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प्रमा 2025

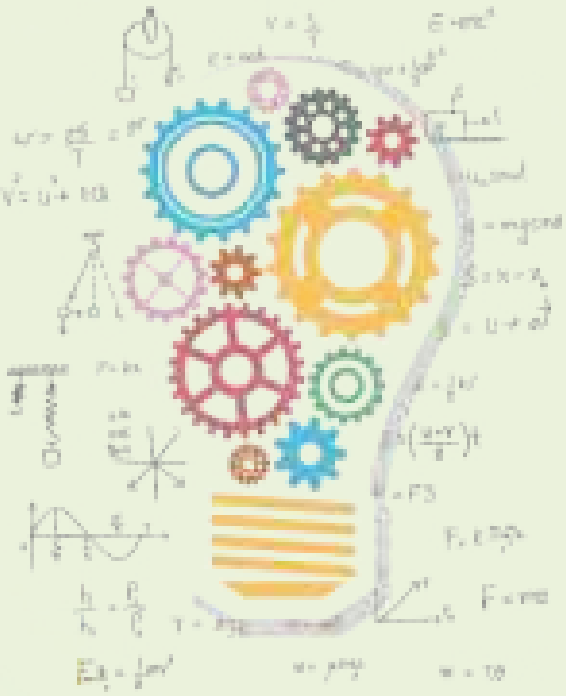
Pramā

True Cognition

SHAKTI

(A NATIONAL MOVEMENT FOR WOMEN)

BHARTIYA WOMEN IN PHYSICS



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विधा वितर्को विज्ञानं स्मृतिः तत्परता क्रिया ।
यस्यैते षड्गुणास्तस्य ना साध्यमतिवर्तते ।।

विद्या, तर्कशक्ति, विज्ञान, स्मृतिशक्ति, तत्परता और कार्यशीलता
ये छः जिसके पास हैं, उसके लिए कुछ भी असाध्य नही है।

Nothing is impossible for those who have these six virtues Knowledge, Logic, Science, Memory, Readiness and Ability to function.

प्रमा 2025

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SHAKTI Annual Publication

प्रमा - 2025

Bhartiya Women in Physics

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संदेश

मुझे यह जानकर हार्दिक प्रसन्नता हुई कि महिलाओं के राष्ट्रीय संगठन 'शक्ति' द्वारा अपने वार्षिक प्रकाशन 'प्रमा' के माध्यम से भारतीय महिला वैज्ञानिकों की जीवनी पर आधारित विशेष अंक तैयार किया जा रहा है।

यह भी सराहनीय है कि वर्ष 2025 में प्रकाशित होने वाला प्रमा का अंक **"Bhartiya Women in Physics"** के योगदान पर केन्द्रित होगा। निश्चय ही यह प्रयास विज्ञान और भौतिक के क्षेत्र में महिलाओं की प्रेरक भूमिका को नई पहचान दिलाएगा।

मुझे विश्वास है कि प्रमा का यह अंक सभी के लिए ज्ञानवर्धक, उपयोगी और प्रेरणादायक सिद्ध होगा।

प्रकाशन की सफलता के लिए मेरी हार्दिक शुभकामनाएँ।

(विष्णु देव साय)

प्रति

डॉ. हिमता शर्मा
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Prof. Kamal Singh
Former Vice-Chancellor
S.G.B., Amravati University, Amravati

It is with a great pride and immense pleasure to write that with 'Shakti', a national movement started for women in 2003, a quiet revolution began for Indian women, inspired by the ideals of Vijana Bharati in the true spirit of the saying "When a woman holds a test tube, she holds a torch. When she raises a question, she raises a civilization", to provide a vision of science and technology for social harmony.

Marie Curie the only women in the world, was awarded Nobel Prize in two subjects)Physics and Chemistry).She discovered Radioactivity without having any research laboratory, fought gender bias, social injustice and was also known for her patriotism. One of her two daughters, Irène Joliot-Curie was also awarded Nobel Prize for chemistry.

Today, when we talk about Quantum Physics, Astrophysics, Condensed Matter Physics, Space Physics, the Physics of electronics, Nanophysics and Material Science, we see that these fields, blended with all branches of science, engineering and medical science have already paved our ways to modern life with newer technology. In this direction, semiconductor physics gave birth to revolutionary ideas leading to Quantum computer, bringing about a sea change in the present world.

Women in physics, and science at large, bring new paradigms blending analytical clarity with human sensitivity, and discipline with empathy. "Physics is not just about particles, equations and experimentsit is about perspectives and the woman's perspective has been missing far too long. It is a way to understand the world, to build harmony, and to empower. Shakti brings this power to every woman especially in Bharat, where the fusion of intellect and culture creates something unique and powerful.

Today, when PRAMA 2025 brings us together, we celebrate not just achievements but alignments of purpose, passion, and patriotism. Let us remind every young girl in every corner of India - Shakti is more than a word - it is the embodiment of energy, creativity, and quiet strength. As women in physics, we bring not only intellectual rigor but also emotional depth, collaborative spirit, and an inclusive lens to science.

As a woman physicist who began her journey when laboratories were mostly male dominated, I stand today in awe and admiration of the new wave of women scientists who are not just entering the world of physicsbut reshaping it.

With warmest regards,

Yours Sincere,

K Singh

(Kamal Singh)

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Dear Members of Shakti,

It is a matter of great pride that this year's issue of SHAKTI's annual publication is dedicated to Bhartiya women in Physics. This volume celebrates the inspiring journeys and outstanding contributions of women scientists and academicians all over India who have advanced the frontiers of physics through their path-breaking research and dedicated mentorship.

May this edition serve as both a tribute to these remarkable pioneers and a beacon for future generations, encouraging more women to contribute to the growth of Physics and to the nation's scientific progress.

I extend my warmest congratulations to SHAKTI, the women's wing of Vigyan Bharati, for its sincere efforts in creating a comprehensive database of women scientists and academicians contributing across diverse STEM fields, and for bringing out these invaluable yearly issues.

With best wishes,

(Dr. Shiv Kumar Sharma)
National Organising Secretary
Vijnana Bharati

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Dr. Sudha Tiwari

National President Shakti

SHAKTI
(A NATIONAL MOVEMENT FOR WOMEN)

It is a matter of great pride and pleasure that "SHAKTI", a National Movement for Empowerment of Women, upholding the sanctity of Indian womanhood in her power of deliverance and softness of assimilation ,is marching towards its goal of orientation of women as an anchor in the society to upsurge as a strong pillar on which family ,society and the nation can rely upon.

We all are lucky to have a great team and teamwork which has resulted in coherent activities from the centre towards the state units. I feel happy to announce that one of the major activities is Publication of shakti's National magazine "PRAMA" under the theme women scientists we are focusing on women Physicists The contribution of Women scientists through ages is very impressive and should be brought in the limelight for younger generation to take inspiration

I am proudly present this volume of Prama which includes the contribution of woman Physicist.

The contents have good contribution of articles from all over India, and a resourceful collection of information through ages. I am satisfied to provide good readable and informative matter for the readers.

My best wishes for the team.

-Dr Sudha Tiwari

National President, Shakti

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Dr. Leena Bavadekar
General Secretary, SHAKTI

SHAKTI
(A NATIONAL MOVEMENT FOR WOMEN)

It gives me immense pleasure to extend my warm greetings to SHAKTI for bringing out this annual issue dedicated to Bhartiya Women in Physics. The compilation of biographies and articles in this volume is a tribute to the remarkable contributions of Indian women scientists and academicians who continue to illuminate the path of knowledge and innovation.

This initiative not only celebrates their achievements but also inspires future generations to pursue excellence in science and technology with dedication and confidence. My best wishes to the editorial team for their sincere efforts in documenting and honouring the legacy of women in Indian science.

लीना बावडेकर

-Dr. Leena Bavadekar
General Secretary, SHAKTI

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SHAKTI
(A NATIONAL MOVEMENT FOR WOMEN)

From Editors' Desk…

SHAKTI – A National Movement of Women
Annual Publication – 2025
Theme: Bhartiya Women in Physics

Science in India has always been a pursuit of knowledge intertwined with values, curiosity, and creativity. Women, through their perseverance and intellect, have consistently contributed to this journey, often breaking barriers and redefining possibilities. SHAKTI, the women's wing of Vigyan Bharati, continues its mission to highlight and celebrate these inspiring stories of Indian women in Science and Technology.

Following the success of our previous volume on Indian Women in Mathematics, this year's issue of SHAKTI is dedicated to Bhartiya Women in Physics. The 2025 edition brings together around one hundred biographies of eminent Indian women physicists — academicians, researchers, and scientists, who have made remarkable contributions across diverse branches of physics. Their stories reflect the power of determination, the brilliance of intellect, and the spirit of inquiry that drives the nation's scientific progress.

In addition to these inspiring life sketches, this issue includes insightful articles on various themes in physics — from ancient Indian knowledge systems to cutting-edge advancements shaping the modern world. Together, they portray not only the achievements of women in physics but also the evolving landscape of Indian science where inclusivity and excellence go hand in hand.

SHAKTI is steadily building a national database of Indian women scientists and technologists, creating a living archive of contributions that will serve as a source of motivation for generations to come. Through this initiative, we aim to recognize the role of women in nation-building through science and inspire young minds to pursue careers in STEM with confidence and pride.

We express our heartfelt gratitude to all contributors, institutions, and reviewers who have made this volume possible. May this issue of SHAKTI continue to illuminate the path of knowledge and empowerment, echoing the vision of "Science for Society, Science for Women, and Science with Values."

Dr. Smita Sharma

Dr. Surekha Kalkar

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Section -1

BIOGRAPHIES

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Introduction:

Kamal Singh

Dr. Kamal Singh is a distinguished Indian physicist and materials scientist, renowned for her groundbreaking contributions to ferroelectrics, solid electrolytes, and electrochemical devices. With a career spanning over 48 years, she has made significant advancements in solid-state batteries, gas sensors, and materials engineering, earning international recognition. As a trailblazing academic leader, she served as the first woman Vice-Chancellor of Vidarbha (2005–2010) at SGB Amravati University and the founding Vice-Chancellor of GH Raisoni University, Saikheda, Chhindwara (MP). Her visionary leadership, prolific research, and commitment to education positions her as a luminary in Indian science and academia.

Education:

Dr. Miss Kamal Singh born at Nagpur on 7th November 1946 earned her B.Sc. (1966) and M.Sc. (1968) in Physics from Nagpur University, specializing in electronics. She pursued her Ph.D. at Visvesvaraya Regional College of Engineering under Professor K.G. Deshmukh, as first regular research student, completing it in 1975 with pioneering research on the growth, dielectric, and domain structure of lithium niobate single crystals. Her doctoral work was lauded by Professor E.C. Subbarao of IIT Kanpur, leading to an invitation to collaborate on single-crystal growth for his research group.

Research Contributions:

Dr. Singh's research has profoundly impacted materials science, particularly in ferroelectrics and solid-state ionics. Key contributions include:

Pioneering Ferroelectrics Research: Her Ph.D. work on lithium niobate single crystals remains a seminal contribution, establishing novel insights into dielectric and domain structures. Between 1973 and 1977, she conducted groundbreaking work on the structure-property relationships of 21 displacive erroelectrics, laying the foundation for advanced materials applications.

Solid-State Electrochemical Devices: Leveraging materials engineering, Dr. Singh developed optimized materials for solid-state batteries and gas sensors. Under a DRDO project (1984–1988, Rs. 5.85 lakhs), she delivered 20 lithium solid-state batteries, a significant milestone in energy storage technology. Her work on lithium sulphate and sulphate-based systems elucidated fundamental conduction mechanisms, advancing solid-state ionics.

Electrochemical Gas Sensors: Dr. Singh's team developed selective gas sensors capable of detecting pollutants (SOx, COx) at ppm levels, a breakthrough in environmental monitoring. Her group was designated as a nodal center by DST, New Delhi, for electrochemical gas sensor development. She also chaired the Sensors session at the International Union of Materials Research Society conference at IISc Bangalore in 2008.

Research Output: Over her career, Dr. Singh completed 14 research projects, secured 2 patents, published 185 research papers, supervised 14 M.Phil. dissertations, and mentored 31 Ph.D. students, with examiners from prestigious institutions like Oxford, MIT, and IISc. She authored three undergraduate textbooks on Quantum Mechanics, Statistical Mechanics, and Electronics and Solid-State Devices. Her research projects garnered funding of approximately Rs. 525 lakhs.

Awards and Achievements:

Dr. Singh has been awarded with National Ferroelectric Award (1994), UGC Research Award (1999), Takahashi Fellowship (1997), Best Poster Award at the 10th International Conference on Solid State Ionics (1995), and Hari Om Ashram Prerit Dr. K.R. Ramnathan Teaching Aid Award (1982).She has received Junior Research Fellowship (UGC, 1970), Senior Research Fellowship (CSIR, 1973), Post-Doctoral Fellowship (CSIR, 1975), Swedish Government Post- Doctoral Fellowship (1984), ICTP Visiting

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Scientist Fellowship (Italy, 1988), and ACU Fellowship (England, 1997). Elected Fellow of the International Academy of Physical Sciences (Allahabad) and Maharashtra Academy of Sciences. She has been awarded Regional Honors such as Bharat Ratna Visvesvaraya Memorial Award (2010), Dr. Panjabrao Deshmukh Award, Tejashwini Mahila Award (2006), Vidarbha Ratna, Mahatma Jyotiba Fule Award (2014), and Krushi Bhushan Award, among others. She was appointed as Vice-Chancellor of SGB Amravati University (2005–2010).Dr. Singh demonstrated exceptional leadership and was instrumental in the creation of Asia's third FABLAB, inspired by MIT, fostering innovation and skill development among students. She secured 25 teaching posts, fully utilized the XthPlan budget, and enhanced departmental and hostel infrastructure. She took Environmental Initiatives by promoting "Shramdan" culture, she created water reservoirs, elevating the campus water table and earning the Priyadarshini Award for the greenest campus. As the founding Vice-Chancellor of GH Raisoni University (18 months), she laid a robust foundation for academic and research excellence. Her nominations to prestigious bodies, including NAAC's General Council, BHU's Executive Council, and the search committee for 14 Central University Vice-Chancellors, underscore her influence in higher education.

Social Impact of the work:

Dr. Singh provided consultancy services to Glob Bricks Refractories (1985–1988) for economical housing materials and to Cambridge High-Tech Sensors (1990–2005), supporting India's only indigenous electrochemical gas sensor manufacturer. Her proposal for a Women's IIT, presented to President Pratibha Patil, and her efforts to elevate SGB Amravati University to Central University status reflect her commitment to societal advancement through education.

Message highlighting topics for research for future generations:

To every researcher, regardless of field: let your work be rooted in authenticity, ensuring that your results are reproducible across the world. Interpret your findings with care—test your theories, compare them with existing or historical frameworks, and when no theory exists, develop models grounded in your evidence. Above all, do not approach research mechanically; strive to deeply understand the core of the problem, think critically, and engage in innovative inquiry that advances meaningful knowledge.

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(Late) Rohini Madhusudan Godbole (1952 – 2024)

Introduction:

Prof. Rohini Madhusudan Godbole, born on12 November 1952, was an Indian physicist and academic specializing in elementary particle physics: field theory and phenomenology. She was professor at the Centre for High Energy Physics, Indian Institute of Science, Bangalore. She worked extensively on different aspects of particle phenomenology over three decades, in particular on exploring different aspects of the Standard Model of Particle Physics (SM) and the physics beyond it (BSM). Her work regarding hadronic structure of high-energy photons outlined a variety of ways in which to study it and has had implications for the design of next generation electron positron colliders. She was an elected fellow of all the three academies of Science of India and the Science Academy of the Developing World (TWAS). She was an avid supporter of women pursuing careers in science and technology.

Education:

Prof. Madhusudan graduated with a Bachelor's degree from Sir Parshurambhau College, University of Pune, a Master's degree from the Indian Institute of Technology, Bombay and Ph.D in theoretical particle physics from the State University of New York at Stony Brook. She joined Tata Institute of Fundamental Research, Mumbai as a visiting fellow in 1979. She was Lecturer and Reader at the Department of Physics, University of Bombay from 1982 to 1995, joined the Centre for High Energy Physics, Indian Institute of Science, Bangalore, as an Associate Professor in 1995 and has been a Professor since June 1998, superannuating there by 31 July 2021, she became an Honorary Professor.

Research Contribution:

Prof. Godbole worked in theareas of New Particle Production at current and future colliders, Physics at Large Hadron Collider and Next Linear Collider, QCD phenomenology: Structure Functions of a proton, photon and nucleus, Supersymmetry and Electroweak Physics. She authored more than 150 research papers, many of which have some of the largest citation indices in her area.

Awards and Achievements:

For her remarkable contribution to science and technology, the Government of India conferred the 'Padma Shri' in 2019. She has been bestowed with 'Ordre National du Merite', by the French Government. She is recipient of various other awards and honors that include: Honorary doctorate, IIT Kanpur (2021). Satyendranath Bose Medal of Indian National Science Academy (2009). Fellowship of National Academy of Sciences, India (NASI) (2007). Fellowship of Academy of Sciences of the Developing World, TWAS 2009. Devi Award of the New Indian Express Group, August 2015. Prof. Godbole was part of the International Detector Advisory Group (IDAG) for the International Linear Collider in the European research lab, CERN. The International Detector Advisory Group monitors the ILC detector research and development of the Research Directorate and the detector design groups. She was the Chair of the Panel for Women in Science initiative of the Indian Academy of Sciences. Along with Ram Ramaswamy, she jointly edited Lilavati's Daughters, a collection of biographical essays on women scientists of India, which was published in the form of book by Indian Academy of Sciences in 2008. Her book 'Theory and Phenomenology ofSparticles: An Account of Four-dimensional N=1 Supersymmetry. In High Energy Physics provides a comprehensive, pedagogical and user-friendly treatment of the subject of four-dimensional N=1 super symmetry as well as its observational aspects in high energy physics and cosmology. Prof. Godbole passed away on 25 October 2024 at her home in Bangalore from a short illness at the age of 71.

