

Newsletter of the Physical Research Laboratory

THE SPECTRUM



Image of the Month

Participants of 1st winter school in solar physics at USO

January 2024

Table of Contents

Program organized by PRL-ICC regarding Prevention of Sexual Harassment Act-PoSH 2013.....	3
1st Winter School in Solar Physics at USO-PRL [04 - 08 December 2023].....	4
Death Anniversary of Late Prof. Vikram A Sarabhai and Late Prof. K R Ramanathan.....	8
Christmas & New Year 2024 Celebration at USO/PRL, Udaipur.....	9
PRL Amrut Rajbhasha Vyakhyaan-4.....	10
PRL Ka Amrut Vyakhyaan.....	11
Dust EXperiment (DEX) flown on PS4 of PSLV C-58	12
Monthly Digest.....	13
Awards & Honours.....	14
New Members and Visitors.....	14
Obituary.....	15

Program organized by PRL-ICC regarding Prevention of Sexual Harassment Act-PoSH 2013

A program was organized by the Internal Complaints Committee at Physical Research Laboratory, Ahmedabad on 11th December, 2023 to mark the historic judgement of Prevention of Sexual Harassment Act-PoSH 2013 and its 10th anniversary. The program started with the speech of Chair, ICC, Dr. Shital Patel who informed all the members about PoSH Act-2013. After this, the Director, PRL, Prof. Anil Bhardwaj delivered the welcome speech and made everyone aware about keeping the workplace environment fear-free and friendly to all the employees. Prof. R.D. Deshpande, Registrar PRL, addressed all the members about the importance of ICC at workplace. Members of Udaipur Solar Observatory, Udaipur and Infrared Observatory, Mount Abu also participated in this program through online medium. The Speaker of this program was expert PoSH trainer Dr. Krishna Bipin Mehta who was introduced by Prof. Som Kumar Sharma. Dr. Krishna Mehta spoke about the sexual harassment at workplace and the Internal Complaints Committee formed to report such incidents. This Internal Complaints Committee is to be mandatorily formed in all those offices where 10 or more than 10 employees work. Apart from this, an audio play conceived and recorded by PRL personnel about awareness on PoSH Act and ICC at the workplace was presented. A memento was presented to Dr. Krishna Mehta by the Director, PRL. On this occasion, the Director, PRL distributed prizes to the winners of an "Online Quiz competition" that was organized by the Internal Complaints Committee of PRL on 09 October 2023. The vote of thanks for the program was delivered by Dr. Megha Bhatt.



Glimpses of the event

1st Winter School in Solar Physics at USO-PRL [04 - 08 December 2023]

The 1st Winter School in Solar Physics was held at the Udaipur Solar Observatory, PRL from 4th to 8th December 2023. A total of 35 students representing 16 Universities and Colleges all across India attended the School. The list of Institutions were as follows **University of Kerala** (Trivandrum, Kerala), **Calicut University** (Kozhikode, Kerala), **St. Josphes' College** (Trichy, Tamil Nadu), **Loyola College** (Chennai, Tamil Nadu), **Andhra University** (Visakhapatnam, Andhra Pradesh), **Utkal University** (Bhubaneswar, Odisha), **Pt. Ravishankar Shukla University** (Raipur, Chattisgarh), **Fergusson College** (Pune, Maharashtra), **St. Xavier's College** (Ahmedabad, Gujarat), **Maharaja Sayajirao University** (Baroda, Gujarat), **Mohanlal Sukhadia University** (Udaipur, Rajasthan), **Bhupal Nobles' University** (Udaipur, Rajasthan), **University of Rajasthan** (Jaipur, Rajasthan), **PG J. P. University** (Chhapra, Bihar), **Manipur University** (Imphal, Manipur), and **Doon University** (Dehradun, Uttarakhand).

