



The Author



Neeraj Rastogi

About him:

Dr. Neeraj Rastogi is an Associate Professor at the Geosciences Division.

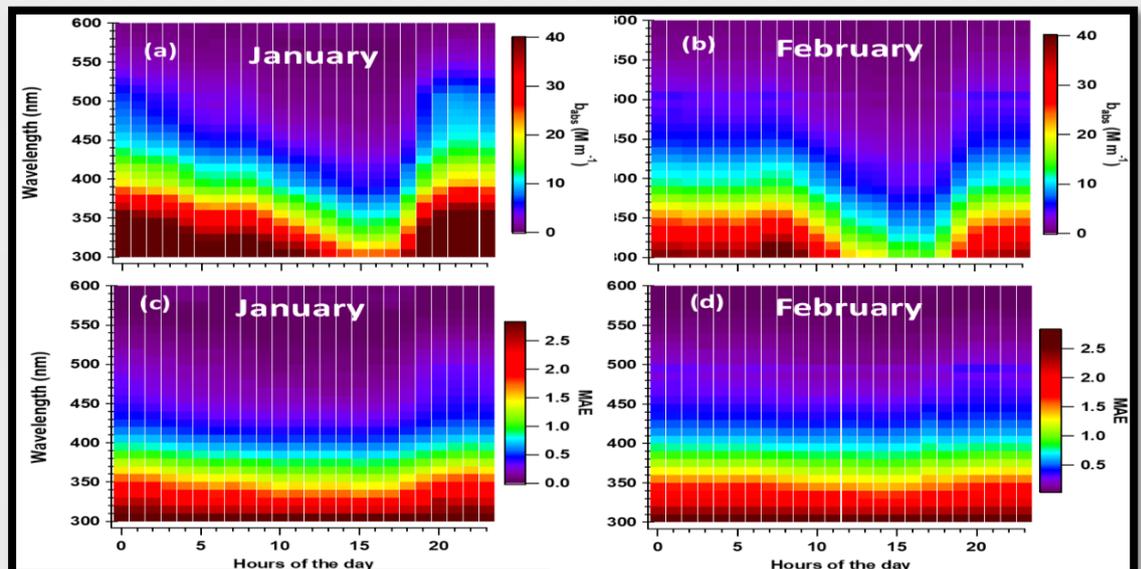


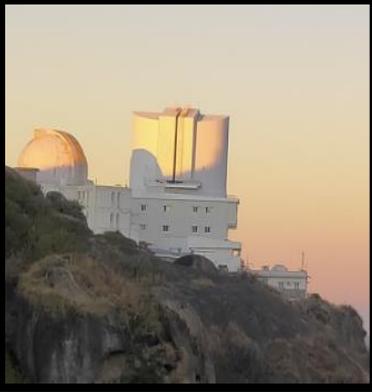
Figure: Diurnal variability in (a) BrC spectra during January and (b) BrC spectra during February, and in (c) MAE during January and (d) MAE during February

Diurnal Variability in the Spectral Characteristics and Sources of Water-soluble Brown Carbon Aerosols over Delhi

(Neeraj Rastogi, Rangu Satish, Atinderpal Singh, Varun Kumar, Navaneeth Thamban, Vipul Lalchandani, Ashutosh Shukla, Pawan Vats, S. N. Tripathi, Dilip Ganguly, Jay Slowik, Andre S. H. Prevot)