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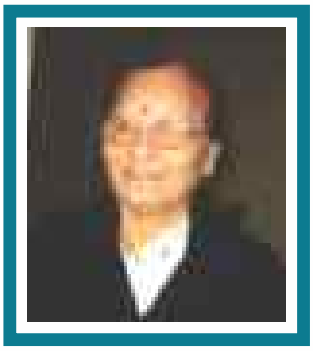
(Late) Kalpana Duorah (1942–2018)

Introduction:



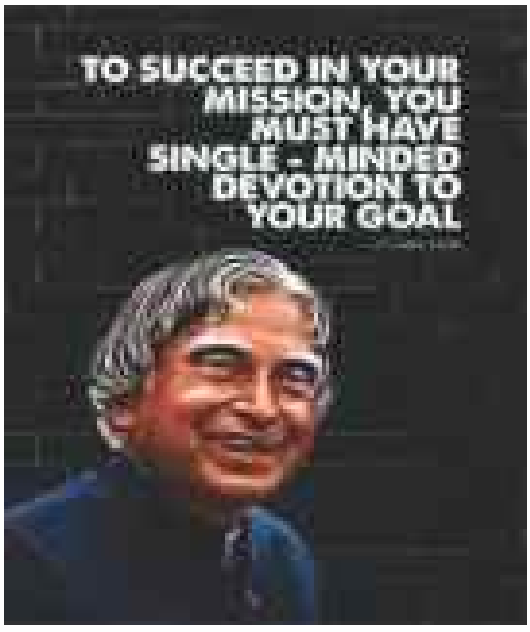
Prof. Kalpana Duorah, born on June 29, 1942, in Nazira Handique village, Assam, was a pioneering astrophysicist and educator whose life story reflects determination, brilliance, and dedication. She grew up in a culturally rich environment where learning and discussions were encouraged, shaping her intellectual curiosity from an early age. After completing her schooling in Dibrugarh, she pursued Physics at Cotton College, Guwahati (1959–63), and later obtained her master's degree in physics from Gauhati University. She began her teaching career at Shivsagar College before joining Gauhati University as Associate Professor of Physics. While raising a family of three children, she earned her PhD in astrophysics—an achievement that highlighted her perseverance and commitment to both science and family.

Along with her husband, Prof. Hiralal Duorah, she pioneered astrophysics research at Gauhati University in the 1970s, making it the first such program in Northeast India. Her research primarily focused on nuclear astrophysics and the production of chemical elements in stellar environments. Over the course of her career spanning five decades, she supervised numerous PhD students across diverse areas including stellar evolution, supernovae, cosmology, meteorites, and active galaxies. She inspired her students to explore new domains like dark matter and dark energy, fostering a spirit of curiosity and innovation.

Prof. Duorah's contributions extended far beyond research. She was instrumental in establishing the Gauhati University Observatory in the 1990s, the first in Northeast India, which continues to serve as a vital hub for both student training and public outreach. She co-founded the Astronomy and Space Science Association (ASSA) to promote astronomy education, authored an introductory textbook on astrophysics with her husband, and co-wrote Anabagunthita in Assamese, chronicling the lives of 70 women scientists. She was also actively associated with the Astronomical Society of India, Inter-University Centre for Astronomy & Astrophysics, and the Physics Academy of the North East (PANE).

Her scientific curiosity was matched by her passion for outreach. Even after retirement, she taught school children, delivered talks, and encouraged young minds to “look up and explore more.” A remarkable achievement was her leadership in the analysis of the 2001 Dergaon meteorite, which provided insights into the stellar origins of our solar system.

Prof. Kalpana Duorah is remembered not only for her pioneering research but also for her humility, warmth, and mentorship. Her lifelong dedication to science and education has left an enduring legacy, inspiring generations to pursue the mysteries of the universe.



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Introduction:

Lalitha Dhareshwar

Dr. Lalitha Dhareshwar is an Indian Physicist who worked at the Bhabha Atomic Research Centre, Department of Atomic Energy from 1970 to 2010. She is a specialist in High Power, Intense Nd: Glass lasers and their applications in High Density-High temperature plasmas. She is the Former Raja Ramanna Fellow (RRF), Department of Atomic Energy and retired as the Head Laser & Neutron Physics Division. She is the past President, Indian Women Scientists' Association and presently a member of the Board of Trustees of this association. She is also presently a member of the APEX Committee of the National Council for Science and Technology Communication (Division of DST).

Education:

She completed her BSc (Hons) in Physics from Bangalore University and joined the 13th batch of Training School in Physics at BARC in 1969. After successful completion of the training, she joined the Laser group of the Electronics Division, BARC. She completed her PhD in physics in 1988 on Optical Probing of High-Density plasmas generated by focusing Gigawatt laser pulses on solid targets.

Research Contributions:

She has worked for forty-five years at B.A.R.C., in the field of High Power Lasers, Laser Plasmas & applications and was instrumental in carrying out several prestigious projects at B.A.R.C. She has over seventy-five publications in International Journals.She was mainly responsible to set up the High Power/ High Intensity Laser system of Nd: Glass, at BARC. This laser system has been used by several research scientists from India and abroad for generating and for the study of plasmas at temperature of a million degrees and hundred times the solid density. She has been invited by International Laboratories and Universities, in USA, Japan, Germany, France, Russia, Spain, Italy, Poland, Lithuania, Czech Republic, for Scientific Collaboration & Training scientists and research scholars, in the latest field of Lasers & Plasma physics.

Awards and Achievements:

Dr. Dhareshwar, has been recognized for her contributions in Value Based Spiritual Education, by N.C.E.R.T. and Atomic Energy Education Society. For her contributions to Community Development, she has been honoured by Rotary Club, Lions Group, Kanara Saraswat Association, Modern College, Amity University, Pillai group of Institutions, MGM group, Anjuman Islam College, Jyeshtha Nagarik Sangh of Navi Mumbai and many Universities and Associations.

Social impact of the work:

Believing that science must reach beyond the lab to benefit society, after her active research career at BARC, Dr. Dhareshwar joined Indian Women Scientists' Association (IWSA), an NGO, serving as a Board of Trustees member. IWSA focuses on taking science to society, empowering women to pursue career in science, and talent nurturing among students. She organizes workshops, refresher courses, and training programs for students and faculty, and actively leads the Science Nurture Program, which teaches science to school children through hands-on experiments. Through IWSA, she also supports students from economically weaker backgrounds and participates in community welfare efforts. She has facilitated collaborations with Vigyan Prasar (DST) for three projects: the 'Each One Teach One' science mentorship program, the Shikshan Setu Pre-primary school teacher training initiative, and the Learning Garden Living Museum."

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Message highlighting topics for research for future generation:

Emerging research in short-pulse, high-intensity lasers offers vast interdisciplinary opportunities. Key focus areas include laser-plasma interactions, nuclear fusion ignition, high-field quantum electrodynamics, and precision laser applications in biology and medicine. Additionally, research into laser-based communication systems and advanced manufacturing techniques can drive innovation across multiple sectors. Exploring these domains can lead to breakthroughs in energy, healthcare, communication, and industry.

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Introduction:

Shubha V

Dr. Shubha V served CSIR–National Aerospace Laboratories, Bangalore, for 46 years, joining as Junior Research Fellow in 1974, as Junior Scientist in 1982 and retiring as Distinguished Scientist in December 2020. She rose through various positions, serving as Chief Scientist (2006–2016), Head of the Materials Science Division (2013–2014), and leading the Airport Instrumentation Division, where she spearheaded the development of Drishti, an indigenous instrument for safe airport operations. In recent Sindoor operations Drishti visibility measuring system, aided Indian Air Force extensively and contribution is also towards successful launching of missiles and has been awarded NadaprabhuKempegowda award and Operation Sindoor award in 2025.

Education:

Dr. Shubha earned her B.Sc. (Hons) in Physics from Bangalore University in 1972, securing the 1st rank. In 1974, she completed her M.Sc. in Physics with a specialization in Electronics from Bangalore University, again securing the 1st rank. She was awarded her Ph.D. from Mysore University in 1981.

Research Contribution:

Her research contributions span diverse areas, including airport instrumentation, thermophysical instrumentation, materials science and technology, high-pressure science and technology, and ultra-high temperature ceramic materials. She has published 89 papers in journals and conference proceedings, authored 110 technical documents, edited 3 books, contributed 3 book chapters, and written 10 articles in public journals. Her intellectual property contributions include 6 patents, 30 copyrights, and 1 trademark for Drishti.Her work on Materials Science and High-pressure physics had made many foreign scientists interact with her asking for their samples to be studied including scientists from Bell telephone Laboratories, USA. She has guided 400 M.Sc and Engineering students for their project work. Guided 12 ME/MTech and 3 Ph.D students. She has also served in 6 International and many National conference committees and edited the proceedings.

Awards and Achievements:

She received 7 academic awards for securing 1st rank in both B.Sc. (Hons) and M.Sc with 2 Gold Medals. She has been honoured with 33 professional awards, including 17 Individual awards, 10 team awards for airport instrumentation specially getting the First Make in India Award for Drishti in 2015, CSIR Platinum Jubilee Technology Innovation Award, NRDC, IETE and IESA corporate awards and 6 team awards in thermophysical instrumentation given by CSIR-NAL and IETE Corporate Award.

In Individual awards, she has been recognized as a woman achiever for her contribution to Science and Technology, for developing indigenous products both nationally and by Karnataka state Government. Many organizations have honoured her like Press Council of India, Institution of Engineers, Karnataka State Council for Science and technology (Sir M Visveswaraya award by both Karnataka Government and Swadeshi VignanaAndolan, Karnataka), Adamya Chetana award - established by Late Union Minister Ananthkumar, and Vasvik award. Private organizations like Sohrab Godrej& Rotary Club of Bombay and Rotary Club of Bangalore, BNV trust, Akhila Karnataka Brahmin trust etc have recognized her contribution to Nation. She got young scientist award in 1989 by CSIR.

Social Impact of the work:

Drishti (175 systems at cost of 1/4th the imported system) and Aviation weather monitoring System developed --which are mandatory as per International Civil Aviation Organisation for safe Airport operations are truly Made in India Products

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saving crores of rupees of foreign exchange to the country. These equipment's are aiding safe landing and take-off at 22 Civilian International Airports (55 Systems) and 120 systems in 40 Indian Air Force Airbases across the country.

Drishti was showcased in Republic Day Parade and at a special Indian Air force event at Agra. It has received extensive national media coverage, appreciation from user agencies, and featured in a video produced by the Ministry of Science and Technology in 2019.

The Thermo-physical material characterization Instruments developed has saved foreign exchange to the country and NASA has reported the same in their website in 1986. Many of the thermophysical equipments have been supplied to Universities and Research Instituitionslike Inter University Consortium, Indore, Raman Research Institute, NITK, Surathkal and was donated to Indian Academy of Sciences as teaching aids. Extensive material characterization has been done for many scientific organizations both in India and abroad.

Ultra-High temperature special components developed for Missile program and Rocket launchers at the request of DRDL- Hyderabad have aided in successful launching of their programs.

Many new materials have been developed like piezo electric, thermoelectric coolers and generators &infrared detector materials, aiding very useful, cost-effective indigenous sensor developments.

She has served as Management Council Member for CSIR-NAL, as ISO Chairperson for the Division and served in NAL annual reports committee. She has served in many woman harassment and other employees committees both at CSIR-NAL and other organizations to solve work related issues. She was Chairperson for NAL Nursery school helping employees children and other needy people for 20 years.

She is Vice president of Swadeshi Vignana Andolana, an organization under Vignana Bharathi and Ethics committee of Rangadorai hospital run by Sringeri Sharada Peetam.

In 1975, she started a philanthropic organization, Friends Service League to help needy people for education and medical treatments for which she has served for more than 40 years in this organisation and as a chairperson for 14 years.

Message highlighting topics for research for future generation:

There are immense opportunities for the future generation of researchers in areas such as the indigenous development of instruments, the creation of advanced software programs, the innovation of sensor materials, and research dedicated to environmental protection. Make in India concept should be taken up.

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 ISBN:978-81-932733-5-7

Introduction:

Prof. Suman Bala Beriis the First Lady Professor and First Lady Professor Emeritus in Physics Department, Panjab University, Chandigarh.

Education:

M.Sc (Hons. School) Physics (1970), Ph.D(Cosmic Rays)(1976)Panjab University, Chandigarh.

Suman Bala Beri

Research Contribution:

Prof. Berihas supervised 17 Ph.D students. Total No. of Publications (as co-author- S.B.Beri) is 2021(with High H-index and total citations more than 100,000). Also published articles in Journal of Science Education, Resonance and in Ídea of Excellence: Multiple Perspectives. Edited One Book.

Awards and Achievements:

Prof. Beri joined Physics Department, Panjab University as Teaching Assistant in 1974. During this period, she also held the position/s of visiting scientist, TIFR, Mumbai (1988-89), Guest Scientist, Fermilab, USA (1994-95) and two months each year till 2010, visiting scientist in CERN, Geneva-Switzerland 1999-2019 (2 months each year). Served as Adjunct Professor at Shoolini University, Solan. She was awarded CSIR Emeritus Scientist in 2012. Awarded UGC Emeritus Fellowship 2015-17. Honor of being Professor Emeritus, Panjab University 2017 onwards - till date. She is a part of Research Team for Discovery of Higgs boson announced on 4th July, 2012 worldwide. Also, part of Top Quark discovery and single top quark observation with lot of media coverage bringing laurels to Panjab University. As per HT news published a few years back, her name was at the top in whole Panjab University who has maximum published work in journals with highest Impact parameter and H Index. In DST, Govt.of India Publication her name appeared in top 10 Researchers overall in India based on publications and citation counts (International Comparative Performance of India's Research Base – Elsevier Publication). In MHRD survey conducted by Careers 360 she obtained: Outstanding Research Faculty Award in Physics and Astronomy as one of the top 10 Knowledge Producers in India for academic year 2017-18. She has been a member of Editorial Board of 'Resonance' Journal of science education, IA of Sciences and subject expert in many committees. Life member of IPA and IAPT. Her name is included in INSA publication (2024) “Women Shaping Scientific Frontiers – From lab coats to Leadership” authoredby Dr Archana Sharma and K.S. Harshita.

Social Impact of the work:

Herresearch is in Basic Fundamental Physics and understanding the creation of Universe. She is a member and founding vice president of society for promotion of Science and Technology in India contributing to outreach programs for budding young students. Honorary Chairperson of Chandigarh Dhyana Kendra –Meditation Centre of YogodaSatsanga Society of India YSS /Self Realization Fellowship centre, Chandigarh.

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Aruna Goswami

Introduction:

Prof. Goswami, a former professor at the Indian Institute of Astrophysics (IIA), Bangalore, is a well-known stellar astrophysicist. Her main research areas include stellar archaeology, chemical composition studies of late-type stars, nucleosynthesis and Galactic Chemical Evolution.

Education:

Prof. Goswami received her PhD degree in 1989 from the Department of Physics, Gauhati University. Her PhD thesis entitled "Studies on the formation of elements during the explosive stages of stellar evolution" was carried out under the supervision of Prof. Hira Lal Duorah.

Research Contribution:

Prof. Goswami along with her collaborators from India and abroad have contributed significantly to her field of research that include discovery of a rare hydrogen-deficient carbon star using Himalayan Chandra Telescope at IAO, Hanle. She has published widely in several prestigious journals. She is the lead editor of the book "Principles and Perspective of Cosmochemistry" published by Springer. She is also the Editor of the Chapter "Exploration of the Milky Way and Nearby Galaxies" of the Thirty Meter Telescope Detailed Science Cases (TMT DSC) -2015. She is a member of the Thirty Meter Telescope science development team (TMT-ISDT), and also a science member of the Maunakea Spectroscopic Explorer (MSE).

Awards & Achievements:

As a faculty member of IIA, Bangalore, she had held a number of responsible positions, such as, Chairperson of the Board of Graduate Studies, Chairperson of the division "Stars and Galaxies", IIA, Chairperson of the Gender Amity Cell, member of several academic and administrative committees. She is an active member of the International Astronomical Union (IAU), elected member of the IAU commission committee G3: Stellar Evolution (2024-2027), Member of the IAU Finance Committee (2024-2027), Fellow of the Indian Academy of Social Sciences, Life Member of the Astronomical Society of India.

Social Impact of the Work:

Prof. Goswami is active in teaching, training, outreach, and promoting gender equality and women's empowerment. She is the lead editor of the book "Women Astronomers of IIA: Reaching for the Stars and Beyond", an autobiographical sketch of women scientists of IIA published by the IIA's Gender Amity Cell in the year 2021. She had taught several graduate courses at IIA, guided several Ph.D., undergraduate and masters project students and delivered public lectures on astrophysics.

Message highlighting the topic of research for future generations:

Astronomy and astrophysics, among the oldest sciences, explore the cosmos and our origins. With advanced instruments and space-based observations, they have become highly precise fields. The field also develops strong problem-solving, analytical, and computational skills transferable to many areas. Despite progress, many mysteries of the universe remain unsolved. Research in these fields is essential for advancing our understanding of space and paving the way for future space exploration. Research curriculum should aim at training students as critical thinkers rather than producing specialists or narrowly focussed researchers. With many upcoming astronomical explorations and extensive application of data analytics and AI, astronomy and astrophysics is among the frontier sciences today.

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 ISBN:978-81-932733-5-7

Introduction:

Dr. (Mrs.) Vedavati Gururaj Puranik is Ex. Sr. Principal Scientist, National Chemical Laboratory, Pune. She made significant contributions to various pharma industries in giving active pharmaceutical ingredient API for different compounds.