Day 1, December 4th

The students were welcomed by Prof. Shibu Mathew, Head USO-PRL, who then introduced themselves to the rest of participants. A short movie was shown to the students describing USO's history and its facilities. This was followed by the first lecture of the day by **Dr. Brajesh Kumar** who introduced the Sun to the students which included the solar structure, various phenomena, its activity, and the intricate relation between the Sun and the Earth. The second lecture dealt with astronomical and heliographic coordinate systems by **Dr. Rohan Louis** followed by a tutorial where students had to calculate the heliographic coordinates of several sunspots using a picture of the Sun. The afternoon session, consisted of lectures by **Dr. Raja Bayanna** who introduced image formation, basic concepts of Geometric and Fourier optics, as well as Adaptive Optics. This was followed by an exercise where students had to calculate distances between different optical elements and focal planes for a specific telescope configuration. Day 1 concluded with a lecture by Dr. Brajesh Kumar on the Solar Internal Structure, Dynamics, and Helioseismology.



Day 2, December 5th

The students were taken to the island Observatory of USO in the morning where they were shown the 50 cm Multi-Application Solar Telescope (MAST) and the 15 cm SPAR telescope. The optical layout of the different post-focus instruments, telescope control system, guider telescopes, telescope pointing and tracking were explained in great detail to them. The students were shown the GONG, e-CALLISTO and Coudé facilities.

Day 3, December 6th

The first lecture of Day 3 was on Sunspots and its fine structure by **Dr. Rohan Louis** which covered magnetic and velocity fields, the myriad of small-scale features, the Evershed flow, penumbral formation, and some science highlights using MAST observations. Students were asked to estimate the solar rotation rate by tracking sunspots in time at different latitudes to determine the differential rotation of the Sun. They were also asked to verify their results on the computer using Python. The tutorial by **Dr. Raja Bayanna** required students to plot the optical transfer function of an ideal telescope as well as one with seeing conditions for a given Fried's parameter. The last lecture of the day was given by **Prof. Bhuwan Joshi** on the active Sun where he explained the physics of flares, mass ejections and types filaments/prominences. This was followed by a short tutorial by **Ms. Binal Patel** on identifying the types of radio



bursts emanating from the solar corona during the passage of a solar eruption.

Day 4, December 7th

Day 4 began with an introduction to solar spectroscopy and polarimetry by **Prof. Shibu Mathew**, describing the concepts of spectrographs, narrow-band filters, wave plates, and liquid crystal retarders. **Mr. Sandeep Dubey** demonstrated a Python tutorial detailing the theory of Mueller matrices and how the polarisation state could be determined by changing the value of retardance and rotation angles of the polarising element. The final tutorial was given by **Dr. Rohan Louis** where students had to plot the solar spectral profile under the influence of a magnetic field and determine the field strength from the separation of the Zeeman components. The afternoon session consisted of 2 talks, the first was by **Prof. Ramit Bhattacharyya** where he described the mathematical framework for carrying out MHD Simulations of Magnetic Reconnection which was followed by **Dr. Girjesh Gupta's** lecture on the Fundamental Problem of Solar Coronal Heating, our current understanding of the various physical processes behind it and the state of research in the field.

Day 5, December 8th

The final day of the School comprised 2 talks with **Dr. Aveek Sarkar**, from the Astronomy and Astrophysics division, speaking on the upper solar atmosphere, the dynamics of the solar wind, and the importance of determining the properties of charged particles from in-situ measurements. **Prof. Dibyendu Chakrabarty**, Head - Space and Atmospheric Sciences division, spoke on the various processes and phenomena contributing to the conditions in the near Earth space environment such as solar flares, CMEs, CIRs, SEPs etc. and the importance of monitoring the Sun for its role in driving space weather. He also described the primary objectives of the Aditya-L1 mission, specifically the ASPEX instrument on board the spacecraft and the working principle of SWIS and STEPS.

The final session of the School consisted of the students' feedback and distribution of the participation certificates. The 1st Winter School in Solar Physics at USO-PRL concluded successfully due to the painstaking and invaluable contributions of several individuals who made sure that the programme went on flawlessly. The organizers sincerely and wholeheartedly thank the Director, PRL, the Head, USO, the faculty, and all the colleagues of the administration section of the USO for their meticulously taking care of each and every aspect of the logistics. The vote of thanks acknowledged all the persons by name.



