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The 4th State

Newsletter of the Institute For Plasma Research, Gandhinagar, Gujarat (India)



PLATINUM JUBILEE YEAR
70
Glorious Years
1954-2024

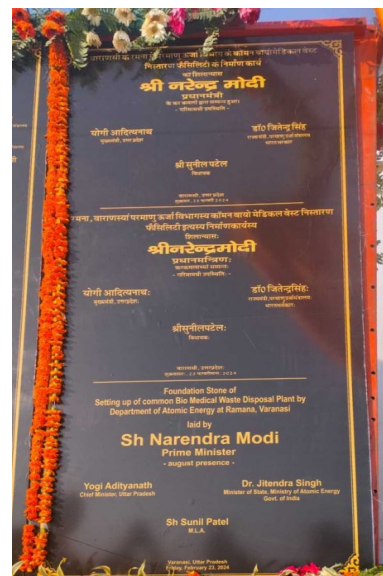


PM Lays Foundation Stone for “RAUDRA” at Varanasi

Hon'ble Prime Minister Shri Narendra Modi laid the foundation stone for setting up of a common Bio-Medical Waste Disposal Plant (RAUDRA) at Ramana, Varanasi on 23 Feb 2024. “RAUDRA” is a plasma pyrolysis system being developed by IPR and has an operational capacity of disposing ~5 Tons of bio-medical hospital waste per day.

Plasma pyrolysis is one of the technologies which has been developed by IPR for safe disposal of bio-medical waste. In Plasma Pyrolysis, high temperature is produced using plasma torch in oxygen starved environment to destroy bio-medical waste efficiently and in an ecofriendly manner. This indigenously developed system is environment friendly and uses high power plasma arc technology developed by IPR and will be a major contribution towards “Atmanirbhar Bharat”. The system can cater to the disposal of bio-medical waste generated by a 10,000 bed hospital.

The system will be jointly operated by IPR, Tata Memorial Centre Varanasi and the Divisional Commissioner office and Municipal Corporation of Varanasi. Bio-medical waste from different hospitals and health centers of Varanasi will be collected and treated in the system at a very high temperature in an environmentally friendly technique and shall follow the regulations laid by central government. Here are short video clips of [RAUDRA](#) and the [foundation laying program](#).



The **National Science Day**, conducted under the aegis of the Platinum Jubilee Celebrations of the Department of Atomic Energy (DAE) was conducted as an offline event at IPR main campus after a gap of three years. Over 350 students and 80 teachers from 44 schools participated in this 2-day event held on 10-11 February, 2024. The program was inaugurated by Dr. Paritosh Chaudhuri, Dean R&D and Mr. Niranjana Vaishnav, CAO, IPR. Seven competitive events were conducted in which 21 prizes were awarded. Apart from the competitive events, this event also had open house visits to various labs of IPR as well as a solar observation event using the high resolution solar telescope of IPR outreach. Around 45 students and 5 teachers participated in the science model competition. St Xavier's High School, Gandhinagar was awarded the IPR NSD Rolling trophy for scoring the maximum points in the competitive events. Over 3000 people visited IPR during these days.



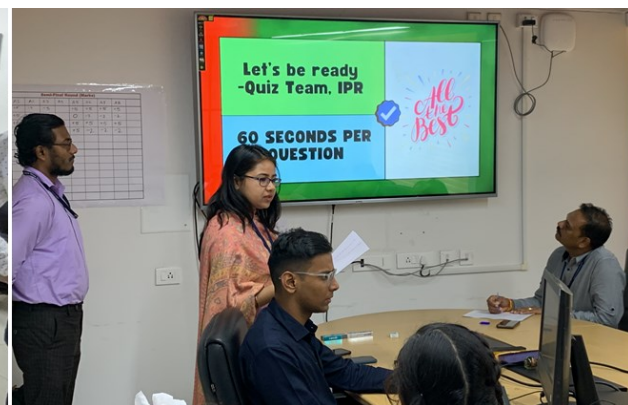
Inauguration of the NSD-2024



Eloquence competition in progress



Skit competition in progress



Quiz competition in progress



Essay competition in progress



Poster competition in progress



Solar observation event



Science models by school students



Some of the prize winners during the prize distribution ceremony



View of the audience during the concluding session



The IPR NSD Rolling Trophy for the year 2024 being awarded to St Xavier's High School, Gandhinagar