Vedavati Gururaj Puranik

Education:

Dr. Puranik obtained M.Sc. (1974) in Solid State Physics and the Ph.D (1982) in X-Ray crystallography both from Bangalore University. At National Aeronautical Laboratory, Bangalore she has done single crystal X-ray Diffraction using CAD-4 later using SMART APEX CCD diffractometer. She has also carried out Computation using ICL 1904S computer at University of Pune then Computation using NEC_1000-S at National Informatic Center, Pune earlier and later Using PC for Structure solution, plotting of the molecules, packing diagrams etc.She has undergone application training on CCD SMART APEX in Single Crystal X-ray Techniques at Bruker-axs, Karlsruhe, Germany in April 2002, visited Prof. Sheldrick and engaged in in-depth discussions with Prof. Powell at Karlsruhe University, Germany, enhancing academic knowledge and professional experience in the field.

Research Contribution:

Amlodipine, a drug commonly used for managing blood pressure, is known to have side effects such as dizziness and swelling due to the presence of its R and S components. Dr. Puranik collaborated with a research group by providing molecular structures at different stages, enabling the team to synthesize an improved version of the drug without these side effects. The modified drug is now available in the market.

She studied over 2,000 newer compounds, collected data from thin and unstable crystals at liquid nitrogen temperature and worked with metal coordination complexes for vapor and anion detection. Her research involved the effective usage of the Cambridge Crystallographic Data Base to support structural elucidation and validation.

Dr. Puranik contributed for a DST_DAAD project with Institut für AnorganischeChemie, Christian-Albrechts Universität Kiel, Kiel, Germany. The most novel results have been published in reputed international journals with a very good paper in Journal of American Chemical Society 2008, 130, 17743-17754.

She worked in the project with the prestigious International Associate Laboratories (LIA) program between NCL, CNRS and the Unité de Catalyse et de Chimie du Solide (UCCS), France, fostering international collaboration in advanced research.

She presented her research work at the International Conference on Bioinorganic Chemistry at Parry Sound, Ontario, Canada, delivered Invited talk at Universität Leipzig Fakultät für Chemie und Mineralogie, Institut für AnorganischeChemie, Leipzig and invited lecture at Korea Research Institute of Chemical Technology (KRICT) Daejon.

Published over 270 papers in reputed international journals and presented 168 at national and international conferences, with several contributions receiving poster awards. She has supervised and trained numerous MPhil and PhD students, with three awarded PhDs and four MPhils, served as an evaluator of numerous PhD theses, reviewer for reputed international journals, invited speaker for lectures and refresher courses at various institutions across India and conducted projects for leading pharmaceutical companies including Torrent, CIPLA, EMCURE, SANDOZ, Glenmark, Biocon, and United Phosphorus Limited, providing critical information on APIs."Dr. Puranik served as Convener for the

Bruker-AXS CCD Single Crystal X-ray. Diffractometer Workshop 2006 from 30th May to 1st June 2006 at NCL, member of the Technical committee of SPMCIL to decide the technical parameters for the CWBN paper, Technical committee of Setting up state of the art test laboratories in BRBNMPL Presses and Executive committee member for Indian crystallographic Association.

Awards and Achievements:

Dr. Puranik US Patent No.: US 9, 891, 200 B2 (45) 2018 that discloses novel multi - action copper complexes which are used for reversible vapochromic detection of polar solvents as well as anion sensing in both aqueous and non - aqueous media.The Paper in Angew. Chem., Int. Ed., 1998, 37(8), 1110-1112 was cited by CSIR as paper with the highest impact factor from all CSIR Labs. Paper in Chem. Comm. 2002, 1924-1925 received Rajappa Award for Chemistry for year 2002 at NCL. The paper J. Med. Chem. 2007, 50, 5519-5523 is One of the Top 10 Publications for 2007. Some papers have been cited for more than 70 times. Many papers bagged the best Poster Awards in National and International seminars.

Social Impact of work:

Single crystal X-ray diffraction studies by Dr. Puranik have enabled development of blood pressure drugs without side effects, more active pharmaceutical compounds, improved perfumes and drugs from natural sources are now available in the market.

Message highlighting topics for research for future generations:

There are different types of applications of single crystal X-ray diffraction and it is very useful and very interesting for students working in different fields.

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Introduction:

Prof. Rupamanjari Ghosh served as the Vice-Chancellor of Shiv Nadar University Delhi-NCR (SNU) for two terms till January 2022. She was the Founding Director of School of Natural Sciences, and the Founding Dean, Graduate Studies & Research at SNU. SNU became an 'Institution of Eminence' within few years of its existence under her transformational and directive leadership and received prestigious grants and awards. Professor Ghosh is a former Co-Chair, FICCI (Federation of Indian Chambers of Commerce and Industry) Higher Education Committee. She is a former Professor of Physics & Dean of School of Physical Sciences at Jawaharlal Nehru University (JNU), New Delhi.

Rupamanjari Ghosh

Education:

B.Sc. (Physics Honors) & M.Sc. (Physics), University of Calcutta; M.A. & Ph.D., University of Rochester, NY, USA

Research Contribution:

Prof. Ghosh has a very well-recognized Ph.D. from the University of Rochester, NY, USA, where she worked as a Rush Rhees Fellow, chosen for "outstanding scholarly ability and the promise of exceptional contributions to scholarship and teaching." The only female Ph.D graduate under Prof. Leonard Mandel, she is credited with the discovery in the mid-1980s of a new source of entangled photons using spontaneous parametric down conversion, and the first experimental demonstration of two-photon interference exhibiting nonlocality of quantum mechanics. Her group at JNU has worked extensively on the critical issue of decoherence (quantum ↔ classical transitions) in specific models. She has had highly successful international collaborations exploring the process of electromagnetically induced transparency, a promising approach for implementing quantum memory.

Awards & Achievements:

Prof. Ghosh is a recipient of the Stree Shakti Science Samman for her "original contribution to Science". She received the DAE (Department of Atomic Energy, Government of India) CV Raman Lecture award (in Physics) in 2018-19. She has been nominated to be the Homi Bhabha Lecturer for the year 2025 in the UK, under an MoU between Institute of Physics, UK, and Indian Physics Association. Professor Ghosh was felicitated as Visionary EduLeader of India "for having championed a learner-centric higher educational ecosystem at Shiv Nadar University, anchored in research & innovation, flourishing on progressive interdisciplinarity, driven by an outstanding faculty and supported by national & international academic partnerships" by Re:think India, New Delhi, in December 2017. She Wings honoured her as India's Changemaker: Woman of the Year 2022 for Excellence in Education. Professor Ghosh is currently the first and only international member of the Advisory Board, Executive Leadership Academy, University of California, Berkeley; Governing Council Member, RRI, Bangalore; Member, Board of Governors, Jaipuria School of Business, and Observer & Coach, Seth AnandramJaipuria Group of Educational Institutions; Member, Advisory Council, Association of Indian Principals, etc.

Social Impact:

Professor Ghosh has been extensively involved as an expert with the INR 6,000-crore National Quantum Mission being run by the DST, Government of India. A leading expert in laser physics, nonlinear optics, quantum optics and quantum information, she has been a driving force in quantum education and policymaking. Professor Ghosh has served as the Chief Advisor for the NCERT Science textbooks for Classes IX and X,

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developed afresh under the National Curriculum Framework-2005. Besides her contribution to science research and training from university to school level, she is also well known for her stand and efforts to bring in gender justice, environment consciousness and sustainability in the higher education system.

Social Impact of the work:

Do remember that technology is not a solution by itself for all our problems of food, clean air, clean water, healthcare and energy. Research in basic sciences is the foundation of inventions that the world has been waiting for. The focus should not be just commercial innovations. To keep the desperate dream of a sustainable world alive, education must lead to research and development of the deep kind – technology will be a great enabler and multiplier.

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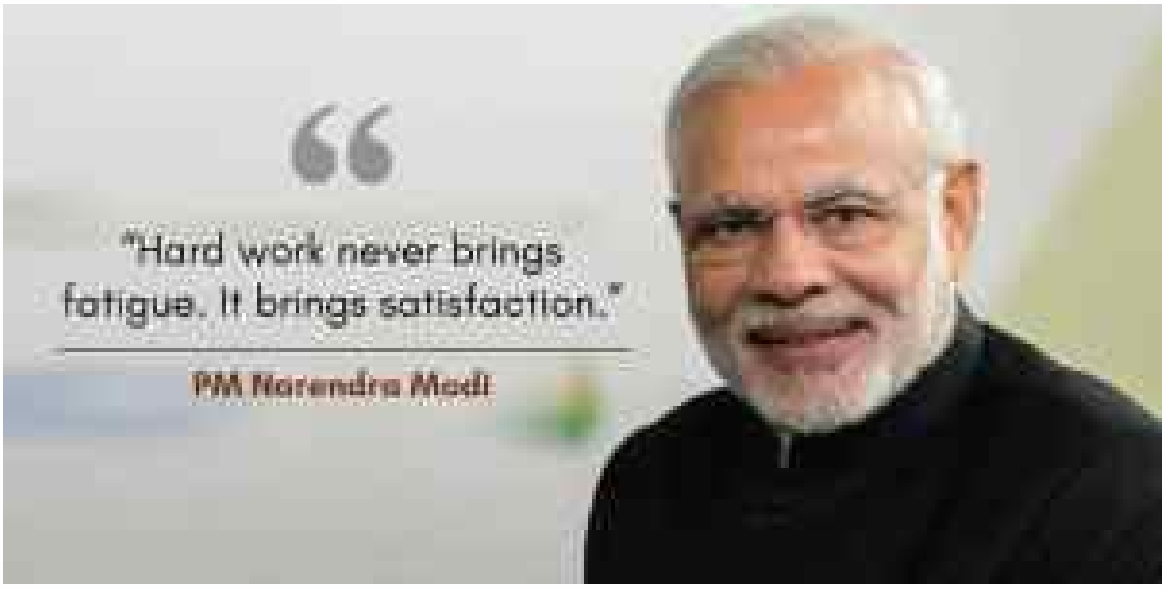

 ISBN:978-81-932733-5-7

Introduction:

Dr. Namrata Agrawal is an Indian academician and physicist. She was born into an educated family in Delhiand completed her entire education there. She is currently a Professor at the Department of Physics, Swami Shraddhanand College, University of Delhi.

Namrata Agrawal

Education:

Dr. Agrawal had won the second position in her 10thgrade examinations in the entire Delhi region. She did B.Sc. (Hons) in Physics from the prestigious Hindu College, University of Delhi. Her master's in physics and subsequent Ph.D. in the field of High Energy Physics were at the Department of Physics and Astrophysics, University of Delhi, India. She cleared the NET/JRF and GATE examinations during her master's program.

Research Contributions:

Dr. Agrawal is part of the research team at the University of Delhi, which is working in collaboration with CERN, Geneva, Switzerland, for the discovery of the Higgs Boson (commonly known as the God Particle). During her stay in the US for a few years, she worked at the Department of Computer Science, University of Houston, Texas, under a project on Volunteer Computing. After returning to India, she worked full-time as an Assistant Professor and took a break from research due to other family commitments. Returning to research after a gap of almost ten years was a challenge that not many are ready to accept. But she started working again in Experimental High Energy Physics. Simultaneously, she explored other research fields and started working on material science as well.

Awards and Achievements:

Dr. Agrawal worked as a member of the governing body of her college, committee of courses at the Department of Physics & Astrophysics, University of Delhi and Convenor of the admission committee for foreign nationals at the Foreign Students' Registry, University of Delhi.She was selected as a fellow of Institute of Lifelong Learning, University of Delhi.

Social Impact of this work:

She has worked for the upliftment and education of the girl child and with an NGO to train students against harassment and how to handle situations when one is a witness or a victim.

Message highlighting topics for research for future generation:

To future generations, life is not a race—don't compare yourself with others. Enjoy the journey, dream big, and take small, consistent steps toward your goals. Failures are part of growth; keep moving forward with focus and sincerity, and success will follow. Along the way, pause to reflect on your progress, push beyond your comfort zone, and always value the support of family and friends when you reach the summit.

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 ISBN:978-81-932733-5-7

Sudha Gupta

Introduction:

Dr. Sudha Gupta specialises in the field of sensors. She has worked mainly on semiconductor sensors, viz., infrared detector arrays, MEMS technology-based THz detector arrays and High g switches. She has also led technology teams for development of acoustic emission sensors and underwater communications using blue-green laser. Her core area of interest is cooled and uncooled infrared focal plane arrays for thermal imaging systems.

Education:

Ms. Gupta obtained her graduation and post-graduation degrees in Physics from Hindu College, University of Delhi in 1984 and 1986 respectively and joined as Junior research fellow of CSIR in Department of Physics, University of Delhi in 1986. Subsequently she joined solid state research lab (SSPL, Delhi), a lab under Defence Research & Development (DRDO), Ministry of Defence on 6th Nov. 1987. In SSPL, she worked on several advanced and strategic technologies until her superannuation on 29th February, 2024. She published several papers in international journals and was granted a patent by the Indian Patent Office.

Research Contribution:

Ms. Gupta had worked on defence technologies for the self-reliance of the country in the field of defence technologies and systems.She has guided graduation and post-graduation students during their research in SSPL and reviewed their project reports.

Awards and Achievements:

Ms. Gupta received 48th Raising Day Award (SSPL, 2009) for development of Microbolometer Technology, Technology Group Award (SSPL, 2014) in the field of MEMS Technology, Technology Group Award (SSPL, 2020) for development & deployment of Indigenous Acoustic Emission Sensors and Data Acquisition System, Technology Group Award (SSPL, 2021) for development of high-g switch technology for Electronic Fuzes Application, led team that received AGNI Award (DRDO, 2021) for Development & Deployment of Acoustic Emission Sensors and Data Acquisition System at various snow avalanche prone places in the Himalayan region and Received Technology Group Appreciation (SSPL, 2022) for development of MEMS-based THz Technology.

Social Impact of the Work:

The team led by Ms Gupta developed Acoustic Emission sensors and data acquisition systems which were rigorously tested in extreme conditions of -30C. Many of these systems have been deployed across the Manali-Leh axis and J&K for 24/7 data collection.

Message highlighting topics for research for future generation:

Explore THz and Quantum technologies, as these futuristic fields are expected to see major innovations in the coming decade, potentially revolutionizing the functioning of many complex devices and systems.

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 ISBN:978-81-932733-5-7

Introduction:

Prof. Keya Dharamvir served as a Professor of Physics at Panjab University, Chandigarh.

Keya Dharamvir (Nee Sur)

Education:

Prof. Dharamvir obtained her B.Sc. degree in 1969 from Allahabad University and M.Sc. in Physics in 1971 from the Indian Institute of Technology Kanpur. She was a National Science Talent Scholar (NCERT) from 1966 to 1975. She received her Ph.D. degree from IIT Kanpur in 1980, specializing in Condensed Matter (Solid State) Theory under the supervision of Prof. T. V. Ramakrishnan, FRS.

Research Contribution:

Prof. Dharamvir has worked at IIT, Kanpur as research scholar and Teaching Assistant, ImperialCollege, London as Post-doctoral Fellow and Panjab University, Chandigarh as RA,Pool Officer and Faculty in Physics, in the areas oftheoretical, computational and experimental approaches and several topics of contemporary interest in Condensed Matter Physics and Nano-materials. Fullerenes and Fullerides, such as C60 solids, Carbon Nanotubes and their bunches, and various types of metallicclusters and nano-wires, were studied theoretically using model potentials and computationally using density functional theory.

Social Impact of the work:

Prof. Dharamvir was a part of experiments, carried out at IUAC (Inter University Accelerator Centre, Delhi) with swift heavy ions incident on thin sheets of Carbon Nanotubes that revealed a unique healing property.

Biological applications of nano materials were also conducted in her lab. A novel seed priming technique using dispersed carbon nanotubes was developed through a collaborative project involving the Departments of Chemical Engineering, Botany, and Physics of Panjab University. This technique resulted in significantly enhanced yields in wheat, rice, and oats.

Another interesting attempt to modify thesurface of industrial steel, for use in boilers in sugar industry, resulted in a patent.She is Gen. Secy., Society for Promotion of Science and Technology in India, a not for profit society registered under societies act, working mainly in Haryana- Punjab –Chandigarh region since 2009. She received significant project grants from DST, GOI for'Circus of Science', a unique mobile science laboratory.

Awards & Achievements:

Early theoretical researches were on two dimensional electron gas, Bound Statesof Quarkonia(in collaboration with colleagues working in the area of ParticlePhysics, one of whom was awarded the Hari Om Award on the basis of this work)and Mixed Valence Systems (subject of her Ph.D. thesis and post doctoralresearch). The paper from Ph.D. work (development of diagrammatic technique)was considered a pioneering one in the area and has over 200 citations.

She has one Patent to her credit.She was Principal Investigator and Co-PI in 7 research projects granted by variousNational agencies (DST, UGC, etc.). On the basis of a project proposal initiated andprepared by Prof. Dharamvir, Panjab University had been shortlisted as a Centre for Potential in Nano-sciences by the UGC (July, 2011; Rs. 3.4 crores).

 ISBN:978-81-932733-5-7

Introduction:

Dr. Urbasi Sinha is working in Raman Research Institute (RRI), Bangalore, India as Professor, Canada Excellence Research Chair, University of Calgary; Cofounder, QuSyn Technologies.

Urbasi Sinha

Education:

Dr. Sinha completed her M.Sc. and Ph.D. in Physics from the University of Cambridge, UK, as a Nehru-Chevening and Gates Cambridge scholar respectively.