It is well established that light-absorbing organic aerosols (commonly known as brown carbon, BrC) impact climate. However, uncertainties remain as their contributions to absorption at different wavelengths are often ignored in climate models. Further, BrC exhibits differences in absorption at different wavelengths due to the variable composition including varying sources and meteorological conditions. However, diurnal variability in the spectral characteristics of water-soluble BrC (hereafter BrC) is not yet reported. This study presents unique measurement hitherto lacking in the literature. Online measurements of BrC were performed using an assembled system including a particle-into-liquid sampler, portable UV-Visible spectrophotometer, and total carbon analyzer. This system measured the absorption of ambient aerosol extracts at the wavelengths ranging from 300 to 600 nm with 2 min integration time and water-soluble organic carbon with 4 min integration time over a polluted megacity, New Delhi. Black carbon, carbon monoxide (CO), nitrogen oxides (NO_x), and the chemical composition of non-refractory submicron aerosols were also measured in parallel. Diurnal variability in absorption coefficient (0.05 to 65 Mm⁻¹), mass absorption efficiency (0.01 to 3.4 m⁻² gC⁻¹) at 365 nm, and absorption angstrom exponent (AAE) of BrC for different wavelength range (AAE₃₀₀₋₄₀₀: 4.2-5.8; AAE₄₀₀₋₆₀₀: 5.5-8.0; and AAE₃₀₀₋₆₀₀: 5.3-7.3) is discussed. BrC chromophores absorbing at any wavelength showed minimum absorption during afternoon hours, suggesting the effects of boundary layer expansion and their photo-sensitive/volatile nature. On certain days, a considerable presence of BrC absorbing at 490 nm was observed during nighttime that disappears during the daytime. It appeared to be associated with secondary BrC. Observations also infer that BrC species emitted from the biomass and coal burning are more absorbing among all sources. A fraction of BrC is likely associated with trash burning, as inferred from the spectral characteristics of Factor-3 from the PMF analysis of BrC spectra. Such studies are essential in understanding the fundamental BrC characteristics and their further utilization in climate models. <https://doi.org/10.1016/j.scitotenv.2021.148589>





MIRO, PRL

About MIRO:

MIRO is located at Gurushikhar, the highest peak of Aravali mountain range in Mount Abu at an altitude of 1680 km.



The visit of Honorable Governor to the Mount Abu Infrared Observatory (MIRO) of PRL

Honorable Governor of Rajasthan, Shri Kalraj Mishra visited the Mount Abu Infrared Observatory (MIRO) on June 25, 2021 with his family. They got to know about various astronomical instruments and telescope functioning. They appreciated the achievements and research work happening at the observatory.



Figure: (Top left) Presenting the memento, (Top right) A group photo with MIRO staff, and (Bottom) Mr. Ashirbad, a MIRO staff member, explaining about telescope functioning to Honorable Governor and family.

The scientific results on Unraveling the mysteries of the Solar Corona: New results from Chandrayaan-2 Solar X-ray Monitor by *Prof. Santosh V Vadawale*, Professor, *Mr. Biswajit Mondal*, Senior Research Fellow, *Mr. Mithun N. P. S.*, Scientist/Engineer-SD, *Dr. Aweek Sarkar*, Associate Professor, *Prof. Janardhan P. (Retd.)*, *Mr. Adalja Hitesh Kumar L*, Scientist/Engineer-SE and *Mr. Neeraj Kumar Tiwari*, Scientist/Engineer-SD of Astronomy & Astrophysics Division; *Dr. Bhuwan Joshi*, Associate Professor of Udaipur Solar Observatory; *Dr. Shanmugam M*, Scientist/Engineer-SF, *Mr. Arpit R. Patel*, Scientist/Engineer-SD, *Mr. Goyal Shiv Kumar*, Scientist/Engineer-SE, *Mr. Tinkal Ladiya*, Technical Officer-C, *Mr. Nishant Singh*, Scientist/Engineer-SC and *Mr. Sushil Kumar*, Scientist/Engineer-SC of Planetary Sciences Division, and *Dr. Anil Bhardwaj*, Director, PRL has been highlighted as a "ISRO Story of the Week".

The ISRO story of the week can be accessed from:

<https://www.isro.gov.in/update/22-jun-2021/unraveling-mysteries-of-solar-corona-new-results-chandrayaan-2-solar-x-ray>

This story is based on the following research articles:

<https://doi.org/10.3847/2041-8213/abf35d> & <https://doi.org/10.3847/2041-8213/abf0b0>

This result has also been covered in the News media, the links for which are provided below:

<https://www.thehindu.com/sci-tech/science/chandrayaan-instrument-helps-unravel-the-mysteries-of-solar-corona/article34923039.ece>

<https://weather.com/en-IN/india/space/news/2021-06-25-chandrayaan-2-observes-the-sun-to-study-heating-of-its-corona>

The recent work on Natural selection in few milliseconds: Shock-induced formation of complex macroscale structures by *Mr. V. S. Surendra*, Senior Research Fellow and *Mr. J. K. Meka*, Scientist/Engineer-SD of Atomic, Molecular & Optical Physics Division, *Dr. M. Muruganantham*, Ex-Postdoctoral Fellow, Geosciences Division, *Dr. S. Vijayan*, Assistant Professor, Planetary Sciences Division, *Dr. Anil Bhardwaj*, Director, *Dr. B. Sivaraman*, Associate Professor, Atomic, Molecular & Optical Physics Division of PRL has been highlighted as a "ISRO Story of the Week".