Volunteers from MG Science College, Ahmedabad with IPR NSD Team

Dr. Pietro Barabaschi, the Director General (DG) of ITER Organization was in India during 5-6 February 2024 along with Mr. Sriram Kattalai Ramachandran, Head of Office of the DG. This was his first visit to India after assuming the post of DG in October 2022. In a meeting with Dr. Ajit Kumar Mohanty (Secretary, DAE & Chairman, AEC) at DAE Headquarters, Mumbai on 5 Feb 2024, he expressed the ITER Organization's support for Indian domestic fusion program. He also visited the works of M/S Larsen and Toubro Mumbai in the afternoon. On 6th Feb, the DG visited ITER India, IPR. In the morning session, attended by IPR staff and research students, he delivered a talk titled "Fusion & the ITER Project". It was preceded by a welcome speech by the Director, IPR and a presentation on overview of the activities at IPR, FCIPT and ITER India.



The Director General of ITER with Dr. Ajit Kumar Mohanty, Chairman, AEC & Secretary DAE at the DAE office in Mumbai



The Director General of ITER delivering his talk

The DG also took the occasion to visit the ITER India laboratories (viz., ITER-India Gyrotron Test Facility (IIGTF), ICRH Lab, Indian Test Facility INTF- Diagnostic Neutral beam, Power Supply Lab, ITER-India Cryogenics Laboratory, Diagnostic Lab), High heat flux test facility, Experimental He cooling system lab, ROBIN lab, the RH and virtual reality lab, ADITYA and SST-1 and took keen interest in various developments. In the evening, the DG had an interaction session with the ITER-India colleagues.



The Director General of ITER interacting with IPR staff

Plasma Exhibition @ Shahpur (Himachal Pradesh)

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Institute for Plasma Research (IPR), Gandhinagar (Gujarat), in association with the Central University of Himachal Pradesh (CUHP), Shahpur Campus (Kangra District), Himachal Pradesh, organized an exhibition on Plasma, the fourth state of matter during 09-13 October, 2023. This program is part of IPR's rural scientific outreach activity in various states of India. This is the first outreach activity of IPR to be held in the state of Himachal Pradesh. The programme consisted of an exhibition on plasma, its applications as well as introductory talks on plasma for visiting students. The event was inaugurated by Prof. Pardeep Kumar, Dean-Academics, CUHP. For this exhibition, over 50 students of BSc and MSc Physics from CUHP were trained by IPR team to explain the exhibits to visiting students in their local language. A fun filled competition for the volunteers in assembling the TokoToy model was also organized as part of the event. Click [HERE](#) to read more.



View of the exhibition of Plasma and its applications at CUHP, Himachal Pradesh



Inauguration of the event by Prof. Pardeep Kumar, Dean-Academics, CUHP



Images from the plasma exhibition held at CUHP, Shahpur, Himachal Pradesh



Training the student volunteers from CUHP for the exhibition



Volunteers from CUHP explaining the plasma exhibits to visitors



Student volunteers explaining the plasma exhibits to visitors

Date	Institution	Visitors
1-Feb-2024	Bahauddin Science College, Junagadh	25 students of BSc Physics + 2 faculty
7-Feb-2024	Marwadi University, Rajkot	25 students of MSc/PhD Physics + 1 faculty
15-Feb-2024	Christ College, Rajkot	26 students of BSc/MSc Physics + 3 faculty
19-Feb-2024	K. D. Polytechnic, Patan	25 students of diploma in electrical engg + 2 faculty



Students and teachers of Christ College, Rajkot, Surat, during their visit to IPR