Research Contribution:

Dr. Sinha's research focuses on quantum information processing, secure quantum communication, and foundational tests of quantum mechanics using single and entangled photons. She led the Quantum Information and Computing Lab at RRI. She served as associate faculty at the Institute for Quantum Computing (IQC) and the Perimeter Institute in Canada. She has authored numerous peer-reviewed publications in leading international journals and have co-founded a quantum deep tech startup, QuSyn Technologies, to translate research into technological solutions. She currently is the lead Principal Investigator for the Technology group under India's National Quantum Mission, working on a multi-node quantum repeater network as part of the Quantum Communications Hub. She served as the NQM nodal point at the Open Quantum Institute in Geneva and is on its advisory board.

Awards and Achievements:

Dr. Sinha'srecognition includes, Homi Bhabha Fellowship (2017), ICTP-ICO Gallieno Denardo Award (2018), Named among Asia's Top 100 Scientists (2019), Emmy Noether Fellowship, Perimeter Institute (2020–2023), Team Lead for the 2020 BRICS Future Skills Challenge in Quantum Technology, ASSOCHAM Women in Cyber Award (2021), SIES National Eminence Award (2023), Distinguished International Associate, Royal Academy of Engineering, UK (2024), Rashtriya Vigyan Puraskar – Yuva Shanti Swarup Bhatnagar Award (2024), Gates Cambridge Impact Prize (2025)

Social Impact of the Work:

Her work contributes to building secure quantum communication infrastructure for national and international use, with applications in cybersecurity and technological sovereignty. Through her startup and collaborative initiatives, she aims to bridge the gap between academia and industry, creating opportunities for deep-tech innovation and job creation in the quantum sector.

Message to Future Generations:

Science is a beautiful and deeply fulfilling pursuit. It encourages curiosity and rigorous questioning about the world around us. Future researchers should explore areas like quantum networks, quantum machine learning, and the interface of quantum physics with other domains like biology and AI. Science offers a path to create a legacy that outlives one that can continuously evolve and serve society. Remain curious, work hard, and let your questions guide you into uncharted scientific territories.

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 ISBN:978-81-932733-5-7

Introduction:

Dr. Neetu Jha is serving as an Assistant Professor (Senior Grade) at Department of Physics, Institute of Chemical Technology, Mumbai.

Neetu Jha

Education:

Dr. Jha obtained her B.Sc(Phy Hon) from Calcutta University followed by M.Sc from Banaras Hindu University, Varanasi. She pursued her PhD at the Indian Institute of Technology Madras and was awarded the degree in 2009 for her thesis titled "Development of Carbon-Based Nanomaterials and Their Applications in Direct Methanol Fuel Cells, Nanofluids, and Biosensors.

Research Contribution:

Dr. Jha pursued her postdoctoral research at the Haddon Research Group, University of California Riverside, focusing on electrodes for PEM fuel cells and supercapacitors. In 2012, she joined the Institute of Chemical Technology, Mumbai, focusing on zinc-based batteries, fuel cells, water splitting, green hydrogen generation and water purification technologies like capacitive deionization and solar thermal systems. So far, she has supervised 11 PhDs, 23 master's theses, published 85+ papers, holds 7 patents, and has an h-index of 31.

Award and Achievements:

Dr. Jha has earned multiple prestigious recognitions for her materials science, education, and sustainable technology work. She was selected among 15 women scientists for the UKIERI Advanced Leadership Development Programme at Coventry University, UK, supported by DST and the British Council. In 2024, she was named a Young Associate of the Maharashtra Academy of Science and featured in the Stanford–Elsevier list of the world's top 2% scientists in materials science. She represented India at the ASEAN Women Scientist Conclave in Singapore, organized by ASTAR and DST. A member of the Indian National Young Academy of Science (INYAS), she also received the Society for Materials Chemistry's Bronze Medal (2023) for her contributions to materials chemistry and physics. In addition, she was honored with the Best Assistant Professor Award at ICT (2020), the Young Scientist Research Award from BRNS, and awards from the Gates Foundation and Energy Swaraj Foundation for solar-based water treatment innovations.

Social Impact of the work

Dr. Jha is an active researcher and educator in the field of Functional Nanomaterials, with a focus on their application in energy devices and water remediation technologies. As a member of INYAS, INSA, and Robinhood Academy, she is deeply committed to societal outreach, regularly engaging with school students and women from economically underprivileged backgrounds. She also advocates for institutional improvements, including better sanitation facilities for women and accessibility for physically challenged individuals.

Message highlighting topics for research for future generation

Multifunctional electrode materials using green synthesis techniques; PEM Fuel cell; Zinc-Ion Battery; Seawater splitting, Capacitive Deionisation and photothermal-solar water treatment devices.

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 ISBN:978-81-932733-5-7

Introduction:

Dr. Joyanti Chutia is a notable physicist from Assam, India. She was born on August 1, 1948 at Amguri in Sibasagar district of Assam. She was the first woman director of Institute of Advanced in Science and Technology (IASST), Guwahati, an autonomous Institute under the Department of Science and Technology (DST), Government of India. She was also elected as a Fellow of the National Academy of Sciences, India in 2005.

Joyanti Chutia

Education:

Dr. Chutiahas M.Sc, Ph.D, D.Sc, FNAScdegrees to her credit. She was one of the first girls to take Mathematics as a main subject in her school. She later studied physics at the Cotton College, Assam and obtained a B.Sc. in 1967. She continued teaching at the Cotton College before obtaining an M.Sc. in physics from the Dibrugarh University in 1969. Following this, Dr. Chutia taught for some time as a lecturer, eventually deciding to continue with research by pursuing a Ph.D. under the Dibrugarh University with a fellowship in 1976. Her research focused on the conduction mechanism of thin polymer films and she was awarded her degree in 1981.

Research Contribution:

Dr. Joyanti Chutia is well-known nationally and internationally for her research work on plasma physics. Other areas of her research include solid-state physics, biomedical field and materials science. She is recognized for developing plasma-based technologies for a durable and biodegradable wound suturing material from Muga Silk and for development of corrosion-resistant protective and decorative coating for bell-metal and other copper alloys.

Achievements and Awards:

Dr. Chutia published more than 100 numbers of research papers in internationally recognized cited journals along with two patents on "Radiofrequency plasma polymerization technology for surface protection of bell metal at low temperature" and "Antibiotic-loaded Muga (Antheraea Asama) silk fibroin (AASF) as suture biomaterial". She successfully completed several projects on plasma research as principal investigator.

Dr. Chutia received numbers of National and international recognitions. She attended Spring College Course in Polymer Science at ICTP, Trieste, Italy and worked as Visiting Scientist at the Institute for Space and Astronautical Science, Japan. Dr. Chutia received prestigious fellowship from Indian National Science Academy for Indo-German exchange Programme to carry out research work at Kiel University, Germany.

Dr. Chutia received Durlav Deka Memorial Award for original research activities from Assam Science Society in 1998, Basanti Bordoloi award from Assam Sahitya Sabha in 2002, Ghanashyam Goswami memorial award for popular science writing in 2004, elected as a member of the National Academy of Sciences, India in 2005, Sadhani Saurya award for original plasma physics research in NE India in 2005, Kamal Kumari National Award for original research in Science and Technology in 2005, Women Physicist Award from Mother Teresa Women's University, Kodaikanal in 2010 and Sati Sadhini Award in 2023 by the Government of Assam. Further, the State Science Award (Lifetime Achievement Award) for the year 2020 was presented to Dr. Chutia by the by the Government of Assam. Moreover, the Dibrugarh University, Assam conferred D.Sc. (Honoris Causa) on Dr. Joyanti Chutia in 2025. Dr. Chutia's name was also included in the book titled "Lilavati's Daughters: The Woman Scientists of India", as one among 100 Indian women scientists, published by Indian Academy of Sciences.

 ISBN:978-81-932733-5-7

Social Impact of the Work:

The contribution of Dr. Chutia in research and administrative work was tremendous, which helped significantly in taking over of the IASST by the DST, Government of India in 2009 and its subsequent growth as a national research institution of repute which is contributing remarkably to societal development. As a president of the Assam Science Society during 2019-2021, she worked greatly for promotion of scientific temper in the society. Dr Chutia has also been playing an important role in the spread and promotion of science education through her contribution in science literature.

Message for Future Generation:

Dr. Chutia is determined to create world-class research environment and facilities in the North-Eastern region of India so that the talented young scientists can compete on equal footing with the scientists of the developed countries with a strong confidence on the capabilities of the talented youths of the region.

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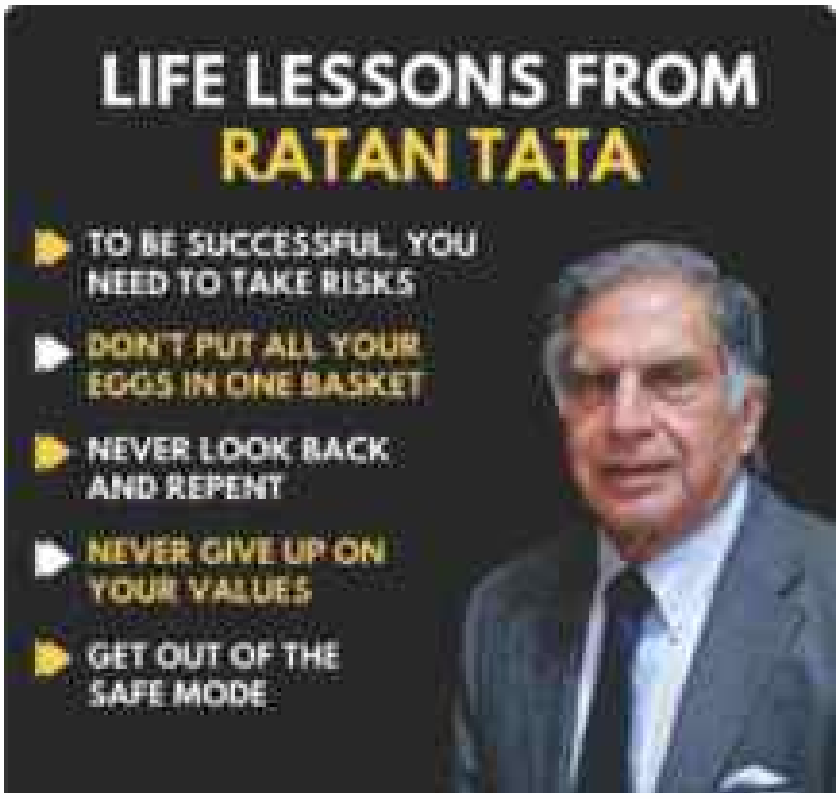

 ISBN:978-81-932733-5-7

Introduction:

Smita Acharya

Dr. Smita Acharya is a distinguished Indian physicist and Professor in the Department of Physics at RTM Nagpur University, specializing in materials science. Her pioneering research focuses on complex functional oxide systems for applications in energy materials, fuel cells, sensors, and multiferroics. She is especially known for developing low-temperature synthesis techniques for nanostructured oxy-ion conductors used in solid oxide fuel cells (SOFCs).

Education:

Born on July 1, 1972, in a modest family, Dr. Acharya pursued her B.Sc. from J.B. Science College, Wardha (1993) and M.Sc. from Institute of Science, Nagpur (1995). Despite early financial challenges, she pursued her Ph.D. at RTMNU, receiving her degree in 2008 under Dr. Kamal Singh. She later earned prestigious fellowships, including the C.V. Raman International Fellowship (2016) and INSA, NASI Summer Research Fellowship (2007), conducting research at Pennsylvania State University, USA, and IISER Pune, respectively.

Research Contribution:

Dr. Acharya's research is primarily focused on the development and characterization of complex functional oxide systems with applications in energy materials, sensors, fuel cells, and multiferroics. Her work integrates fundamental investigations with applied solutions in material science and solid-state physics. Her core areas of research include: Ion diffusion mechanisms in solid-state ionic conductors; Influence of defect clustering on ionic conductivity, Thermodynamics and kinetics of phase transitions, Reduction of phase transition temperatures in nanostructured materials using cationic and anionic surfactants, Modulation of spin exchange interactions in orthoferrite systems.

She has also led groundbreaking experiments using EXAFS and Raman spectroscopy to study in-situ oxy-ion diffusion mechanisms under operational SOFC conditions. Her innovative approach has enhanced understanding of the structure-property relationship in ionic conductors. Additionally, she has significantly reduced the phase transition temperature (by approximately 1000°C) in II-VI group semiconductors through tailored surfactant-assisted synthesis. Her contribution to the International Centre for Diffraction Data (ICDD), USA, includes the development of novel crystallographic data for complex oxides. Dr. Acharya has authored over 105 SCI-indexed journal papers, two commercialized Patent, contributed four book chapters, and supervised 12 Ph.D. scholars. She has led over 12 research projects, with funding over ₹10 crore from DST, SERB, DRDO, BRNS, UGC, UGC-DAE-CSR, and ICDD-USA.

Awards and Achievements:

Her accolades include the AICTE Young Scientist Award (2008), DST Fast Track Young Scientist Award (2011), and fellowship of the Maharashtra Academy of Sciences (2022). As Director of IQAC and NEP Nodal Officer, she has driven academic excellence, NAAC 'A' grade accreditation, and education reforms at RTMNU. She earned CV Raman Post-doctoral and NASI, INSA sponsored research fellowship.

Social Impact of the work:

Dr. Acharya'sone of the most notable achievements is the establishment of the Advanced Materials Laboratory at RTM Nagpur University—developed from the ground up—which has become a hub for cutting-edge research on energy devices

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in a region like Nagpur, far from traditional research centers. She has actively nurtured young talent, especially students from rural and underprivileged backgrounds, providing them with high-quality training and exposure to advanced experimental techniques. Her efforts have enabled several of these students to secure positions in premier national institutions such as NPL-Pune, IIT-Indore, NPL-Delhi, Institute of Nanoscience and Technology, Mohali and ICT, Mumbai, thereby contributing to the creation of skilled scientific manpower.

In her administrative roles as Director of IQAC, Coordinator of NAAC, and Nodal Officer for NEP Implementation, she has played a key role in transforming higher education practices at RTM Nagpur University. Her initiatives have strengthened academic governance, improved institutional benchmarking, and aligned curricula and teaching standards with national and global quality frameworks. These efforts have enhanced educational outcomes for thousands of students and elevated the university's academic standing.

Message highlighting topics for research for future Generation:

Dr. Acharya believes the future of physics lies in interdisciplinary, impact-driven research that inspires the next generation to tackle both fundamental questions and real-world challenges.

Energy Materials and Sustainability: Advanced materials for solid oxide fuel cells, thermoelectrics, and next-generation photovoltaics are crucial for clean energy solutions and carbon neutrality. Functional Oxides and Nanoionics: Investigating ion transport mechanisms and phase behavior in nanostructured materials will lead to breakthroughs in sensors, batteries, and fuel cells. Multiferroics and Spintronics: These systems offer exciting prospects in low-power memory devices and multifunctional applications. Computational Physics and Data-Driven Modeling: Integrating machine learning and quantum simulations to model complex systems can enhance predictive capabilities in materials science and condensed matter physics.

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 ISBN:978-81-932733-5-7

Introduction:

Dr. Sudipta Sarkar Pal is a Physicist and works in the field of photonics. She is a Senior Principal Scientist at CSIR-Central Scientific Instruments Organisation (CSIR-CSIO), Chandigarh. Currently she is heading the Centre for Nano-Optics Fabrication (CNOF) at CSIR-CSIO.

Sudipta Sarkar

Education:

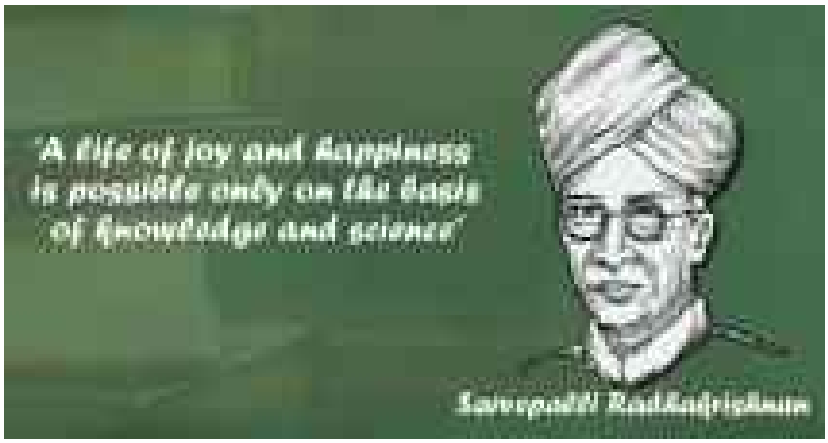
Sudipta obtained her B.Sc. (Hons) in Physics from Bethune College, Kolkata and M.Sc. in Physics from University of Calcutta. She pursued her Ph.D. from Saha Institute of Nuclear Physics, Kolkata in the field of surface science to correlate structure, morphology and electronic properties at the nanoscale.

Research Contribution:

Sudipta spent few months as a Visiting Research Fellow at Max Planck Institute für Metallforschung (Renamed as MPI for Intelligent Systems), Stuttgart, Germany. She has worked as a postdoctoral fellow for two years at Katholieke Universiteit Leuven in Belgium. Before joining CSIR-CSIO as a Senior Scientist in 2012, she worked for a year as a Visiting Scientist at the Materials Science Division of Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam, Tamil Nadu, India. At CSIR-CSIO, her work on light-matter interaction at the nanoscale includes exploration of various applications of fiber-optic nano-antenna, design and development of optical fiber probes for chemo-bio sensing and plasmonic sensors. She is now engaged in indigenous development of waveguide-based and metasurface-enabled augmented reality display systems for strategic sector.

Social Impact of work:

Sudipta took a leading role to establish a state-of-the-art national facility at CSIR-CSIO for large area micro-nano fabrication of optical and photonic components and devices. The centre named Centre for Nano-Optics Fabrication (CNOF), is the first of its kind in the country to offer the capability of indigenous development of specialized optical components for Indian defence sector.



