, and the general public, visited the Infra-Red Observatory at PRL in Mount Abu to gain exposure on its various facilities.

Awards & Honors

• **Dr. Kuljeet K. Marhas**, Professor, Planetary Sciences Division, PRL, has been invited to serve as a member of the Editorial Board of the newly launched Open Access journal, Earth and Planetary Science Advances (EPSA).

Hearty welcome to our new members

Name: Dr. Abhishek Mohapatra

Designation: Assistant Professor

Date of Joining : 06.04.2026

Division/Area: Theoretical Physics Division

Name: Ms. Shreya Lokendra Singh Arya

Designation: Junior Personal Assistant

Date of Joining: 13.04.2026

Division/Area: Planetary Science Division

Name: Mr. Gohil Jaypalsinh Mahipatsingh

Designation: Laboratory Assistant

Date of Joining: 16.04.2026

Division/Area: Planetary Science Division

OBITUARY

Late Shri. K.S.B. Manian
Engineer-SE

Date of Birth	13.07.1940
Date of Joining PRL	20.11.1967
Date of Retirement	31.07.2000
Date of Death	31.03.2026

Teary Eyes for our Departed Member

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