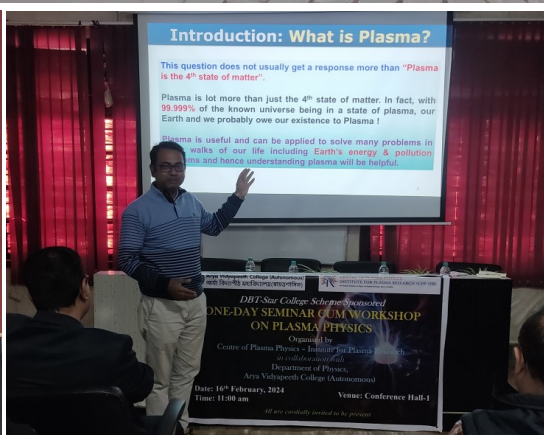


Students and teachers from Marwadi University, Rajkot, during their visit to IPR



Students and teachers of K. D. Polytechnic, Patan, during their visit to IPR

CPP-IPR's Outreach Cell conducted a "One Day Seminar cum Workshop on Plasma Physics" on 16th February, 2024 at Arya Vidyapeeth College, Guwahati. The programme was attended by 6 teachers and 45 students of Physics Department of the college. During the technical session, Dr. Rakesh Moulick gave a talk on introduction to plasma physics, followed by a talk on basics of experimental plasma physic by Dr. Ngangom Aomoa. After the talks, the participants were shown a glow discharge plasma, arc plasma (Jacob's ladder) and a plasma globe, and working principle and role of various components of the set-ups were explained to them.



Photos from the one-day plasma event held at Arya Vidyapeeth College, Guwahati

- ◆ **Dr. S Sunil**, gave an invited talk on "*LIGO-India: A route to innovation*" at XLVI OSI Symposium (OPTIQ-2023) International Conference on Optics, Photonics and Quantum Information, Cochin University of Science and Technology (CUSAT), Kochi, 11-13 December 2023
- ◆ **Dr. S Sunil**, gave an invited talk on "*LIGO-India-IPR: Possibilities in Abundance*" at School of Pure and Applied Physics, Mahatma Gandhi University, Kottayam, on 14 December 2023
- ◆ **Prof. Gurudas Ganguli**, Naval Research Laboratory, Washington, gave a talk on "*Orbital Debris-Generated KdV Solitons in the Ionosphere*" on 16th January 2024 (**Colloquium #329**)
- ◆ **Prof. Hubertus M. Thomas**, German Aerospace Center DLR, Institute of Materials Physics in Space, Germany, gave a talk on "*Complex/Dusty Plasma Physics - From Laboratory to Space*" on 19th January 2024 (**Colloquium #330**)
- ◆ **Dr. Ngangom Aomoa**, gave a talk on "*Experimental studies on decomposition of Carbon Dioxide Gas in a Glow Discharge Plasma*" at 31st National Conference, Condensed Matter Days (CMDAYS 2023), Tezpur University, Assam, 22-24 January 2024
- ◆ **Prof. Swadesh Mitter Mahajan**, University of Texas at Austin and ExoFusion, gave a talk on "*Fusion on Earth A Quintessentially Scientific Pursuit with an Important Commercial Goal*" on 25th January 2024 (**Colloquium #331**)
- ◆ **Dr. Pietro Barabaschi**, Director General, ITER Organization, gave a talk on "*Fusion & the ITER Project*" on 6th February 2024 at EDII, Gandhinagar
- ◆ **Dr. Alphonsa P. Joseph**, gave an invited talk on "*Cold Plasma- A New Frontier in Low-temperature Plasma Applications for Healthcare*" at NextGen Therapeutics: Multidisciplinary Research Approaches for Drug Development and Delivery: Bridging the Gaps: From Drug Discovery to Patient Care (NIPiCON 2024), Nirma University, Ahmedabad, 7-9 February 2024
- ◆ **Mr. Pawandeep Singh**, gave a talk on "*Studies of Sheath Effect on Resonance Hairpin Probe for Electronegative Plasma Diagnostics*" on 7th February 2024
- ◆ **Ms. Swati Dahiya**, gave a talk on "*Studies on Magnetic Field Effects in a Capacitive Coupled Cylindrical Radio Frequency Plasma Device*" on 7th February 2024
- ◆ **Prof. M. Krishnamurthy**, Center Director, TIFR, Hyderabad, gave a talk on "*Converting liquid droplets to mini-accelerators using ultra fast lasers*" on 14th February 2024 (**Colloquium #332**)
- ◆ **Dr. Mamta**, gave a talk on "*Particle-in-Cell Simulation of Interaction of Electromagnetic Waves with Inhomogeneous Plasmas*" on 15th February 2024
- ◆ **Mr. Ajay Kumar Pandey**, gave a talk on "*Guided and Leaky Modes Characteristics of Dielectric Loaded Helix Structure*" on 16th February, 2024
- ◆ **Mrs. Varsha Siju**, gave a talk on "*Study of electron dynamics in tokamak plasma through Electron Cyclotron (EC) emission using Radiometer*" on 19th February 2024
- ◆ **Dr. Sarvesh Kashyap**, gave a talk on "*Design and Development of closed-loop pulse tube refrigeration (PTR) system for a Cryopump*" on 20th February 2024