Death Anniversary of Late Prof. Vikram A Sarabhai and Late Prof. K R Ramanathan

On the solemn occasion of the 30th of December 2023, marking the death anniversary of the esteemed founder of the Physical Research Laboratory, Late Professor Vikram A. Sarabhai, and the subsequent day, the 31st of December 2023, commemorating the death anniversary of the founding Director of PRL, Late Professor K.R. Ramanathan, a heartfelt homage was extended to these distinguished scientific pioneers. This reverential tribute held at the Foyer area of the K.R. Ramanathan Auditorium on Friday, the 29th of December 2023.

The portraits of Professor Vikram A. Sarabhai and Professor K.R. Ramanathan were adorned with garlands, and a lamp was lit in their memory, symbolizing the enduring light of their contributions to science.

Professor Anil Bhardwaj, the Director of PRL, and Professor R.D. Deshpande, the Registrar of PRL, led the assembly in paying floral tributes to the revered founders. During the ceremony, Director Bhardwaj addressed PRL members, eloquently highlighting the profound scientific legacies left by both Professor Vikram A. Sarabhai and Professor K.R. Ramanathan. The Director shed light on the pivotal role these institution builders played in shaping the landscape of Indian science. Following this, Registrar R.D. Deshpande shared insights into the remarkable journey of Prof. Sarabhai and Prof. Ramanathan, emphasizing their divergent family backgrounds yet united vision that contributed significantly to India's global recognition in the realm of research.

In a touching culmination, PRL members collectively paid their respects by offering floral tributes to the late visionaries, sealing the event as a poignant remembrance of the indelible mark left by Professor Vikram A. Sarabhai and Professor K.R. Ramanathan on the scientific tapestry of India.



Professor Anil Bhardwaj paying floral tributes to the revered founders.

Christmas & New Year 2024 Celebration at USO/PRL, Udaipur

On 22nd of December 2023 Christmas and New Year 2024 Celebrations were organized under the aegis of Staff Welfare Committee at USO/PRL, Udaipur.

The said function was celebrated with great zeal and enthusiasm by USO/PRL staff members and their family members. Colorful decorations and twinkling lights boosted the enthusiasm of all the guests and created a festive atmosphere.

To ensure the participation and entertainment of all the staff members and their family members present in the said program, many types of activities like musical chairs, talent show, songs, poetry and lively dance floor were organized during the event. Little children were very happy and excited about Christmas as they also received Christmas gifts. The festive feast with a varied menu filled everyone with joy. The people present at the program wished each other a Merry Christmas and New Year 2024 and prayed that the coming New Year 2024 removes all negativity and darkness from people's lives.



Cake cutting ceremony on the christmas eve

PRL Amrut Rajbhasha Vyakhaan - 4

"पीआरएल अमृत राजभाषा व्याख्यान (पर्व)" का 7वां व्याख्यान 20 दिसंबर, 2023 को आयोजित किया गया। इस अवसर पर श्री संजीव चतुर्वेदी (आईएफएस), मुख्य वन संरक्षक (सीसीएफ), हल्द्वानी, उत्तराखंड, सम्मानित वक्ता के रूप में उपस्थित थे। व्याख्यान का शीर्षक था "सुशासन एवं भ्रष्टाचार उन्मूलन में लोक सेवको एवं नागरिकों की भूमिका"।

The 7th lecture of "PRL Amrut Rajbhasha Vyakhaan (PARV)" was held on December 20, 2023. The distinguished speaker for the occasion was Shri Sanjeev Chaturvedi (IFS), Chief Conservator of Forest (CCF), Haldwani, Uttarakhand. The lecture was titled "सुशासन एवं भ्रष्टाचार उन्मूलन में लोक सेवको एवं नागरिकों की भूमिका"।

व्याख्यान के दौरान श्री. संजीव चतुर्वेदी ने इस विषय पर प्रकाश डाला की जैव विविधता, प्राकृतिक संसाधन और मानव संसाधनों के मामले में भारत निसंकोच एक समृद्ध देश है, किन्तु इन सभी प्राकृतिक और मानव संसाधनों की उपलब्धता और अनुकूलता के बावजूद, आमतौर पर पोषण, स्वास्थ्य, शिक्षा जैसे अधिकांश मानव सूचकांकों जैसे की पोषण, स्वास्थ्य, शिक्षा, प्रदूषण, स्वच्छ जल की उपलब्धता इत्यादि में भारत का स्थान सामान्यतः अन्य विकसित व विकासशील देशों की तुलना में अभी भी काफी नीचे है।

During the lecture, Shri Sanjeev Chaturvedi highlighted on the richness on India in terms of biodiversity, natural resources, and human resources, but despite the availability and compatibility of all these natural and human resources, India generally ranks low in most of the human indices like nutrition, health, education,



pollution, availability of clean water, etc. Still quite low compared to other developed and developing countries.