The ISRO story of the week can be accessed from:

<https://www.isro.gov.in/update/14-jun-2021/natural-selection-few-milliseconds-shock-induced-formation-of-complex-macroscale>

This story is based on the following research articles:

<https://doi.org/10.1017/S1473550421000136> & <https://doi.org/10.3390/molecules25235634>

Organization of Yoga webinar at Udaipur Solar Observatory

On the occasion of 7th International Yoga Day, an online program / Webinar was organized by Udaipur Solar Observatory (USO) on 22 June, 2021, for the staff members, retired employees and their family members. The invited speakers on this occasion were Mrs. Shubha Surana, Yoga Trainer cum Research Scholar, Mohan Lal Sukhadia University (MLSU), Udaipur and Ms. Shreya Gadiya, Founder – Kayakalp and Research Scholar, MLSU, Udaipur. The programme began with the welcome address by Dr. Anil Bhardwaj, Director, PRL. This was followed by introducing the first speaker of the session, Mrs. Shubha Surana, by Prof. Nandita Srivastava. Mrs. Surana presented the role of Yoga practices and Pranayam during this pandemic aided with some demonstrations by her colleague. The second speaker of the session, Ms. Shreya Gadia, was introduced by Dr. Brajesh Kumar. Ms. Gadiya presented the importance of Dincharya and Ritucharya in our daily life. Both the talks were followed by very fruitful Question and Answer session concerning the aforementioned topics of discussions, which made this programme very useful for the participants. The programme concluded with the Vote of Thanks by Dr. Bhuwan Joshi, and final concluding remarks on the importance of Yoga for the scientists by the Director, PRL.



Flag-off of the Flight Model of APXS for Chandrayaan-3 Rover Mission

The Chandrayaan-3 is a follow-up mission of Chandrayaan-2 planned to be launched next year. It consists of a Lander, a Rover, and a propulsion module. The rover configuration is almost identical to the Pragyan rover of Chandrayaan-2, including the two scientific payloads – namely the Alpha Particle X-ray Spectrometer (APXS, developed by PRL) and the Laser Induced Breakdown Spectroscope (LIBS, developed by LEOS, Bangalore). The main scientific objective of APXS is to determine the elemental composition of the lunar surface at different locations in the vicinity of the landing site by measuring the characteristic X-ray lines of different elements excited by the alpha particles and X-rays emitted by the in-built Cm-244 radioactive sources. The APXS payload for Chandrayaan-2 was designed and developed at PRL, and the test & evaluation (T&E) of QM (Qualification Model) and FM (Flight Model) was conducted at SAC (Space Application Centre). A flight spare model (FM Spare) of APXS was also fabricated following the same process as QM & FM of APXS. This flight spare model is now used as the flight model (FM) for the Chandrayaan-3 rover. After verifying performance with environmental tests, the FM of APXS was declared ready for Chandrayaan-3 rover mission. A flag-off ceremony was held at Thaltej campus of PRL on the evening of 9 July 2021 for delivery of the APXS FM to Chandrayaan-3 project. The flight model of APXS was delivered to the Chandrayaan-3 project at ISITE (URSC), Bangalore, on 13 July 2021. It has been integrated with the rover on 14 July, and the initial tests show that its performance is nominal in terms of all scientific and technical parameters. The integrated rover will undergo further environmental tests, and the performance of APXS will be monitored at every stage.