Upcoming Events

- ◆ European Hydrogen Energy Conference (EHEC 2024), Bilbao, Spain, 6-8 March 2024; <https://ehed.info/>
- ◆ 3rd DAE-BRNS International Conference on Current Trends In Analytical Chemistry (CTAC-2023), Bhabha Atomic Research Centre (BARC), Mumbai, 6 - 9 March 2024; <https://shorturl.at/bO267>
- ◆ 4th Annual Small and Advanced Reactors Conference, Idaho, USA, 7 March 2024; <https://www.neimagazine.com/news/newssmall-and-advanced-reactors-2024-call-for-papers-10905507>
- ◆ 15th International Conference on Sustainable & Innovative Materials and Design for Global Needs (APM-2024), Central Institute of Petrochemicals Engineering & Technology (CIPET), Ahmedabad, 14th-16th March 2024; <https://apm2024.com/conference/>
- ◆ 2024 International Topical Meeting on Nuclear Applications of Accelerators, Norfolk, Virginia, 17-21 March 2024; <https://www.jlab.org/conference/AcceleratorApplications2024>
- ◆ 3rd Tritium School, Marseille, Jardin du Pharo, 18-22 March 2024; <https://titans-project.eu/third-tritium-school/>
- ◆ Joint ICTP-IAEA School on Data for Modelling Atomic and Molecular Processes in Plasmas, Trieste, Italy, 18-22 March 2024; <https://indico.ictp.it/event/10462>
- ◆ The European Physical Society (EPS) Forum, Berlin, Germany, 25-27 March 2024; <https://epsforum.org/>
- ◆ Current Challenges in the Physics of White Dwarf Stars, Santa Fe, New Mexico, 25-29 March 2024; <https://web.cvent.com/event/31432501-69ee-4a83-bd32-e606eca95ef8/summary>
- ◆ Workshop on Theoretical and Analytical Aspects of Kinetic equations in Plasmas, CIRM, France, 25-29 March 2024; <https://conferences.cirm-math.fr/3075.html>

Conference Participation



Mr. Aditya Naugraiya, gave a talk on "A Simulation Analysis of 30 kV / 5A DC Power Supply for Neutral Beam Injectors" at the 3rd IEEE International Conference on Power, Control and Computing Technologies (ICPC2T - 2024), NIT Raipur, during 18-20 January 2024. He also received the **Best Paper Award**.



Ms Pratibha Gupta participated in the "*Sahitya Sarita 2024*" which was a workshop on effective communication organized by the L. D. College of Engineering, Ahmedabad during 16-18 February 2024 at L.D. College of Engineering.

IPR Outreach participated in the Science Week-2024 held as part of the 100th birth anniversary of Shri Balvantray Parekh during 22-24 February, 2024. During this event organized at the Shri Balvant Parekh Science City, Bhavnagar, IPR exhibited several interactive models of plasma and its applications. Over 2500 students and general public visited the exhibition.