उन्होंने इजराइल और जापान जैसे देशों का उदाहरण भी दिया, जहां कठिन भौगोलिक परिस्थितियों और आवश्यक प्राकृतिक संसाधनों की तुलनात्मक अनुपलब्धता के बावजूद, यह देश मानव विकास के सभी सूचकांकों में दुनिया के अग्रणी देशों में गिने जाते हैं। उन्होंने इस अंतर का मूल कारण देश के नागरिकों और लोक सेवकों चारित्रिक दृढ़ता, नैतिक मानदंड और देश और समाज के प्रति उनके उत्तरदायित्व की भावना पर प्रकाश डाला। किसी भी देश की प्रगति के लिए उसका सबसे मूल्यवान संसाधन उस देश का मानव संसाधन होता है।

He also gave examples of countries like Israel and Japan, where despite difficult geographical conditions and comparative unavailability of essential natural resources, these countries are counted among the leading countries of the world in all indices of human development. He enlightened about the basic reason for this difference is the strength of character, moral standards, and sense of responsibility towards the country and society of the country's citizens and public servants. The most valuable resource for the progress of any country is; its human resource.

व्याख्यान में, श्री संजीव चतुर्वेदी ने केन्द्र व विभिन्न राज्य सरकारों तथा न्यायपालिका, कार्यपालिका एवं विधायिका के साथ, लोक सेवक के रूप में, अपने दो दशक से भी अधिक, सतत एवं गहन अनुभव के निष्कर्षों को प्रस्तुत किया और सुशासन और भ्रष्टाचार उन्मूलन में लोक सेवकों और नागरिकों की भूमिका के बारे में विस्तार से जानकारी दी।

In the lecture, Shri Sanjeev Chaturvedi presented his findings of continuous and deep experience as a public servant for more than two decades with the Central and various State Governments and the Judiciary, Executive and Legislature and elaborated about the role of public servants and citizens in good governance and eradication of corruption.

प्रश्न-उत्तर सत्र ने श्रोताओं को इस विषय के बारे में अधिक जानने और व्याख्यान के बाद व्यक्तिगत अंतर्दृष्टि विकसित करने का अवसर प्रदान किया।

A stimulating question-and-answer session allowed listeners to learn more about the topic and develop individualized insights after the lecture.

PRL Ka Amrut Vyakhyaan

87th Amrut Vyakhyaan was delivered by Prof. Balasubramanian Sundaram (Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru), on 29 December, 2023. He delivered the Vyakhyaan on the topic "Addressing Chemical Complexity Through Molecular Simulations".

Over the last six decades molecular simulation has advanced to such an extent that it has significantly improved our knowledge on the understanding of the chemical complexity of molecules by complementing and supplementing laboratory experiments. During the Vyakhyaan, Prof. Sundaram gave an overview of the improvement that has been made in the direction of molecular simulations through technical innovations, including coarse-graining, enhanced sampling, quantum chemical, and deep learning treatment of intermolecular interactions. He presented case studies of ethanol-CO₂ interactions, the crystal structure of carbonic acid, and the development of interatomic potentials for ethylene glycol. He concluded the Vyakhyaan, showcasing the applications of machine-learned potentials in understanding the anomalous diffusion of water in aqueous salt solutions.