Monthly Publications Digest of PRL

1. Zinchenko, I. I., Dewangan, Lokesh Kumar, Baug, T., Ojha, D. K., Bhadari, N. K., 2021, [ALMA discovery of a dual dense probably rotating outflow from a massive young stellar object G18.88MME](#), Monthly Notices of the Royal Astronomical Society: Letters, DOI: 10.1093/mnrasl/slab070, Date of Publication: 22/06/2021
2. Ajay Ratheesh, A. R. Rao, N. P. S. Mithun, Santosh V. Vadawale, Ajay Vibhute, Dipankar Bhattacharya, Priya Pradeep, S. Sreekumar, Varun Bhalerao, 2021, [A generalized event selection algorithm for AstroSat CZT imager data](#), Journal of Astrophysics and Astronomy, 42, 37, Date of Publication: 10/06/2021
3. Nilkanth D. Vagshette, Sachindra Naik, Neeraj Kumari & Madhav K. Patil, 2021, [Imaging and photometric studies of NGC 1316 \(Fornax A\) using Astrosat/UVIT](#), 2021, Journal of Astrophysics and Astronomy, 42, 34, Date of Publication: 07/06/2021
4. G. K. Jaisawal, Sachindra Naik, Shivangi Gupta, P. C. Agrawal, Arghajit Jana, Birendra Chhotaray & Prahlad R. Epili, 2021, [Detection of X-ray pulsations at the lowest observed luminosity of Be/X-ray binary pulsar EXO 2030+375 with AstroSat](#), 2021, Journal of Astrophysics and Astronomy, 42, 33, Date of Publication: 05/06/2021
5. Ketan M. Patel, 2021, [Fermion mass hierarchies from supersymmetric gauged flavour symmetry in 5D](#), SciPost Phys. 10, 154 (2021), Date of Publication: 24/06/2021
6. Hema Kharayat, Bhuwan Joshi, Prabir K. Mitra, P. K. Manoharan, Christian Monstein, 2021, [A Transient Coronal Sigmoid in Active Region NOAA 11909: Build-up Phase, M-class Eruptive Flare, and Associated Fast Coronal Mass Ejection](#), Solar Physics, Date of Publication: 22/06/2021
7. Bhuwan Joshi, Prabir K. Mitra, R. Bhattacharyya, Kushagra Upadhyay, Divya Oberoi, K. Sasikumar Raja, Christian Monstein, 2021, [Two-Stage Evolution of an Extended C-Class Eruptive Flaring Activity from Sigmoid Active Region NOAA 12734: SDO and Udaipur-CALLISTO Observations](#), Solar Physics, Date of Publication: 03/06/2021
8. B. K. Sahoo, B. P. Das, and H. Spiesberger, 2021, [New physics constraints from atomic parity violation in ¹³³Cs](#), Phys. Rev. D 103, L111303 (2021) <https://doi.org/10.1103/PhysRevD.103.L111303>, Date of Publication: 25/06/2021
9. B. K. Sahoo, 2021, [Investigating properties of Cl- and Au- ions using relativistic many-body methods](#), J. Phys. B 54, 115001 (2021) <https://doi.org/10.1088/1361-6455/abd91b>, Date of Publication: 07/06/2021
10. Rastogi, N., Satish, R., Singh, A., Kumar, V., Thamban, N., Lalchandani, V., Shukla, A., Vats, P., Tripathi, S. N., Ganguly, D., Slowik, J., and Prevot, A. S. H, 2021, [Diurnal Variability in the Spectral Characteristics and Sources of Water-Soluble Brown Carbon Aerosols over Delhi](#), Science of the Total Environment, 148589, Date of Publication: 27/06/2021
11. Harsh Raj, Ravi Bhushan, 2021, [Spatial and temporal changes in bomb radiocarbon in the northern Indian Ocean](#), Journal of Environmental Radioactivity, Date of Publication: 15/06/2021