Images from the Plasma exhibition held at the Shri Balvant Parekh Science City, Bhavnagar

सीपीपी-आईपीआर का राजभाषा कार्यान्वयन संबंधित निरीक्षण

प्लाज्मा अनुसंधान संस्थान, गांधीनगर की राजभाषा निरीक्षण समिति द्वारा प्लाज्मा भौतिकी केंद्र-प्लाज्मा अनुसंधान संस्थान (सीपीपी-आईपीआर), गुवाहाटी का राजभाषा कार्यान्वयन निरीक्षण 07 फरवरी 2024 को किया गया। आईपीआर की राजभाषा निरीक्षण समिति में शामिल सदस्य - श्री राज सिंह, सह अध्यक्ष, राभाकास, श्री निरंजन वैष्णव, मुख्य प्रशासनिक अधिकारी एवं डॉ. संध्या दवे, हिंदी अधिकारी द्वारा सीपीपी-आईपीआर के राजभाषा कार्यान्वयन पर विस्तार से चर्चा की गई एवं महत्वपूर्ण सुझाव प्रदान किये गये। निरीक्षण के पश्चात् सीपीपी-आईपीआर के कार्मिकों के लिए एक हिंदी कार्यशाला का आयोजन किया गया, जिसमें निरीक्षण समिति के सदस्य श्री राज सिंह ने "हिंदी में काम करना कठिन नहीं" विषय पर चर्चा की। उन्होंने हिंदी के इतिहास पर प्रकाश डालते हुए वर्तमान में विश्व में हिंदी का स्थान एवं भारतीय भाषाओं के साथ हिंदी के तालमेल पर विस्तार से प्रकाश डाला। साथ ही हिंदी और असमिया भाषा की कई सारी समानताओं को उन्होंने चित्र के माध्यम से सभी श्रोताओं को अवगत कराया और कहा कि असमिया के माध्यम से भी हिंदी को सीखा जा सकता है। इसके बाद "राजभाषा कार्यान्वयन हेतु कंप्यूटर पर हिंदी प्रयोग के उपयोगी टूल्स" विषय पर डॉ. संध्या दवे ने उपस्थित कार्मिकों को जानकारी प्रदान की। उन्होंने राजभाषा नीति एवं राजभाषा नियमों पर संक्षिप्त में चर्चा करते हुए वर्तमान तकनीकी के माध्यम से हिंदी में सुचारू रूप से कार्य करने हेतु कंप्यूटर पर उपलब्ध टूल्स पर ध्यान केन्द्रित किया। साथ ही फोनेटिक कीबोर्ड को इंस्टॉल कर आसानी से इसके उपयोग करने के बारे में सभी को अवगत कराया। उन्होंने उदाहरण के साथ गूगल ट्रांसलेट, गूगल वाइस टाइपिंग, अनुवाद टूल-कंठस्थ, 2.0 हिंदी शब्द सिंधु आदि टूल्स के साथ-साथ ई-सरल शब्द कोश, मोबाइल पर हिंदी के प्रयोग करने की जानकारी प्रदान की।

इस कार्यशाला में कुल 48 कर्मचारियों ने भाग लिया। हिंदी के प्रयोग को बढ़ावा देने हेतु यह कार्यशाला बहुत महत्वपूर्ण रही। अंत में जलपान और धन्यवाद ज्ञापन के साथ हिंदी कार्यशाला का समापन हुआ।



The following talks were organized at Institute for Plasma Research as part of the DAE Platinum Jubilee Celebrations.

“Fusion on Earth: A Quintessentially Scientific Pursuit with an Important Commercial Goal”

by **Prof. Swadesh Mitter Mahajan**, University of Texas at Austin and ExoFusion

Date : 25th January 2024

Abstract: The pursuit of Fusion on earth has been until recently led largely by government-funded universities and labs; now, private capital is also entering the picture as the goal of Commercially Viable Fusion (CVF) is increasingly important for an energy-starved and growing world population. As private interests enter the picture, the tendency is to think that the "problem" has been reduced to a technical one requiring only engineering solutions. While engineering is highly challenging, CVF will continue to remain a fundamental scientific pursuit. While the goals can be societal and commercial, the pathway to getting there must be led by physics. We will explore the current vast fusion landscape and make a case why new physics will be crucial to make fusion energy affordable.



Prof. Swadesh Mahajan

“Converting liquid droplets to mini-accelerators using ultra fast lasers”

by **Prof. M. Krishnamurthy**, Center Director, TIFR, Hyderabad

Date : 14th February 2024

Abstract: Intense ultrashort pulse lasers generate relativistic electrons when the intensity reaches relativistic scales, 10^{18} Wcm⁻² for 800nm pulses. This requires Terra watt class lasers that are complex, cumbersome, expensive and deliver typically 10 pulses per second. While the electron/x-rays/proton beams generated from such system have shown a lot of promise, developing applications on such systems is very challenging. I will talk about experiments where even at a 1/100th of laser intensity, it is feasible to generate relativistic electron beam of 1 MeV energy with multi kHz few mJ/pulse lasers. We show that plasma wave instabilities generated and manipulated with suitable target is the underlying mechanism. The source size of the short pulse electron beam is amenable for x-ray radiography and shadowgraphy.