Via **webex**

Stable Conformations of Ethylene glycol

Intramolecular hydrogen bond

1. tGg' (4)	2. gGg' (4)	3. g'Gg' (2)	4. tTt (1)
5. tTg (4)	6. gTg' (2)	7. gTg (2)	8. gGg (2)
9. tGt (2)	10. tGg (4)		

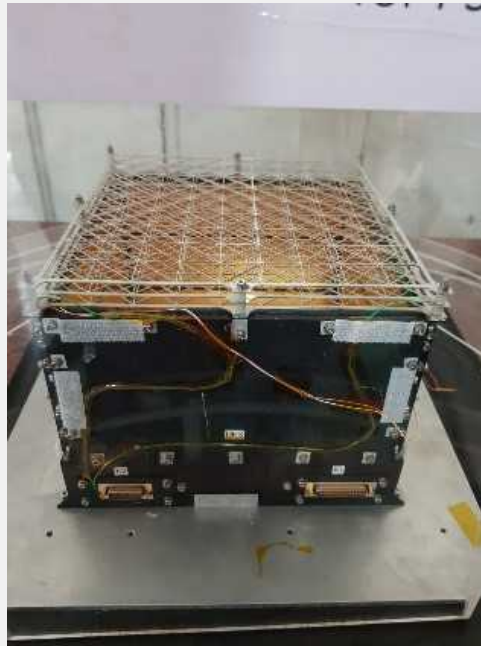
Dary L. Howard et al. *J. Am. Chem. Soc.* 2005, 127, 17096-17103

29 Dec 2023 PRL 2023 25

Dust EXperiment (DEX) flown on PS4 of PSLV C-58

Dust is a major constituent in any planetary system and it is found everywhere. Over the last couple of decades, there have been remarkable changes in the field of dust science due to in-situ space experiments, the remote sensing and the observations of dusty comets. Present research includes optical and momentum sensing techniques for cometary dust particles, near Earth and interplanetary dust collection and measurements, origin and dynamics of the dust particles found in solar system and many more. The Interplanetary Dust Particles (IDPs) interact with planetary bodies and can affect the ionospheric layer. To study IDP at Venus, the engineering model of Venus Orbiter Dust EXperiment (VODEX) was developed at PRL. To demonstrate the dust detector working in space, a Dust EXperiment (DEX) module was sent off from PRL on 20 December 2023 and finally it was flown on PS4 of PSLV C-58 (XPoSat) on 1st January 2024. The DEX has been found working successfully in the space. It provided observations of IDP impacts in the Earth's orbit, at altitude of 350 km. The DEX is a dust detector, which helps in understanding the physical properties of IDPs reaching Earth. It works on the principle of hypervelocity impact ionization.

Team: Jayesh Pabari (Principal Investigator), Srirag Nambiar, Sonam Jitarwal, Rashmi, Kinsuk Acharyya, Arpit Patel, Hiteshkumar Adalja, Anil Bhardwaj from PRL; S. M. K. Praneeth, Bhavik Shah, Jaimin Rami, Jaykumar Delvadiya, Deepak Kumar, Pinalkumar Suthar, V. K. Singh, Sandip Somani, Tarun Singh Baghel, Ishwar Lal, Vipul Purohit, Shrikant Patil, Arun Bindal, Sourabh Jain, Rahul Khandekar, Shilpa Pandya from SAC; R. K. Singh from IPR and Team.



(a) Top left: Snapshot of DEX Flight Model; (b) Top right: DEX interfaced with PS4 of PSLV C-58; (c) Flag off of DEX on 20 December 2023.

PRL Monthly Publications Digest

Astronomy and Astrophysics Division [1]

1. Tanmoy Chattopadhyay, Abhay Kumar, A. R. Rao, Yash Bhargava, Santosh V. Vadawale, Ajay Ratheesh, Gulab Dewangan, Dipankar Bhattacharya, N. P. S. Mithun, Varun Bhalerao, 2023, High Hard X-Ray Polarization in Cygnus X-1 Confined to the Intermediate Hard State: Evidence for a Variable Jet Component, The Astrophysical Journal Letters, 960:L2, Date of Publication: 29/12/2023.

Geosciences Division [2]

1. Patel, A. and Rastogi, N., 2023, Oxidative Potential of Atmospheric Aerosols over Different Regions of India and Surrounding Oceans, ACS Earth and Space Chemistry, Date of Publication: 18/12/2023.

2. Achyuth Venugopal, Gyana Ranjan Tripathy, Vineet Goswami, Sumit K. Ghosh, and Deependra Singh, 2023, Oceanic Redox State During the Early Cambrian: Insights From Mo-S Isotopes and Geochemistry of Himalayan Shales, Geochemistry, Geophysics, Geosystems, Date of Publication: 14/12/2023.