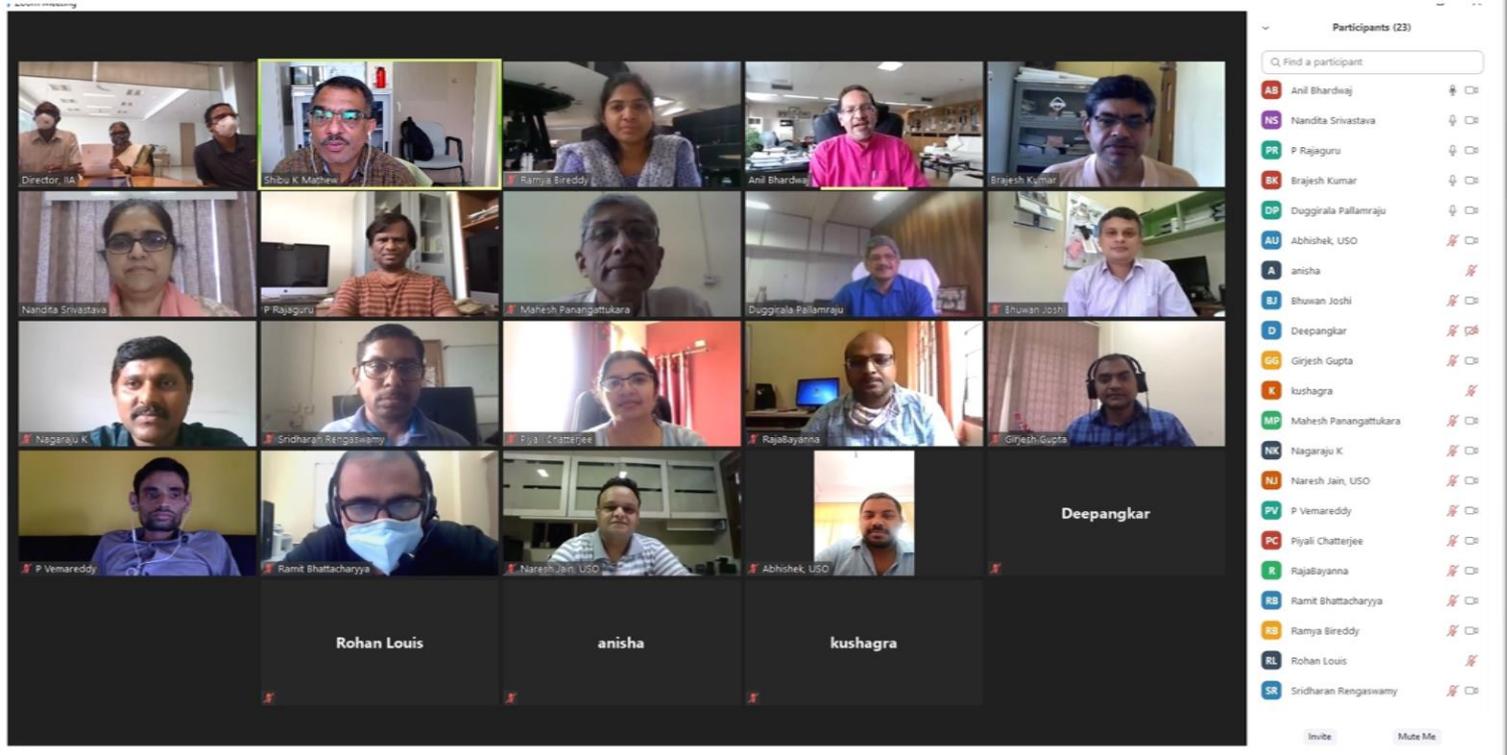
Monthly Publications Digest of PRL

12. Partha Sarathi Jena, Ravi Bhushan, Ajay Shivam, Romi Nambiar, Nisha Bharti, 2021, [Production rate variation and changes in sedimentation rate of marine core dated with meteoric ¹⁰Be and ¹⁴C](#), *Journal of Environmental Radioactivity*, Date of Publication: 15/06/2021
13. Arvind Singh, L. Bach, C. Löscher, A. Paul, N. Ojha, U. Riebesell, 2021, [Impact of increasing carbon dioxide on dinitrogen and carbon fixation rates under oligotrophic conditions and simulated upwelling](#), *Limnology and Oceanography*. doi://10.1002/lno.11795, Date of Publication: 04/06/2021
14. S. Sebastian, R. Bhutani, S. Balakrishnan, Tomson J. K., Anil D. Shukla*, 2021, [Geochemical and isotopic studies of potassic granite from the western Dharwar Craton, southern India: Implications for crustal reworking in the Neoproterozoic](#), *Geological Journal*, Date of Publication: 01/06/2021
15. Arvind Singh and P. Chaturvedi, 2021, [Error Propagation](#), *Resonance*, doi://10.1007/s12045-021-1185-1, Date of Publication: 01/06/2021
16. Tiwari K., Ghosh S., Miyahara M. and Ray D., 2021, [Shock-Induced Incongruent Melting of Olivine in Kamargaon L6 Chondrite](#), *Geophysical Research Letters*, Date of Publication: 08/06/2021
17. Ray, D., Baliyan, S. and Nayak, C., 2021, [Progressive aqueous alteration and iron oxidation record in the matrix of Mukundpura CM2 chondrite, a new fall](#), *Advances in Space Research*, Date of Publication: 03/06/2021
18. Sovan Saha, Duggirala Pallamraju, Tarun K. Pant, and Supriya Chakrabarti, 2021, [On the Cause of the Post-Sunset Nocturnal OI 630 nm Airglow Enhancement Over Low-Latitude Thermosphere](#), *Journal of Geophysical Research - Space Physics*, Date of Publication: 24/06/2021
19. S. Ramachandran and Priyadarshini B., 2021, [Biomass burning and impacts on aerosols: Optical properties and radiative effects](#), in "Biomass Burning in South and Southeast Asia", Date of Publication: 24/06/2021
20. Gareth J Stewart, Beth S Nelson, W Joe F Acton, Adam R Vaughan, James R Hopkins, Siti SM Yunus, C Nicholas Hewitt, Oliver Wild, Eiko Nemitz, Ranu Gadi, Lokesh K Sahu, Tuhin K Mandal, Bhola R Gurjar, Andrew R Rickard, James D Lee, Jacqueline F Hamilton, 2021, [Emission estimates and inventories of non-methane volatile organic compounds from anthropogenic burning sources in India](#), *Atmospheric Environment: X*, Date of Publication: 08/06/2021
21. Sourita Saha, Som Sharma, KNKumar, PKumar, VJoshi, SLal, 2021, [A case study on the vertical distribution and characteristics of aerosols using ground-based raman lidar, satellite and model over Western India](#), *International Journal of Remote Sensing*, Date of Publication: 23/06/2021
22. S. Maji, R. Yadav, G. Beig, S. S.Gunthe, N. Ojha, 2021, [On the processes governing the variability of PTR-MS based VOCs and OVOCs in different seasons of a year over hilly mega city of India](#), *Atmospheric Research*, Date of Publication: 17/06/2021