Prof. M. Krishnamurthy

News from CPP-IPR



On Martyrs' Day, January 30, 2024, a solemn observance of silence took place to honor and remember the sacrifices of martyrs at CPP-IPR. CPP-IPR staff paid their respects, fostering unity and commemorating the historical significance of the day.



CPP-IPR is observing Swachhata Pakhwada from 16th to 29th February 2024. As part of this initiative, Swachhata Pledge was taken by CPP-IPR employees on 16th February, 2024

Obituary



Prof. Bimla Buti (1933-2024)

Professor Bimla Buti (born 1933), former Dean of Physical Research Laboratory (PRL) and eminent Plasma Physicist of India, passed away at her residence at Ahmedabad on 24th February, 2024. She was 91.

After her Master's degree from University of Delhi, she joined the University of Chicago for PhD under Nobel Laureate Prof. S. Chandrashekar. She was later associated with the Physical Research Laboratory, Ahmedabad from 1970-1993. At PRL, she was one of those who played a major role in establishing the plasma physics program at PRL.

She was the first Indian woman Physicist Fellow of the Indian National Science Academy (INSA) and The Academy of Sciences of the Developing World (TWAS). She was also one of the founder members of Plasma Science Society of India (PSSI). She received the Vikram Sarabhai Award for Planetary Sciences (1977), the Jawaharlal Nehru Birth Centenary Lecture-ship award (1993), the Vainu Bappu International Award in Astrophysics (1994), and the Lifetime Achievement award of the University of Chicago in 1996.

On behalf of staff members of IPR, FCIPT, ITER-India and CPP-IPR, we express our heartfelt condolences to her bereaved family and pray that her soul rests in eternal peace.

Obituary



Brijesh Kumar Yadav (1980-2024)

Shri Brijesh Kumar Yadav (44 years) passed away on 27-Feb-2024 after losing his battle with cancer. He is survived by his wife and son. With profound sadness, we bid farewell to a cherished individual who valiantly fought against the relentless grasp of cancer.

Yadav, after completing his B. Tech. in Mechanical Engineering from GB Pant University, Uttarakhand joined in Liquid Propulsion Systems Centre (LPSC), ISRO, Thiruvananthapuram. Later, in May 2008, he joined IPR as Engineer - SC in the TBM Division, where he was the first mechanical Engineer to join that group. He was actively involved mechanical design of TBM, testing of First Wall helium cooling system for the LLCB TBM in ITER. He was also responsible for the design and development of Experimental Helium Cooling Loop (EHCL) at IPR. He was also involved in development of Helium Cooling System for ITER Organization and related TBM activities.

His gentle demeanor and warm-hearted nature endeared him to all who had the privilege of knowing him, leaving an indelible mark of camaraderie and goodwill within our midst.

On behalf of staff members of IPR, FCIPT, ITER-India and CPP-IPR, we express our heartfelt condolences to his bereaved family and pray that his soul rests in eternal peace.

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Know Your Colleague



Mr. Ratnesh Kumar joined IPR as a Technical Trainee through the TTP 2014 batch after completion of his Bachelor of Engineering in Electrical and Electronics Engineering in 2013, from the Birla Institute of Technology, Mesra. His initial work was in the neutron source up-gradation section. From 2017 onwards, he has been working in the Neutron and Ion irradiation section. His general area of work are Electron Cyclotron Resonance, ECR ion source, simulation of ion transport system and optics, accelerators and related technologies and neutron generator. He has been a major contributor to the work involved in the development, installation and commissioning of the 14 MeV neutron generator at IPR.

Plasma Exhibition @ Shahpur (Himachal Pradesh)



IPR team with the volunteers from CUHP, Himachal Pradesh, during the Plasma exhibition held at Shahpur (HP)

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