Space & Atmospheric Sciences Division [2]

1. Jaydeep Singh, Narendra Singh, Narendra Ojha, A. P. Dimri, Ravi S. Singh, 2023, Impacts of different boundary layer parameterization schemes on simulation of meteorology over Himalaya, Atmospheric Research, Date of Publication: 06/12/2023, Impact Factor: 5

2. K. K. Shukla, Som Kumar Sharma, Kondapalli Niranjana Kumar, Prashant Kumar, Dharmendra Kumar Kamat, Raju Attada & Sourita Saha, 2023, Characterization of a Regional Dust Storm Using RAMAN Lidar Over the Western Indian Region, Journal of the Indian Society of Remote Sensing, Date of Publication: 05/12/2023, Impact Factor: 1

Planetary Sciences Division [2]

1. K.S. Sajinkumar, S. James, G.K. Indu, Saranya R. Chandran, Devika Padmakumar, J. Aswathi, S. Keerthy, M.N. Praveen, N. Sorcar, J.K. Tomson, Anil Chavan, Subhash Bhandari, M. Satyanarayanan, R. Bhushan, A. Dabhi, Y. Anilkumar, 2023, The Luna structure, India: A probable impact crater formed by an iron bolide, Planetary and Space Science, Date of Publication: 06/12/2023.

2. Ramakant R. Mahajan, 2023, Nitrogen isotopic ratio and abundance in selected ordinary chondrites: clues for their formation in proto-planetary disk, Astrophysics and Space Science, Date of Publication: 01/12/2023.

Awards & Honours

1. **Ms. Chandrima Shaw**, SRF, Geosciences Division of PRL has received the **second prize** for platform presentation in the "**Indian Aerosol Science and Technology Association (ISATA-2023)**" conference held at Navi Mumbai during 12-14 December 2023.

Heartily welcome to our new members



NAME: Ms. Ganika Kushwah

DESIGNATION: Project Associate-MOES

DATE OF JOINING: 04.12.2023

DIVISION/AREA: Geoscience Division



NAME: Dr. Riya Debacharya Dutta

DESIGNATION: Post Doctoral Fellow

DATE OF JOINING: 15.12.2023

DIVISION/AREA: Planetary Science Division



NAME: Mr. Tirtha Jyoti Kalita

DESIGNATION: Project Associate-I-SERB-CRB

DATE OF JOINING: 15.12.2023

DIVISION/AREA: Planetary Science Division

Visitors

1. Mr. Keisuke Okayama & Mr. Yusuke Nishiyama both Japan Nationals from JOEL India Pvt. Ltd., New Delhi visited PRL on 07.12.2023 in connection with Technical and Application discussion on Scientific Equipment at PRL Thaltej Campus.
2. Dr. Morino Isamo of National Institute for Environmental Studies (NIES), Japan visited PRL from 11.12.2023 to 12.12.2023 in connection with Scientific discussion on collaboration in the field of remote sensing of greenhouse gases and the latest GOSAT mission from Japan.
3. Dr. Sasakava Tadashi of Kokusai Kogyo Corporation, Kitashinnyuku, Tokyo, Japan visited PRL from 11.12.2023 to 12.12.2023 in connection with Scientific discussion on collaboration in the field of remote sensing of greenhouse gases and the latest GOSAT mission from Japan.
4. Dr. Mahesh Kumar Sha of Royal Belgian Institute for Space Aeronomy (BIRA-IASB), Belgium visited PRL from 11.12.2023 to 12.12.2023 in connection with Scientific discussion on collaboration in the field of remote sensing of greenhouse gases and the latest GOSAT mission from Japan.
5. Prof. Mocnik Grisa, Centre for Atmospheric Research, University of Nova, Gorica, Slovenia visited PRL on 18.12.2023 in connection with Scientific discussion with Scientists and Research Scholars.

Obituary

Late Shri J.L. Thapa Tradesman-E



Date of Birth	13.10.1946
Date of Joining	05.05.1975
Date of retirement	31.10.2006
Date of Death	15.12.2023

Teary eyes for our departed member

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

PRL Contact



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



Website (English)



Website (Hindi)

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