 ISBN:978-81-932733-5-7

Introduction:

Dr. Indra Sulania is a renowned scientist who is presently working as Scientist F at Inter University Accelerator Centre, New Delhi.

Indra Sulania

Education:

Dr. Sulania has completed her graduation and post-graduation in physics from the University of Delhi. She completed PhD in Physics in 2016, from Jamia Millia Islamia, New Delhi, under the Supervision of Prof. Mushahid Husain, Jamia Millia Islamia New Delhi & Dr. D K Avasthi, IUAC, New Delhi. The title of the thesis was "Investigation of ion beam induced nano-patterning on single crystal semiconductors and thin films".

Research Contribution:

Her areas of research are Sensors and catalysis, radiation resistant and shielding materials, Ion beam induced modification of surfaces and applications, polymer composites etc. Her expertise is in synthesis and characterization of nanopattern using energetic ion beams. Dr. Sulania has served as an associate editor for Frontiers in Physics Journal and is a part of reviewer's team for Elsevier, Science Direct, Wiley, World Scientific, and Springer and many more publication teams. She has more than 130 papers in internationally reputed Journals.

Awards and Achievements:

Dr. Sulania is in-charge of Materials Science experimental beamline in beam hall-1, Scanning Probe Microscope and few major equipment in IUAC, New Delhi and has been in organizing committees for National and International Conferences related to ion beams and applications.

Dr. Sulania is a distinguished member of National Academy of Science India. She has been awarded the prestigious SIRE fellowship from SERB, DST, Govt. of India. She was awarded the Young Scientist Medal for the year 2024 by International Association of Advanced Materials IAAM and is a member of Vigyan Bharti (VIBHA) for promotion of Sciences in India.

Social Impact of the work:

She mentors undergraduate and postgraduate students, inspiring them to pursue pure sciences to give back to society through innovation and technology, where science and technology together create a greater impact.

Message highlighting topics for research for future Generations:

Materials and composites can be engineered for applications like sensing, with research driving societal progress. She emphasizes collaborative efforts to address environmental and health challenges, aiming for a greener, cleaner world. Aligned with the UN's Sustainable Development Goals, together we can create a more sustainable future. Research in Science is important as it yields to products or output which leads to betterment of the society and mankind.

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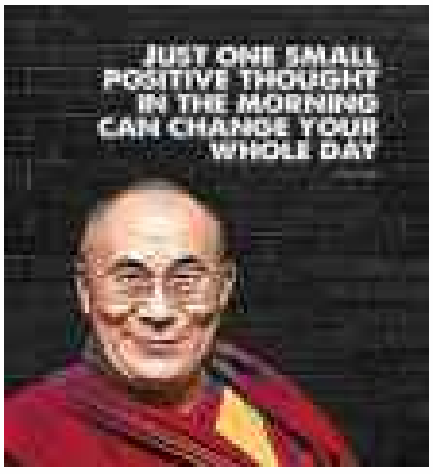
E-mail : indra@iuac.res.in



 ISBN:978-81-932733-5-7

Introduction:

Dr. Ritu Srivastava is an Indian physicist renowned for her contributions to the field of semiconductor optoelectronic devices. With expertise spanning the design, fabrication, and characterization of advanced materials and devices, Dr. Srivastava has made significant strides in developing technologies for applications such as photovoltaics, photodetectors, and light-emitting devices.

Ritu Srivastava

Education:

Dr. Srivastava obtained her B.Sc. and M.Sc. degrees in Physics from Purvanchal University, Jaunpur, Uttar Pradesh. Pursuing her passion for research, she was admitted to Banaras Hindu University (BHU), Varanasi, Uttar Pradesh, for doctoral studies. Under the supervision of the late Prof. Suresh Chandra, Dr. Srivastava completed her Ph.D. in 2001 on the topic "Ion transport studies in some doped hydrogel and alcogel systems."

Research Contribution:

Following her Ph.D., Dr. Srivastava conducted postdoctoral research at the Inter-University Accelerator Centre (IUAC), Indore, Madhya Pradesh. She served as a faculty at ICFAI Institute of Technology, Bhubaneswar for one year. Later she joined the CSIR-National Physical Laboratory (CSIR-NPL), New Delhi, as a scientist, where she has carried work in the area of optoelectronic devices. Currently, Dr. Srivastava serves as Chief Scientist at CSIR-NPL, where she heads the Planning, Management, and Evaluation Division. She also holds the important role of CSIR-NPL AcSIR Coordinator, overseeing academic and research activities under the Academy of Scientific and Innovative Research (AcSIR) framework.

Awards & Achievements:

Her research output is remarkable, with over 195 original research papers published, 4752 citations, an H-index of 34 (Google Scholar), two US patents, two Indian patents, and seven book chapters. She has supervised 25 research trainees, 20 Ph.D. students, and five postdoctoral fellows. Dr. Srivastava's excellence has been widely recognized, including receiving the 5th Venus International Research Award (VIRA) 2019. She is a member of the National Academy of Sciences, India (NASI), the Materials Research Society of India (MRSI), the Indian Women Scientists' Association, and the National Science Movement.

Social Impact of the work:

At CSIR-NPL, she has established the Organic Semiconductor Laboratory leading cutting-edge research on the design, fabrication, and characterization of advanced materials and devices. Notably, she has developed innovative processes for the fabrication of OLEDs, organic light-emitting transistors (OLETs), and colour shift pigment (CSP) security ink pigments, significantly advancing materials science and optoelectronic technology.

Message highlighting topics for research for future Generations:

Research is not just a degree—it trains you to think clearly, ask questions, and create knowledge for society's good. It takes courage to explore the unknown and tackle big challenges.

Stay curious, work honestly, and let your research drive positive change.

Contact: 986837871, E-mail :ritu@nplindia.org

 ISBN:978-81-932733-5-7

Introduction:

Vasundhara Mutta is an Indian physicist specialized in condensed matter physics and a trained materials scientist as well. She is presently working as a Principal Scientist in CSIR-Indian Institute of Chemical Technology (CSIR-IICT), Hyderabad and as an associate professor in the Academy of Scientific and Innovative Research, Ghaziabad, India.

Vasundhara Mutta

Education:

She obtained a B.Sc (Hons) and M.Sc in Physics from Vidyasagar University and her Ph.D (Experimental Condensed matter Physics) from Indian Institute of Technology Kharagpur. She worked as a post-doctoral fellow in Korea Advanced Institute of Science and Technology, South Korea for nearly 3 years as B2K fellow. Soon after she moved to Denmark Technological University (DTU), the then Riso National Laboratory of Denmark as a postdoctoral scientist. After a short stay at DTU, she joined CSIR-National Institute for Interdisciplinary Science and Technology, Trivandrum as a scientist and served there for 7 and half years and then moved to CSIR-IICT in 2020.

Research Contributions:

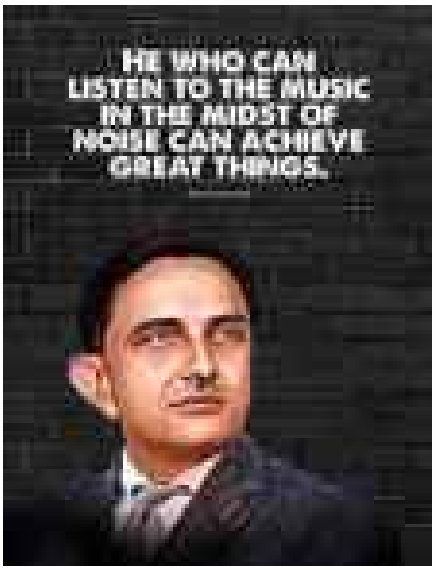
She has successfully completed several R & D projects in the past and presently leading six numbers of sponsored projects as principal investigator funded by different national and international agencies. She has published around 125 research articles in reputed high impact factor international journals and a peer invited reviewer for several International Journals. She has delivered more than 100 invited talks across the country and abroad as well in different conferences/workshops/ keynote lectures. She has guided 5 Ph.D students, 5 M.Tech/M.Phils and 25 M.Sc students for their dissertation work.

Awards and Achievements:

She is a recipient of few prestigious national and international fellowships/awards such as the SERB Power Fellow (sponsored by DST, India), BK21 (Brain Korea 21) Post-doctoral Fellowship (by Ministry of Science and Technology, South Korea) and European Space Agency postdoctoral fellowship (awarded by Danish government, Denmark). She is also a life member of several national and international scientific bodies. She is a fellow of Telnagana Academy of Sciences.

Social Impact of the work:

She gained wide experience in the areas of advanced functional materials for energy and biomedical applications. She is more focused in to developing efficient magneto caloric materials required for a magnetic refrigeration technology, which is one of the prime motivations of present-day research for addressing the climate change and promoting eco-innovation. She is also working on biocompatible nonmaterials for therapeutics used to treat cancerous cells.



 ISBN:978-81-932733-5-7

Introduction:

Anjali Oudhia

Professor Anjali Oudhia an academic entrepreneur and a change leader. She is an accomplished educator of Physics and a dedicated and committed researcher in the field of Nano- science. Presently she is working as Joint Director, RUSA (Rashtriya Uchchatar ShikSha Abhiyan), Department of Higher Education Chhattisgarh. She has been working since last 35 Years as an educator & researcher, Inspiring passion for learning, leadership, and service in first generation learners in Chhattisgarh, fostering a culture of curiosity, creativity, and critical thinking where students are encouraged to explore, innovate, and embrace lifelong learning. As a creative, skilled and enthusiastic educator she was trained as a Research based Pedagogy tool trainer (RBPT) organized by UKIERI (UK – India Education and Research Initiative) and IISER PUNE. She was appointed as Nodal officer for skill development in Durg district Chhatisgarh (Mahavidyalayeen yuva jeevan kaushal vikas yojna - skill development in college students). As a change leader she has been working tirelessly on many high-stakes projects in of State Government and NGOs working for women empowerment like Shakti.

Education:

Dr Anjali Oudhia has an excellent academic record and has received university merit scholarships throughout her academic career with a gold medal in M. Sc. Physics and silver medal in Graduation. She completed her M Phil in 1989 with order of Merit. She topped in PSC exam for selection of AP in 1993. She also received Teacher fellowship by UGC for her Ph.D. thesis work.

Research Contribution:

She has initiated many innovations in research which have been instrumental in supporting researchers all over Chhattisgarh to do quality research with limited resources. She was one of the earliest educators in government colleges in the state to start project work and laboratory based on Simulation and Mathematical modeling of Nano materials using Density Functional Theory, to study Interaction between biomolecules and nanoparticles. She has developed and designed a simulation lab for material science research in which more than 100 students have completed their PG projects, and hundreds of students were benefitted by simulation-based experiments. She has guided 10 PhD scholars till now and has produced many paths breaking innovative research papers in high impact journals on innovative and versatile topics like bio template-based synthesis of Nano materials, ZnO Bucky-balls, Microwave aided synthesis of Nano materials, Perovskite solar cells, Mossbauer spectroscopic study of ferrites etc.

She established Nano fab lab in 2011 for green wet chemical synthesis of Nano materials funded by UGC as a major project. She excelled in research through collaboration and networking with IISc Banglore, IIT Bombay through Indian Nano User Program. Her USP of research is "green and cost effectiveness.". She has also organized a solar training programme in collaboration with kWatt solutions SINE IIT Bombay for implementation of 'Lab to Field' concept in renewable energy applications.

Her thrust areas of research and Expertise is in 'Luminescence studies in nanomaterials '. She is skilled in developing protocols for cost effective and green synthesis using biotemplates like cellulose, natural polymers, bacteria and fungi, and Electro-optical studies of II-VI group Nano-materials used as active materials in devices like Solar cells, LEDs, Sensors, Photo-catalysts, Photoconductors etc. Her commitment to establish Ancient Indian Knowledge System and Indian perspective in mainstream science has resulted in

innovative projects as follows: Self-driven project on Bharateey perspective of Quatum Mechanics, You Tube Channel for videos on fundamental scientific concepts, continuously working on the philosophy of Physics. Gender Responsive Research for women researchers and Pink Apprenticeship programs for skill training of female students.

Award and Achievements:

She is handling projects worth 670 Cr of Ministry of Education as Joint Director RUSA (CG). She has been giving major responsibilities to enhance quality education in the state, due to her ability to thrive in a challenging environment for attaining the goal of Equity, Access and Quality in Higher Education as- In-charge of State Research – innovation cell, Dept of Higher Education (CG). In-Charge of State Industry- Academia Collaboration Cell, Dept. of Higher Education (CG). State Nodal for preparation of Video lectures in physics during Pandemic. Coordinator of two days State level workshop in collaboration with Ministry of Education, New Delhi, to sensitize and to train academia in Chhattisgarh for implementation of NEP 2020.

Social Impact of the work:

Noteworthy contributions in the field of Nano-science & Technology through development of Green and cost-effective methods for synthesis of Nanomaterials, Innovative ICT techniques, by using modeling and Simulation methods in Research facilitating students to do innovative projects. Strengthening Academia – Industry partnerships with project-based learning for Enhancing apprenticeship/ internships and Research opportunities for skilled youth in Atmanirbhar Bharat. Gender Responsive Research for women researchers motivating them for making a career in science through initiatives like Shakti Shodh Setu for mentoring and hand holding of female researchers and conferences like Women for Scientific Social Responsibility ' 2024; as an active member of Shakti (Chhattisgarh Chapter).

Message highlighting topics for research for future generations

The educators & researchers shall come forward and be the torch bearer of change in Bharat. Young researchers shall come forward to validate the Vedic theories of science through novel experiments and prove the depth of ancient wisdom of our sages as a scientific reality. We shall work for Bharateey perspective of science to bridge the knowledge gap and develop an insight into the scientific principles behind our ancient wisdom. This will not only create a paradigm shift in the fundamental understanding of science but also generate a new set of pedagogical tools to teach science in the right perspective.

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Have A Feeling That If The Women Of India Take To Science And Interest Themselves In The Progress And Advance Of Science As Well, They Will Achieve What Even Men Have Failed To Do. Women Have One Quality--the Quality Of Devotion. It Is One Of The Most Important Passports To Success In Science.

- CV RAMAN

 ISBN:978-81-932733-5-7

Introduction:

Prof. Rachana Kumar is working in the Department of Physics, Kalindi College, University of Delhi.

Rachna Kumar

Education:

Prof. Kumar has done her Post Doctrate work in the field of Nanotechnology at Centre of Excellence in nanotechnology, Asian institute of Technology, Bangkok, Thailand. Her Ph.D. work has been done at Maastricht University, Netherlands. She did her Masters and Physics (H) from Hindu College, University of Delhi. She worked as Scientist B in Solid State physics laboratory (DRDO) from 1987-1991 and thereafter joined Kalindi College and is currently working as Professor there. She has published 22 research publications in national and international journals and has published 4 books in Hindi.

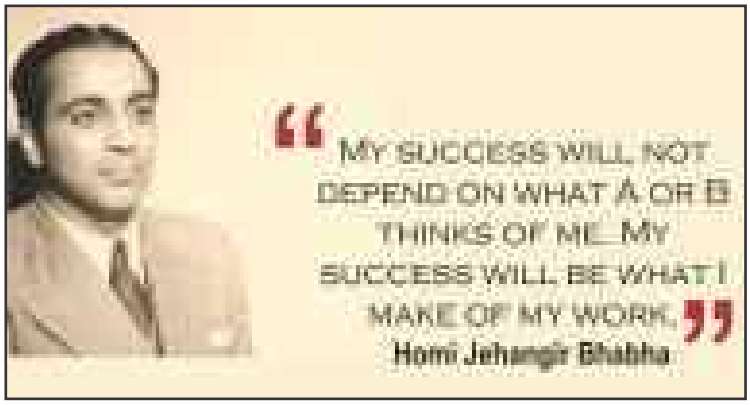
Research Contribution:

Prof. Kumar has worked on Multilayer film growth using sequential Layer - by - Layer assembly of nanoparticles by using Dip coating method. The method can be used for optical device fabrication having multiple uses. She has also worked on Carbon nanotubes, their use as gas sensors. The sensing capability of pristine and functionalized SWNT for various environmentally hazardous gases was studied in detail in her works. She has motivated and mentored students to pursue Physics at higher research levels, referring many to national and international universities. She has also led several research projects as principal investigator, involving students in advanced scientific work.

Awards and Achievements:

Prof. Kumar has been recipient of Award for College Lecturer (2014-15) by Directorate of Higher Education, Government of Delhi. She has received K.S. Krishnan Gold Medal for obtaining First Rank in M.Sc, DU. She has been Visiting Fellow (2009-2011) at the Centre of Excellence in Nanotechnology, Asian Institute of Technology (AIT), Thailand. She has received Dr Meghnad Saha Award (for Physics) for original popular science writing in Hindi by the Government of India (Department of Science and Technology) and Award for literature for Neo-literates by Government of India (Ministry of Education and Culture). She has received Certificate of Merit by the Ministry of Defence for work in the field of processing of infrared detectors.

Contact: 9811104857, E-mail : rachnakumar@kalindi.du.ac.in



 ISBN:978-81-932733-5-7

Introduction:

Dr. Umasankari Kannan, retired as outstanding Scientist, Ex-Head, Reactor Physic Design Division, Mumbai, Senior Professor, Homi Bhabha National Institute, Mumbai, she has over 39 years of experience in the design of nuclear reactors and fuel cycle physics.

Umasankari Kannan

Education:

Dr. Umasankari obtained a BSc degree in Physics from Ethiraj College, Chennai, and MSc from Regional Engineering College (Now NIT), Tiruchirapalli and PhD from Mumbai University for her pioneering work on nuclear data physics of the thorium fuel cycle.