Signing of MoU between Physical Research Laboratory and Indian Institute of Astrophysics for the 2-m National Large Solar Telescope

The Indian Institute of Astrophysics (IIA) Bengaluru, has proposed a 2-m, state of the art, National Large Solar Telescope (NLST) which will be built on the shores of the Pangong Lake in Merak, Ladakh and funded by the Department of Science and Technology (DST). The first light from NLST is expected around 2027. NLST will provide Indian Solar Physicists a unique opportunity to study the Sun at very high spatial resolution across the visible and near-infrared wavelengths to understand fundamental processes coupling the solar interior to its atmosphere. The site over which NLST will be built has already been acquired by IIA and the final specifications of the telescope and dome design are underway. Post-focus and auxiliary optics will be developed in-house as well as in collaboration with researchers from the Udaipur Solar Observatory, Physical Research Laboratory (USO-PRL), whose expertise in optics and instrumentation will be key to this national project. USO-PRL, in particular, has been at the forefront of instrumentation development for solar astronomy for several decades, successfully installing and operating the 50-cm Multi-Application Solar Telescope (MAST) since 2014 at its island site in the middle of Fatehsagar Lake in Udaipur.

NLST is envisaged to generate an important synergy between researchers from IIA and USO-PRL which will be crucial for the realisation of the project. A Memorandum of Understanding (MoU) between IIA and PRL has been formulated which will make USO-PRL a member partner in the NLST project. The key role of USO will be to design and install a Narrow-band Imager as a first-light instrument for the NLST, as well as participate in the design of the telescope, its optical systems, and adaptive optics. The MoU detailing the role of USO-PRL in the framework of NLST was signed on 13 July 2021 by Prof. Annapurni, Director IIA and Dr. Anil Bhardwaj, Director PRL, during an online signing ceremony in the presence of Prof. Shibu Mathew and Prof. Nandita Srivastava from USO and Dr. B. Ravindra and Prof. Eswar Reddy from IIA. Several colleagues from IIA and PRL also joined in the online session which is an important step towards the realisation of NLST.



Obituary



Late Shri M. M. Dalal
Tradesman – G
(16.6.1946 to 13.5.2021)
Date of retirement: 30.6.2006

Hearty welcome to new member



Name : DR. KAVUTARAPU VENKATESH
Designation : Assistant Professor
Date of Joining : 21.06.2021
Division/Area : Space & Atmospheric Sciences

Name : KESHAV PRASAD
Designation : Technical Assistant
Date of Joining : 28.06.2021
Division/Area : Construction & Maintenance Group



Guest editor for The Spectrum

The PRL Newsletter team acknowledges and thanks Ms. Prachi Prajapati for guest editing this issue of The Spectrum.



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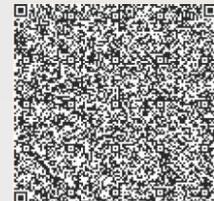
<https://www.prl.res.in/prl-eng/home>



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