Research Contribution:

Dr. Umasankari joined the Bhabha Atomic Research Centre in 1986 and was heading the Reactor Physics Design Division from 2016 till her retirement in 2023. She has several noteworthy contributions in design of advanced nuclear reactors, fuel cycle physics, neutron induced cross section measurements and experimentation in research facilities for both power and societal or non-power applications. Her design of the Advanced Heavy Water Reactor (AHWR) showed a pathway for thorium utilization. Other advanced energy systems she has designed include Indian Pressurised Water Reactor (IPWR), High Temperature Reactors and Molten Salt Breeder Reactors (MSR). Her research focused on development of new methods and codes for neutron transport and modelling of complex physics phenomena in nuclear reactor cores. She has contributed to qualifying advanced nuclear fuels in high neutron fields through extensive experimentation in research facilities. Her research work has been published in 81 peer reviewed Journal articles, 52 international conferences, 149 national conferences and 9 technical articles on thorium. Currently she is a part of the regulatory body for licensing operation of nuclear reactors in India.

Awards and Achievements:

She has co-authored a book "Physics of Nuclear Reactors" published by Academic Press. She has been awarded the Fellow of Indian National Academy of Engineers (FNAE) in 2023.

Social Impact of the work:

Dr. Umasankari is the chairperson of the Board of Directors of the Women in Nuclear Association in India (WiN) and was spearheading many committees for women's issues at her workplace. She was the member of International Nuclear Data committee of the IAEA from 2021 to 2023 and served as a neutronic expert to the Scientific and Technical Committee of ITER. She is currently engaged with the regulatory body for licensing operation of nuclear reactors in India.

Message highlighting topics for research for future Generations:

Nuclear reactor neutronics is a challenging field and requires more intensive research in topics such as modelling the entire core with 3D Monte Carlo techniques, study of coupled neutronics thermal hydraulics and thermo-physical behaviour of fuels, fission and fusion neutronics design and precise estimation of radioactive source term. Exciting and cutting-edge research is required for future energy systems which will be hybrids and will be governed by hi-fidelity simulations of neutron and particle transport. Use of new materials and their characterization in experimental facilities will be another frontier area of research. Dr. Umasankari urges more women to take up this specialized field of nuclear energy and contribute effectively to the India's Net-Zero Carbon by 2070.

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 ISBN:978-81-932733-5-7

Aditi Sen De

Introduction:

She is Quantum Information Theorist. The first woman recipient of the GD Birla Award Excellence, Professor at Harish-Chandra Research Institute, Allahabad, India.

Education:

After completing her bachelor's degree from Bethune College, she pursued Master's in Applied Mathematics from Rajabazar Science College and later conducted doctoral research at the University of Gdansk under the guidance of Prof. Marek Zukowski. Post-PhD, she was an Alexander von Humboldt Fellow at the University of Hannover with Prof. Maciej Lewenstein, followed by a Ramon y Cajal Fellowship at ICFO - The Institute of Photonic Sciences, Barcelona. She had also served as Assistant Professor at Jawaharlal Nehru University, Delhi.

Research Contribution:

Her primary area of research lies in quantum information and quantum technologies. In 2009, Prof. Aditi co-founded the Quantum Information and Computation (QIC) group at HRI alongside Prof. Ujjwal Sen and Prof. Arun K. Pati which now includes 3 faculty members, 21 PhD students, and 2 postdoctoral researchers. Her work encompasses theoretical quantum information, quantum entanglement, and foundational aspects of quantum mechanics, with numerous publications in peer-reviewed international journals.

Awards and Achievements:

Prof. Aditi has been honored with the Buti Foundation Award (2012), the Shanti Swarup Bhatnagar Prize in Physical Sciences (2018), and the GD Birla Award for Scientific Research (2023). She is an elected fellow of both the Indian Academy of Sciences and the Indian National Science Academy.

Social Impact:

Through research and mentorship, Prof. Aditi contribute to developing India's academic ecosystem in quantum science, nurturing future scientists and fostering international collaborations that promote India's presence in cutting-edge technology domains.

Message to the Youth:

Prof. Aditi encourages the next generation to explore frontier areas such as quantum computing, quantum communication, and quantum machine learning to build a transformative future.

To create conditions for the application of science and scientists to the real problems of society, we have to encourage scientists to interest themselves in problems outside their field of specialisation.

-Vikram Sarabhai

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Minakshi Devi

Introduction:

Prof. Minakshi Devi was a lecturer in Physics in 1977 at the Department of Physics, Gauhati University, and was subsequently elevated to reader and professor positions.

Education:

Prof. Minakshi Devi has her M. Sc (Physics) and PhD (Physics) degrees from Gauhati University (GU), Assam. Her thesis involved HF signal communications/ absorption by the ionospheric media through ionosonde observation at Gauhati, with a section on VHF signal modulation characters received at GU from a geostationary satellite set up. On completion of her PhD, she worked as a post-doctoral fellow under CSIR, in National Physical Laboratory, New Delhi & GU in 1976-77.

Research Contributions:

The research disciplines of Prof. Devi covers the design of electronic systems and their deployment towards understanding of Physics of the atmosphere with emphasis on identifying the precursory features of hazards like earthquake, thunderstorm, and GMS, along with quality improvement modes in communication links. These exercises contributed to the development of front-line systems like SODAR, LIDAR, DIAL, and Distrometer. Prof. Devi has established at GU the facilities for utilizing remote sensing data from GPS, AWS, Nephelometer equipped with parallel processing tools, for receiving projected results. One of her prized contributions to the research community is the creation and establishment of a Stratospheric Tropospheric (ST) Radar Centre at GU, the first of its kind in the NE, a rare facility in a unique and rich natural laboratory. This platform is designed to provide the most important parameters for understanding thunder, earthquakes, climate change, and framing of the relevant complex models. The facility is now functioning as an independent research centre of the University with staff appointed by her effort with support from the GU authority & Government of Assam.

She has a large number of research publications to her credit and as a chief editor of the peer-reviewed International Journal of Electronics and Applied Research (IJEAR), she released 22 issues from 2014 to date and a book on research disciplines .19 students received PhD under her guidance.

Awards and Achievements:

Prof. Minakshi Devi had her achievements in the teaching program through the modernization of the PG laboratory environments and introduction to new courses like Atmospheric Sciences and Robotics, with special support from the UGC and DST. She opened the academic collaborative programs with National user agencies, such as the RMC Guwahati and NESAC Shillong. Prof. Devi is a potential contributor to the establishment of the Electronic Science Department of Gauhati University. She has been awarded 10 major research projects from national funding bodies and two international projects, under the collaborative work in Indo- Russian joint programs. She enjoyed the overwhelming award from the Government of Assam towards the creation of the entire infrastructure facility of S T Radar centre covering site preparation, installation of 576 antenna with TR modules, 4 huts, control room and all-equipped scientist building.

Prof. Devi had achieved long-term collaboration with Chiba University, Japan; IZMIRAN, Russia; ICTP, Italy, and invited visits to research institutes across the globe. She was a nominated member of the National Committee on STEP, INSA, 1997-2000, selected as a member scientist at the Institute of High Tech/International Centre for Earth & Environmental Science (ICE), Italy, 1989-2001. Her active collaboration as a member with Nano satellite group of Japanese scientists received landmark achievement in the "Ionosphere Precursor Study Task Group," which was formed

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with the support of the Mitsubishi Foundation in 2014-2015. As a member of the Asia Oceanic Geosciences Society, she is associated in convening the "Nano satellites and their applications" session, in the Society's annual research conventions.

Social Impact of the work:

Prof. Devi was involved in establishing the Electronic Scientists and Engineers Society (ESES) in 1984 and, as a secretary, she has made it grow with regular research activities and student training programs in electronics, computer fundamentals at schools and colleges. Her effort has resulted in the National Symposium on Advances in Electronic and Allied Science & Technology, held each year. Her contribution to society is still active, as reflected in the International Conference (IConEAST-24) that was arranged by her at Gauhati in November 2024, with the main theme on "application of Artificial intelligence in Monitoring and Prediction of Natural Hazards…" , a suitable subject in the modern context. In addition to the academic program, Prof. Devi and her team offer services to victims of natural hazards through financial and material support, visiting the effective areas.

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 ISBN:978-81-932733-5-7

Introduction:

Dr. Vandna Luthra is working as a Professor in the Physics department at Gargi College, University of Delhi.

Vandna Luthra

Education:

Dr. Luthra did her postgraduate in Physics in the year 1992 and qualified the National level NET Junior Research Fellowship cum eligibility for Lecturer ship (JRF-LS) CSIR examination. She has availed prestigious BOYSCAST Fellowship (DST) to work on gas sensing materials at University College London, UK as well as the RAMAN Fellowship (UGC) at State University of New York, Binghamton on the development of nanomaterials for energy applications. She has been a visiting researcher at UCL, UK. PhD.

Research Contribution:

Dr. Luthra has established a Physics Research Laboratory at Gargi College which has promoted research at the undergraduate level for the last many years. The facilities include the synthesis of many functional materials and characterization techniques. She has supervised five Ph.D. students and has also mentored UG students to conduct research under various schemes and summer projects. As a principal investigator of different projects, she has completed research projects funded by the Department of Science & Technology (DST), the University Grants Commission (UGC), three innovation projects by the University of Delhi, and projects under the Science-Society program of the National Academy of Sciences (India). She has completed a UGC-UKIERI Thematic Partnership Award which facilitated the exchange of four faculty members and four Ph.D. scholars from India and the United Kingdom on the development of nanomaterial-based gas sensors and has convened many Indo-UK capacity-building workshops in the field of nanotechnology and gas sensing materials under the project. She has published more than 38 papers in international journals of repute, 5 book chapters, e-lessons, a reviewer with many international journals.

Awards and Achievements:

Dr. Luthra is a recipient of the Meritorious Teacher Award by NCT, Govt. of Delhi (2012), One of the four digital literacy champions by Campus of open learning (COL), University of Delhi and Edinburgh College, Scotland under the UKIERI Higher Education strand. She visited Edinburgh College, UK as a part of the program (2014). She has received a "Teaching Excellence Award for Innovation and Best Innovative Idea" by the University of Delhi for the innovative project, GC-204 (2015). She is a recipient of the Indian Association of Physics Teachers Dinabandhu Sahu Memorial (IAPT DSM) award for the year 2017. She has also received a trusted reviewer award by IOP, UK. She was nominated to participate as a master trainer for effective pedagogy for Delhi Science & Technology Cluster (DEEP-C/DRIIV) under the office Principal Scientific Officer to Govt. of India (PMO).

She has been the Physics co-ordinator for Star College Scheme in her college. She has acted as a convener, session judge, panelist, keynote, and plenary speaker at International conferences and resource person at many workshops. She is a member of the Indian Association of Physics Teachers (IAPT) and the Institute of Physics, (IOP) UK, AACST, and Shakti. She has been the teacher editor for the departmental magazine, Physikos and more than 10 editions of the magazine have been published. She has delivered many invited talks and acted as a resource person for computational physics (Python, Scilab), climate change, astronomy, machine learning, quantum computing and has trained many students and teachers across the country. Recently she has convened an

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International conference on Quantum Computing. She has completed three levels of training by COESME, IISER Pune in collaboration with PMMMNMTT, MHRD, Newton Bhabha Fund, and British Council and has served as a resource person for regional workshops on "Research Based Pedagogical Tools" in different parts of India and has trained about 400 undergraduate teachers. She has acted as a resource person for mentoring and guiding UG students selected nationally. She is also engaged in organizing a range of activities under a Science-Society grant under the aegis of the National Academy of Sciences, India by the Delhi chapter.

Social Impact of the work:

Dr. Luthra has trained 300+ teachers selected from different cities at teaching training workshops for interfacing of the physics experiments (expEYES) being organized by Inter University Accelerator Centre (IUAC). The training on this inexpensive device and Python is instrumental for exposing students to open-ended problems and be creative. She has been constantly encouraging students to "own-a-mug scheme" and created awareness about e-waste and plastic waste collection and safe disposal amongst many other initiatives and has worked as a nodal officer for many such programs and MoUs. Recently, she has contributed a lesson plan for climate change to TROP ICSU and is keenly involved in imparting training on effective pedagogical and digital literacy tools in various fields. Recently she has acted as a course coordinator and resource person for a course on "Demystifying Quantum Computing" for school students and beyond. She has penned many poems on the topics such as hope, light, beauty of nature in English and Sunheri Yaade, Yeh Zindagi in Hindi.

Message highlighting topics for research for future generation:

Learning is seen as a lifelong process. Various teaching methods, including active, research-based, and interdisciplinary approaches, are incorporated, with modern knowledge imparted alongside traditional practices. Green approaches are strongly advocated, and as challenges evolve, continuous skill enhancement is encouraged. Students are reminded to give back to society and serve the nation in the best possible way.

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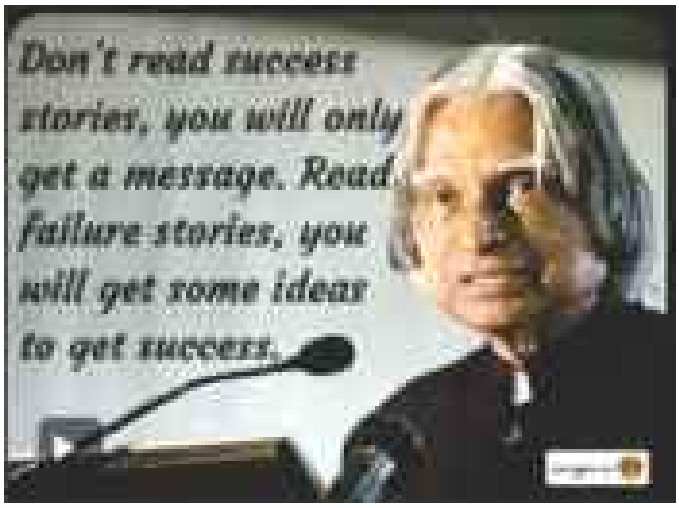

 ISBN:978-81-932733-5-7

Introduction

Dr. Sudha Vasant Bhoraskar is a retired Professor of the Department of Physics, Savitribai Phule Pune University, Pune.

Sudha Vasant Bhoraskar

Education

Dr. Sudha completed her B.Sc. in 1966 from the University of Indore, securing 2nd position, followed by a M.Sc. in Physics in 1968, also with 2nd position, and later earned her Ph.D. in Physics in 1974 under the guidance of Prof. M.R. Bhidey from the University of Pune.

Research Contribution

Dr. Sudha research includes Materials Science, Surface and Defect state spectroscopy, Nanomaterials, gas sensors, SHE Ions in nanomaterials, Plasma based waste to energy processes.

Over the last fifty-five years she has been actively engaged in carrying out research in Physics using indigenously developed instruments. They include Low and High Vacuum systems, Thermal and Non-thermal, atmospheric and low pressure plasma reactors, Electron Cyclotron Resonance, DBD reactors, and Electron and Ion Beam equipment required for material characterization. She had studied polymers, conducting polymers, semiconductors (Like GaAs, Si, porous Silicon) metal oxides, composites and varieties of Nanomaterials including Carbon Nano Tubes, Graphene, Silicene and composites. Dr. Sudha has guided 30 Ph.D students and 12 M.Phil students & several project students. She has handled research projects funded by agencies including DST, BRNS, DAE, CSIR, UGC, DRDO, HEMRL, NMRL and ISRO. She has published over 236 research papers, 3 book chapters, 3 manuals and holds 4 patents.

Awarded and achievements

Dr. Sudha has been conferred upon 'Lifetime Achievement Award' by Power Beam Society of India, 2014, Maharshtra State Government's 'Adarsha Shikshak Award' 2005, WIZITEX award as a Shikshan Ratna for 'Women Beyond 2010' in 2004, Prof. V. K. Joag 'Best Teacher Award' in 2005, CSIR Emeritus Scientists Position 2008-2011, UGC–Emeritus Professors position 2011-2013. She is a Fellow of Maharashtra Academy of Sciences, Member of Indian Physics Association, Indian Plasma Society, Power Beam Society of India and New York Research Society.

Social impact of the work:

Thermal Plasma gasification of MSW for the 'Waste to Energy' project has direct relevance to the society. The system is also capable of producing electricity and useful byproducts as Fuels. Nano-Al is useful in Defense applications in solid rocket propellants. Low pressure ECR plasma system is used in tissue culturing, and for space simulation.

Message highlighting topics for research for future generation:

Both thermal and non-thermal Plasma assisted synthesis routes are promising in producing uncapped non-agglomerated nano-particles with high crystallinity. Plasma assisted Waste Management program needs to be promoted on a large scale for the societal benefits.

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Monika Tomar

Introduction:

Prof. Monika Tomar is currently serving as a Professor in the Department of Physics at Miranda House, University of Delhi, and is a former Fellow of the Institute of Eminence (IoE), University of Delhi. Her academic path reflects a strong and consistent dedication to the field of physics.

Education:

Prof. Tomar completed her B.Sc. in Physics in 1996, M.Sc. in 1998, and Ph.D. in 2003, all from the University of Delhi.

Research Contribution:

Her research interests lie in smart materials, thin film deposition, piezoelectric and acoustic sensors, surface plasmon resonance (SPR), and GaN-based LEDs. She has completed 20 research projects and is currently leading 6 more, supported by government agencies with a cumulative funding of ₹30 crore. She has published more than 450 research papers in reputed international journals. Her innovations include 1 granted patent in the USA, 3 in India, 9 published patents, and 2 under application.

Awards and Achievements:

Prof. Tomar has received the prestigious "Excellence Award for Teacher in Service" during the University of Delhi's 94th Foundation Day. She was honoured with the "SMC Silver Medal – 2024" at the ISMC-2024 held at the DAE Convention Centre, Mumbai, from December 4–7, 2024. In March 2023, she was recognized with the "Woman in Science-Research and Academics" award by the Kamla Power Women Award NGO. She has been conferred Senior Membership of IEEE, a recognition awarded through a rigorous evaluation of her professional contributions. She has delivered over 20 invited lectures on national and international platforms and actively contributes to scientific communities such as IEEE, MRSI, and IAPT.

Social Impact of the Work:

Prof. Tomar's research has made significant contributions to national technological advancement. Her work on acoustic sensors has been integrated into PSLV satellite vehicles, supporting India's space missions. She has successfully transferred the technology of various advanced instruments—including SPR setups, Probe Stations, Thermal Oxidation systems, Thermoelectric and Hall measurement setups—to industry, enabling wider academic and research accessibility. She has delivered several functional device prototypes to premier organizations such as DRDO, ISRO, GAIL, and DST. Furthermore, she established the Smart Materials and Devices Laboratory (SMDL) at Miranda House, greatly enriching research opportunities and infrastructure for undergraduate students.

Message highlighting topics for research for future Generations:

Prof. Tomar emphasizes the importance of interdisciplinary research in addressing global challenges, encouraging young scientists to explore emerging fields such as smart materials, nanotechnology-based sensors, and renewable energy. She urges them to pursue research with curiosity, ethics, and social responsibility, ensuring that scientific progress advances both knowledge and the well-being of society and the environment.

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 ISBN:978-81-932733-5-7

Richa Krishna

Introduction:

Dr. Richa Krishna is working as an Associate Professor at Amity Institute of Nanotechnology, Amity University, Noida, Uttar Pradesh.

Education:

M.Sc. (Physics) from IIT Roorkee in 2002, Dr. Krishna obtained PhD in Physics from Allahabad University in the year 2008 in collaboration with Inter University Accelerator Centre, New Delhi.

Research Contribution:

Dr. Krishna has made substantial contributions to materials research, particularly in the field of doped semiconductor nanostructures for diverse applications. Her work specifically encompasses sustainable transparent conducting oxide materials for optoelectronic devices, nuclear materials for advanced sustainable reactors, wastewater remediation, organic light-emitting diodes (OLEDs), and photodetectors. She is also an AERB-certified Radiation Safety Officer. She has published research articles in prestigious journals.

Awards and Achievements:

Patent granted on "Non Magnetic Elements Doped Semiconducting Metal Oxide Materials And Its Utilization In Organic Electronics

Social Impact of the work:

Dr. Krishna contributed significantly to solving critical societal challenges. By teaching advanced materials science, she empowered students with the knowledge and skills to innovate in emerging fields, inspiring the next generation of scientists and engineers dedicated to sustainable solutions. In the field of sustainable transparent conducting oxide (TCO) materials, she focuses on replacing scarce or toxic components with earth-abundant, eco-friendly alternatives. Her work on nuclear materials for advanced reactors supports the development of next-generation systems that are safer and more efficient, playing a pivotal role in achieving long-term energy sustainability and reducing carbon emissions. Her research into organic light-emitting diodes (OLEDs) promotes energy-efficient, flexible displays and lighting systems, enhancing both consumer electronics and energy conservation efforts. Similarly, advancements in photodetectors enable sensitive detection for applications in healthcare, environmental monitoring, and communication. Her work bridges science, technology, and sustainability, driving progress in energy, environment, and healthcare while fostering responsible research for societal benefit.

Message highlighting topics for research for future generations:

It is essential to focus research efforts on areas that address global challenges and improve quality of life through innovation. In materials science, sustainable nanostructures and doped semiconductors hold transformative potential. Future research must address global challenges through innovation. In materials science, sustainable nanostructures and doped semiconductors hold transformative potential. With purpose-driven science, the next generation can advance technology, protect the planet, and ensure discoveries serve both humanity and the environment.

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 ISBN:978-81-932733-5-7

Vijaya Sangawar

Introduction:

Dr. Vijaya Sangawar, a retired Professor of Physics, Government Vidarbha Institute of Science and Humanities, Amravati. (M.S.) is renowned for her pioneering research and significant academic contributions in the fields of biodegradable polymers, polymer gels, packaging materials, and polymer nanoparticles for diverse applications. A trailblazer in promoting innovation, she has also been instrumental in integrating Patent and Intellectual Property Rights (IPR) into the university curriculum across Maharashtra and is now spearheading similar efforts at the national level.

Education:

Dr. Sangawar has obtained B.Sc. (1983) from Nagpur University and earned her M.Sc. (1985), M.Phil (1989) and Ph.D. (1996) under the mentorship of Dr. C. S. Adgaonkar from Amravati University. To further strengthen her outreach, she pursued a second M.Sc. in Communication from YCMOU, enabling her to conduct educational lectures on IPR, helping both students and the general public understand how to safeguard their innovations.

Research Contributions:

Dr. Sangawar's work focuses on environmentally sustainable solutions, particularly in plastic waste management and biodegradable materials. She has shared her insights through public platforms, including: DD Sahyadri Interview (28th January 2021) on Plastic Waste and Its Management, World Intellectual Property Right Day (26th April 2024) Interview on IPR/Patent awareness for the common man, Amravati Akashwani Radio has also broadcasted two Programs featuring her research on biodegradable plastics. She has received Patents by the Government of India. Dr. Sangawar holds four National Patents that underscore her innovative approach in Material science: Process for Preparation of Naphthalene Doped Polystyrene for Packaging Material, Patent No. 291615 (2018). Synthesis and Study of Bio-erodable Material Using LDPE and PEG Patent No. 351764 (2020). Rhodamin 6G Dye Doped PVA/KScN Reversible Sustainable Polymer Gel Electrolyte, Patent No. 375155 (2021). Opto-Thermo-Electrets CdS Doped Photosensitive Polymer, Patent No. 526325 (2024). Dr. Sangawar has represented Indian science on the global stage, presenting her research at prestigious international conferences: South Korea (October 2014), United States (July 2016). Her research papers received the Best Research Paper Awards in both countries, reflecting the global recognition of her contributions.

Awards and Achievements:

Dr. Sangawar's dedication to science and education has been acknowledged by various dignitaries and institutions she is honoured by the Hon. Governor of Maharashtra and the Hon. Minister of Higher and Technical Education, she has received Certificates of Appreciation from: Marathi Vigyan Parishad, Hon. Union Minister of Education, Director of the Institute

Social Impact of the Work:

Dr. Vijaya Sangawar's work bridges the gap between science, environmental sustainability, and public policy. Her visionary research continues to contribute to public health, education reform, and sustainable innovation. She remains a driving force in inspiring the next generation of scientists and intellectual property creators in India.

Message highlighting topics for research for future generations:

The twenty-first century is the era of invention. Inventions are at the heart of technological and human progress and are also essential for tackling pressing issues. We all must focus on IPR, which is today's need.

Inventions are at the heart of technological and human progress and are also essential for tackling pressing issues. We all must focus on IPR, which is today's need.

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 ISBN:978-81-932733-5-7

Introduction:

She is Emeritus Professor in Physics, Formerly of Jadavpur University, currently associated with the Centre for Interdisciplinary Research and Education (CIRE), Kolkata

Education:

Dr. Nandy obtained her master's degrees in physics from the University of Calcutta and the University of California. She earned her Ph.D. in Liquid Crystals from Kent State University, USA. Her postdoctoral research was carried out at the Max Planck Institute, followed by faculty experience at the University of Ulm, Germany.

Research Contributions:

Dr. Nandy has made significant contributions in the field of Liquid Crystals and later in the scientific investigation of Homeopathy. She has published around 200 research papers and holds several patents. Her guidance has shaped numerous Ph.D., M.Tech., and M.Sc. scholars. Her current research focus is on the science behind Homeopathy, for which she received national acclaim.

Awards and Achievements:

She was awarded the Best Research Paper of 2018 by the Ministry of AYUSH, Government of India. She is an elected Fellow of two prestigious Science Academies and has been recognized for her exceptional work in science popularization. She also served as the Convenor of the 1st International Conference for Gifted Minds.

Papiya Nandy

Social Impact of the work:

As Director of JB National Science Talent Search (2000–2015), Dr. Nandy led human resource development initiatives across various Indian states, nurturing scientific talent and creativity among youth. Through CIRE, she continues to inspire underprivileged schoolchildren and contributes to societal progress through science education.

Message for Future Generations:

Future researchers must explore interdisciplinary fields and focus on scientific validation of traditional knowledge systems, such as Homeopathy. Cultivating creativity and scientific curiosity is essential for solving complex global challenges and sustaining societal growth.

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The history of science is full of examples which alternate from being extremely practical to being extremely basic in their approach and it through the interaction between the basic and the empirical and practical problems that we find the greatest and most fruitful developments of modern science and technology.

- Vikram Sarabhai

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Introduction:

Dr. Amodini Mishra is a researcher and currently a post-doctoral fellow at IIT Delhi.

Amodini Mishra

Education:

Dr. Mishra obtained her M.Sc. and M.Phil. degrees from C.S.J.M. University and Dr. B.R. Ambedkar University, Agra, respectively. She earned her Ph.D (year) from Jawaharlal Nehru University (JNU), New Delhi. After completing her doctorate, she continued her research and joined IIT Kanpur. During this period, she was awarded a prestigious fellowship (which), which enabled her to join IIT Delhi to pursue further research work. Currently, she is a recipient of the WISE-PDF fellowship under the Women Scientist Scheme (ANRF-DST), and she is continuing her research at IIT Delhi.

Research Contribution:

During her Ph.D., she specialized in Condensed Matter Physics, focusing on 2D materials, ion irradiation effects, and carbon-based magnetic nanocomposites for water purification. She has presented her research work at various international platforms as in the USA, Japan and Dubai. She has published 31 research papers in reputed international journals, 20 book chapters.

Award and Achievements

She was awarded Postdoctoral Fellowships from both the University of the Witwatersrand, Johannesburg (South Africa), and Uppsala University, Sweden. She was granted a DST and IEEE Magnetics Society USA Travel grant to present her research work in the USA. She was honoured with the 'Women Emerging in Materials Science' award (year and by whom), highlighting her significant contributions to the field. She also received the Best Poster Award at Jawaharlal Nehru University (JNU), New Delhi. She is a lifetime member of International Association of Advanced Materials (IAAM) Sweden, the Materials Research Society of India (MRSI), the Magnetic Society of India (MSI), and the Indian Association of Physics Teachers (IAPT). She serves as an editor for Springer Nature books, Science Publishing Group and is a reviewer for several reputed journals such as Journal of Alloys and Compounds (JALCOM), Journal of Applied Physics (JAP), and Topics in Catalysis.

Social Impact of the work:

Dr. Mishra's work focuses on layer-based two-dimensional nanocomposites for ultrasensitive detection of explosive traces using surface-enhanced Raman spectroscopy (SERS), with the aim of enhancing public safety and contributing to advanced threat detection technologies. This work explores the scalability of these materials for real-world deployment in security and defense applications.

Message highlighting topics for research for future generation:

Future research should focus on interfacial and surface studies of two-dimensional carbon-based magnetic nanocomposites for sustainable environmental applications. Exploring exciton-plasmon coupling in 2D transition metal dichalcogenides can lead to breakthroughs in ultra-fast optoelectronics applications. These materials hold the key to developing next-generation, energy efficient computing and communication technologies. Layer-based 2D nanocomposites for explosive trace detection via SERS can revolutionize public safety and security systems. Collectively, these advanced materials offer transformative solutions across energy, environment, security, and information technology for the next generation.

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 ISBN:978-81-932733-5-7

Savinder Kaur

Introduction:

Prof. Savinder Kaur is a Professor at Department of Physics, SGTB Khalsa College, University of Delhi. She is a dedicated educator and researcher whose academic leadership is deeply rooted in mentoring the next generation of physicists for over two decades. She blends rigorous scientific inquiry with compassionate teaching, guiding students through impactful research in areas such as machine learning in physics, quantum field theory, cosmology, statistical linguistics, and computational modelling. Her collaborative approach fosters curiosity, innovation, and a lasting passion for physics.

Education:

Dr. Kaur earned her Ph.D. in Physics from the University of Roorkee (now IIT Roorkee) in 1998 in relativistic and non-relativistic studies of electron-atom collisions. She holds an M.Sc. in Physics from the same institution and was a University Medalist. She also served as a Research Associate at the University of Delhi in 1999, focusing on electron scattering from atoms and molecules.

Research Contribution:

Dr. Kaur's research spans atomic and molecular physics, particularly electron-molecule interactions, with 40 journal publications, 26 conference papers, and 13 e-learning chapters. She has collaborated with the UK R-matrix group led by Prof Jonathan Tennyson at University College London. She has supervised M.Phil and undergraduate dissertations, and conducted minor projects, including interdisciplinary work on statistical linguistics and biological systems modelling.

Awards & Achievements:

She is a CSIR-UGC JRF & NET (1995) awardee and GATE Qualifier (1994). She successfully completed multiple refresher and orientation programs certified by reputed institutions, ISO-certified FDP on Quantum Espresso (2024). She is a member of national scientific societies such as ISAMP and IAPT. Peer reviewer for international journals. Refereed Ph.D. thesis and held various academic and administrative leadership roles at college and university levels.

Social Impact of the work:

Dr. Kaur has advanced science education through mentoring, faculty training, curriculum design, invited lectures including NASI webinars for nationwide audiences, and organizing major events like the 13th Asian Physics Olympiad, fostering inclusive learning and scientific literacy.

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EDUCATION IS THE PATH TO LIBERATION AND EMPOWERMENT
- Savitribai Phule

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Introduction:

Dr. Deepali Kelkar is an eminent physicist and a retired Professor of Physics of Govt. Institute of Science, Nagpur. She has also served as the Director (In-charge) of the institute. Her area of research is Polymer Physics.

Deepali Kelkar

Education:

Dr. Kelkar obtained her B.Sc. (1969) and M.Sc. (1971) degree from Nagpur University. She joined as a teacher in Govt. Arts and Science College, Aurangabad in 1973 and was transferred to Govt. Ismail Yusuf College, Mumbai in 1977 and later to Govt. Institute of Science, Mumbai in 1982. In 1985, she received a UGC Teacher Fellowship to pursue her Ph.D. at the Department of Chemical Technology, Mumbai University, under the guidance of Prof. N.V. Bhat. She was awarded the Ph.D. in 1989. Her tittle was "Structural, Mechanical and Electrical Properties of Nylon-6".

Research Contribution:

Dr. Kelkar guided two M.Sc. (by research) and two Ph.D. students at Mumbai University. After her transfer to the Government Institute of Science, Nagpur in 1997, nine more students earned their Ph.D. under her supervision at Nagpur University.

Awards and Achievements:

Dr. Kelkar has completed 2 minor UGC funded research projects and a major research project financially supported by the Dept. of Science and Technology and Govt. of Maharashtra. She has published over 50 research papers in international journals and presented her work at numerous national and international conferences, including in France and Singapore. She also served as one of the resource persons for a Refresher Course at the Institute of Science, Mumbai. She is a life member of Indian Science Congress, Materials Research Society of India, Society for Advancement of Electrochemical Science and Technology, Indian Association of Physics teachers. She worked as a member of syllabus committee for M.Sc. I (Classical Mechanics) of Bombay University during 1996-97. She has a patent to her credit.

Social Impact of the work:

In 2005 she was appointed Director (In-charge) of the Institute of Science, Nagpur. During her tenure she enhanced research facilities by adding new Laboratory equipment's and computerized the library to improve student access to current knowledge and techniques.

Message highlighting topics for research for future generations:

The synthetic polymers are non-degradable and hence hazardous for the environment. So, the future generation of scientists should focus their research on developing degradable polymers and bio-polymers.

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"Dream big, work hard, stay humble, and surround yourself with positive people"

- Sunita Williams

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Introduction:

Dr. Meera Ramrakhiani is a physicist and academician. She has been Professor and Head of Physics Department and Dean, Faculty of Science at Rani Durgavati University, Jabalpur (INDIA).

Meera Ramrakhiani

Education:

Dr. Meera, born in Mhow (Indore), has done her B.Sc. and M.Sc. (2nd position in order of merit of the University in both) and obtained Ph.D degree (with CSIR Fellowship) in 1979 under guidance of Prof. T.S. Murty from the University of Jabalpur (now Rani Durgavati University) and has 40 years of experience in teaching and research.

Research Contribution:

Her area of research has been biophysics, nanomaterials, luminescence, lasers and photovoltaic solar cells. More than 30 students (18 Female) have completed their Ph.D. degree under her supervision. She has carried out two Research projects and presented her work in many seminars/symposia/conferences etc. at national/ international level. She has visited Italy, Hungary, Singapore, USA and China for the research work. She has authored/co-authored 2 books, 3 monographs, 8 Chapters for books and about 400 research papers/articles and edited Special issue of The Open Nanoscience Journal' and book entitled 'Recent Advances in photovoltaic'. She has been reviewer to many national/international journals.

Award and Achievements:

Dr. Meera has received many awards such as Vijaya Shree Award by India International Friendship Society in 1997, The 20th Century Award of Achievement by International Biographical Center, Cambridge, England in 1998, Women of the Year 2005 Jeweler Issued by American Biographical Institute, Inc.; Distinguished Scientist Award by VDGOOD in 2021 etc. She is life member of many professional bodies and Fellow of Luminescence Society of India. She has been member of various committees for curriculum development and administration.

Social impact of the work

The work in the field lighting technology and energy sector is of great importance to improve efficiency and reduce dependence on fossil fuels. Female candidates were encouraged to take up research so that new technologies can be used properly in day-to-day life for benefit of the society. Dr. Meera was President/Vice President of Shakti Mahakoushal for 6 years and contributed for women upliftment.

Message highlighting topics for research for future generation

Everything is becoming AI based now and new hybrid nano-composites semiconductors with specific novel characteristics are to be used. Research for preparing such materials and developing the required technique to manufacture efficient devices is need of the day.

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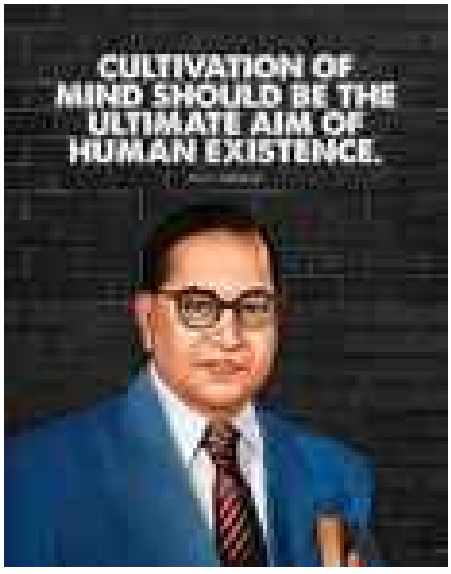
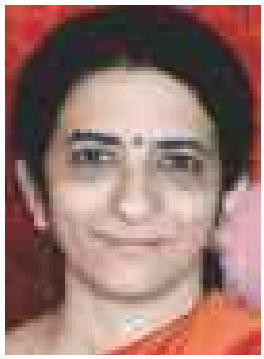


 ISBN:978-81-932733-5-7

Introduction:



Radha Srinivasan

Dr Radha Srinivasan is an Indian physicist, specializing in the field of experimental condensed matter Physics and magnetic materials. Her significant contributions have been in Magnetic Nanomaterials for biomedical applications besides the conventional metallic and rare earth intermetallic alloys. She was among the first faculty in Mumbai to implement the DST Women Scientist project in the emerging interdisciplinary area of nano-bio magnetism in a University affiliated undergraduate college during 2003-07.

Education:

Dr. Radha obtained her B.Sc. and M.Sc. degree in Physics from the University of Mumbai. She was awarded the Ph.D. degree of the University of Mumbai for her work on Magnetically disordered alloys in 1994 in the Low Temperature Physics Group of the Tata Institute of Fundamental Research under the guidance of Prof Girish Chandra and Prof A.K.Nigam.

Research Contribution:

Since 1995, she has taught Physics at the University of Mumbai and its affiliated colleges. From 2009 to her retirement in January 2025, she was engaged in teaching and research and guided numerous M.Sc. projects and over 15 MPhil/PhD students. She developed low-cost instruments for material property measurements and organized student and faculty refresher courses with support from recognized university centers and academies, promoting research that resulted in publications and patents.

Awards and Achievements:

She led several research projects resulting in award-winning presentations. As Chairperson of the Industry Engagement Cell since 2020, she collaborated with industries on student internships and projects, earning the 2024 Professor Glory Award for Research from Technomedia.

Social Impact of work:

Her research grants enabled lab setups with affordable instruments in her host institution and affiliated colleges. She designed a vocational course (2005–07) on appliances repair for school dropouts, supported by Sophia College and Western Regional Instrumentation Centre, (WRIC) Mumbai. She also supported municipal school students through NSS initiatives and promoted student interest in Observational Astronomy at the University, supported by TIFR, IUCAA Pune, WRIC Mumbai and UM-DAE CEBS. A Life Member of several academic societies, she is currently Co-Chairperson of the Mumbai Chapter, Materials Research Society of India. Her proficiency in Indian languages, culture, and music supports her outreach in converging technologies and communication in regional languages.

Message highlighting topics for research for future generations:

Researchers should strive to align their study with broader societal interests, using the latest technology. Work gains added value when pursued with passion, regardless of the field of study.

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 ISBN:978-81-932733-5-7

Pushpa Bindal

Introduction:

Prof. Pushpa Bindal is an Indian Physicist. She joined the Department of Physics, Kalindi College, University of Delhi in 1992 as one of the founder members and is serving as a Professor there since 2018. She specializes in the field of "Photonics".

Education:

Prof. Bindal obtained M.Sc., M.Tech. and Ph.D. degrees from IIT, Delhi in 1986, 1988 and 1993 respectively. She worked under the guidance of Shanti Swaroop Bhatnagar awardee, Prof. Anurag Sharma during her Ph.D. in the field of 'Fiber and Integrated Optics'.

Research Contribution:

Prof. Bindal has been actively involved in research and published more than forty research papers in various international and national journals. She has authored two e-lessons for ILLL, one book chapter in Springer materials and a unit on 'Intergerence' in M.Sc. course material for IGNOU. She has been an honorary reviewer in journals and publishing of books. She has successfully completed many Physics and Interdisciplinary research projects as Principal Investigator.

Awards & Achievements:

Prof. Bindal was honoured with 'Best Lecturer Award' by Government of NCT of Delhi in 2018. She was also bestowed with 'Distinguished Teacher Award' by Lion Capital Greens in 2021. She has been appointed external examiner for evaluation of M.Tech. theses many times at IIT Delhi. She was also appointed as external expert for upgradation of research fellowship of two students at University of Rajasthan.

Prof. Bindal has served as TIC, Department of Physics, Kalindi College from 1993-95, 2004-06 and 2016-18. She has set up many Physics lab experiments in the department during last 33 years of her service. She has headed many important committees and been actively involved in curriculum development of Integrated course, FYUP, CBCS and NEP syllabi.

Social Impact of the work:

Pushpa Bindal has organized many National Seminars, Workshops and outreach programmes funded by UGC, DST and NASI Delhi chapter aimed towards empowerment of women, scientific awareness and health sensitization of rural women and children. She has also worked in the field of Physics Education to efficiently transfer knowledge to students.

Message highlighting topics for research for future generation: Young students should delve into core and applied fields like Nanotechnology, Photonics, Astrophysics, Data Science, and AI to grow professionally and contribute to science and the nation.

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 ISBN:978-81-932733-5-7

Introduction:

Prof. Punita Verma is an academician and currently serving as Professor at the Department of Physics, Kalindi college, University of Delhi.

Punita Verma

Education:

Prof. Verma completed her Ph.D. in Physics from Justus-Liebig-University, Giessen, Germany, with experimental work at GSI Darmstadt in 2010. Her doctoral thesis focused on "X-ray emission from heavy atomic collisions: couplings of inner shells in superheavy quasimolecules." She holds a M.Sc. in Physics from Jamia Millia Islamia where she secured 2nd position in the university and a B.Sc. in Physics (Hons.) from the University of Calcutta.

Research Contribution:

Her research specializes in accelerator-based experimental atomic physics, with notable contributions in ion-atom collisions, X-ray emission spectroscopy, and heavy ion impact studies. Her work has led to several impactful collaborative research projects funded by IUAC, UGC, DST, and DU. She has guided multiple Ph.D. and M.Sc. students and published over 40 peer-reviewed articles in reputed international journals, presented at over 50 national and international conferences, and contributed to numerous interdisciplinary projects.

Awards and Achievements:

Prof. Verma has received numerous prestigious accolades, including the INSA-DFG bilateral fellowship, DAAD sandwich fellowship, and the Distinguished Teachers Award (2021). She has been honoured by the Indian Association of Physics Teachers (IAPT) and has received support from CSIR, DST, and INSA to attend and present at global conferences. She is a life member of several prestigious scientific bodies including NASI, IPA, ISAMP, and Vijnana Bharati. She has developed innovative pedagogies like the "Concentric Method Theory" and has been a pioneer in creating virtual laboratories for undergraduate physics education. Her contributions extend to curriculum development and designing DU's physics syllabi.

Social Impact of the work:

Prof. Verma's outreach work includes founding DASE (Delhi Association of Science Education) to train school-teachers in scientific pedagogy and promoting science awareness through workshops and training. She has led innovative undergraduate research projects that merge fundamental physics with societal needs, including clean energy and environmental monitoring. Her projects on renewable energy, environmental contamination, and women's health reflect her commitment to applying science for societal betterment.

Message highlighting topics for research for future generation:

"Young scientists should pursue interdisciplinary, sustainable, and experimental research, particularly in areas such as energy harvesting, advanced spectroscopic techniques, and environmental diagnostics."

Curiosity, collaboration, and commitment to societal benefit must guide the science of tomorrow.

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 ISBN:978-81-932733-5-7

Introduction:

Dr. Manisha Gupta is serving as an Associate Professor at Department of Physics, University of Rajasthan, Jaipur. She also serves as the Director of University Center for Computer Science and Information Technology at the University of Rajasthan.

Manisha Gupta

Education:

Dr. Gupta completed her M.Sc. in Physics in 1996 from Government College, Ajmer, Rajasthan. She was awarded a Ph.D. by the University of Rajasthan in 2002 for her doctoral research titled "Computer aided designing and testing of patch and array structures of microstripantennas under diferent environmental conditions."

Research Contribution:

Dr. Gupta's research contributions lie in the domain of microwave electronics, with a strong emphasis on advanced RF and microwave devices and systems. She has significantly advanced the field through the publication of 60+ high-quality research papers in reputed indexed journals and international conferences. As a dedicated mentor, she has successfully guided numerous Ph.D, M.Phil and M.Tech.scholars, fostering academic excellence and innovation in this specialized area. She has organised several Workshops on NAAC accreditations, Refresher courses, IEEE/MTT-s conferences, and chaired many of these conferences. She has served on the program committee of international conferences and workshops.

Awards & Achievements:

Dr. Gupta is honoured with "Outstanding Branch Counsellor Award" from IEEE US for her distinguished services in the field. She has been awarded with "Rajasthan Energy Conservation Award" from honourable Chief Minister. Her research has been recognised with certificate of merit from Institution of Engineers Kolkata. Her administrative achievements include Deputy Director, UGC Infonet Center and Additional Director, Center for Converging Technology, University of Rajasthan.

Social Impact of the work:

Dr. Gupta's work in microwave electronics and RF systems has had a meaningful social impact, particularly in the areas of communication, defence, healthcare, and education. Furthermore, by mentoring a large number of postgraduate and doctoral students, she has helped build a skilled workforce, empowering future engineers and researchers to contribute to national development.

Message highlighting topics for research for future generations

Embrace emerging fields like next-generation wireless communication, (6G and beyond), advanced materials for RF/microwave devices, AI-driven microwave systems, quantum communication, and energy-efficient electronics. Explore interdisciplinary links across healthcare, environment, and security. Innovate with purpose, uphold ethics, and keep questioning—the future belongs to explorers like you.

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Creativity Is Seeing The Same Thing But Thinking Differently

- APJ KALAM

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Chhaya Ravi Kant

Introduction:

Prof. Chhaya Ravi Kant is a Professor, Dean (International Affairs), First Appellate Authority, and Incharge Dispensary at Indira Gandhi Delhi Technical University for Women (IGDTUW), Delhi.

Education:

Prof. Kant earned her Ph.D. in Physics from the University of Delhi. She also holds an M.S. in Software Systems, which enhances her interdisciplinary research capabilities.

Research Contribution:

With 30+ years of experience, Prof. Kant has built a robust research profile in cutting-edge areas including Energy Storage Devices, Supercapacitors, Nanocomposites, Direct X-ray Sensors, Gas and Biosensing Applications, and Photovoltaics. She has authored more than 60 publications in reputed international journals, presented more than 35 papers at national and international conferences, and holds two Indian patents.

She leads the RAMAN Lab at IGDTUW, a state-of-the-art facility for interdisciplinary research in advanced materials and electrochemical applications, where her team utilizes cutting-edge tools such as electrochemical workstations, X-ray sources, and thin film deposition systems to drive innovation. Her pioneering work on polystyrene composites for X-ray detection has set new benchmarks in sensor sensitivity and stability.

Awards and Achievements:

Prof. Kant is a four-time recipient of the "Premier Research Award" and holds memberships in prestigious bodies like the Electron Microscopy Society of India and the Plasma Science Society of India.

Social Impact of the Work:

Her research on energy storage and sensing technologies addresses critical societal needs, such as clean energy access and early disease detection, paving the way for affordable, scalable, and sustainable technological solutions. Her innovations have the potential to benefit underserved communities by enabling cost-effective diagnostic tools and reliable power systems in remote areas, thereby bridging the gap between high-end research and grassroots application.

Message highlighting topics for research for future Generations:

Young researchers should explore sustainable materials for clean energy, flexible electronics, and biomedical sensing. Emphasis on interdisciplinary approaches and real-world applications will drive the next wave of scientific innovation. Collaborative research, entrepreneurship, and a commitment to societal challenges will empower future scientists to create transformative technologies that not only advance knowledge but also improve quality of life globally.

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Life is all about a card game. Choosing the right cards is not in our hand. But playing well with the cards in hand determines our success.

- Bal Gangadhar Tilak

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Kriti Batra

Introduction:

Prof. Kriti Batra is a distinguished academician and researcher in the field of Physics, currently serving as a Professor at the University School of Automation and Robotics and University School of Basic & Applied Sciences, GGS Indraprastha University, Delhi. With over 22 years of teaching and research experience, she has made significant contributions in theoretical atomic and molecular physics, quantum heterostructures, and molecular modelling. Her deep understanding of electronic structure calculations and quantum phenomena continues to shape both academic and research directions in the field.

Education:

Prof. Batra earned her Ph.D. in Physics from the Department of Physics and Astrophysics, University of Delhi in 2005. Her doctoral research focused on Excitation and Ionization Studies of Atomic Systems including Rydberg Atoms in External Electromagnetic Fields. She completed her MSc. in Physics with specialization in Electronics (1999) and BSc. (Hons) in Physics (1997), both from the University of Delhi.

Research Contribution:

Her research spans over 20 high-impact international publications indexed in Scopus and Web of Science. She has guided Ph.D., M.Tech, and B.Tech dissertations in the fields of DFT, optoelectronic materials, and molecular spectroscopy. As a reviewer for reputed journals under Elsevier, Springer, and Taylor & Francis, she contributes to the integrity of academic publishing.

Awards and Achievements:

Prof. Batra is a CSIR-NET JRF awardee and has received multiple Certificates of Appreciation from national scientific bodies. She is an esteemed member of academic bodies like IAPT and Vijnana Bharti, further cementing her position as a respected physicist and educator. She has also played key administrative roles across curriculum development, student engagement, and lab innovation. She also serves as an evaluator for national science events including NAEST.

Social Impact of the work

Prof. Batra actively promotes scientific temper and innovation through her leadership roles in the Institution Innovation Council and Incubation Foundation at GGSIPU. She has judged national-level hackathons, mentored student innovations, and coordinated academic-industry initiatives that nurture entrepreneurship and applied science.

Message highlighting topics for research for future generations:

Molecular clusters are studied for their unusual properties and potential to create new materials by using clusters instead of atoms as building blocks. They have wide applications in solid-state physics, materials science, biology, electronics, and optoelectronics. In the future, combining machine learning and high-performance computing with DFT will enhance predictions, accelerating material design, drug discovery, and biological applications.

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Anjali Sharma

Introduction:

Dr. Anjali Sharma is a Professor in the Department of Physics at Atma Ram Sanatan Dharma College, University of Delhi, and a former Fellow of the Institute of Eminence (2022–2024), University of Delhi.

Education:

Dr. Sharma completed her B.Sc., M.Sc., and Ph.D. from the University of Delhi, earning her doctorate in 2013 with research on low-temperature tin oxide thin films for NO_2 gas sensing.

Research Contribution

Dr. Sharma's research lies at the intersection of sensor technology and materials science. Her work spans MEMS-based sensor development, thermoelectric energy harvesters using metal oxides, and 2D materials like MoS_2. She has published 65 journal articles and 13 conference papers, alongside authoring 5 book chapters and 4 books. Her innovations have led to 2 Indian patents being granted, 4 published, and 2 filed. Notably, she has transferred an indigenously developed thermoelectric sensor setup to industry.

Awards and Achievements:

Dr. Sharma has received notable awards, including the "Excellence Award for Teacher in Service" (2024), Shri Ram Arora Award (2012), and G.C. Jain Memorial Award (2015). She was also honored with the Research Excellence Award (2023) and Indo Asian Best Teacher Award (2021). She has received ten awards for best oral/poster presentations at scientific conferences, reflecting both academic excellence and commitment to mentoring young researchers.

Social Impact of the Work:

Dr. Sharma's work exemplifies translational research, especially in the area of low-cost, energy-efficient gas sensors and thermoelectric devices. Her technologies support environmental monitoring and sustainable energy generation, with direct industrial applicability. She has successfully transferred a functional thermoelectric measurement system to industry, promoting indigenous innovation. Her technical acumen in thin film deposition, photolithography, and microfabrication reflects her commitment to both scientific excellence and societal impact. Her contributions have enhanced institutional research capabilities and inspired young researchers. As a key member in various academic committees and college development initiatives, she plays a significant role in shaping the research culture of her institution.

Message highlighting topics for research for future Generations:

Dr. Sharma advocates for science that advances innovation while addressing societal needs. She inspires emerging researchers to explore interdisciplinary fields such as smart materials, sustainable technologies, and nanoscience. Highlighting the importance of ethics and social impact, she encourages students to pursue research that not only pushes scientific boundaries but also contributes meaningful solutions to real-world problems.

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 ISBN:978-81-932733-5-7

Monika Joshi

Introduction:

Dr. Monika Joshi is currently serving as an Associate Professor at Amity Institute of Nanotechnology, Amity University Uttar Pradesh, Noida.

Education:

Dr. Monika Joshi obtained her master's degree in Physics from Kumaon University, Nainital, Uttarakhand. She holds her Ph.D. in Nanoscience and Nano technology from Amity University, Uttar Pradesh.

Research Contribution:

With over 17 years of dedicated experience in teaching and research, Dr. Joshi has made significant contributions to the field of nanoscience and nanotechnology, with a particular focus on environmental applications of Nanomaterials. She has supervised 4 Ph.d. students and 1 is currently pursuing. She has been granted 7 patents and 4 are filed.

Awards and Achievements:

Dr. Joshi is an expert member of Bureau of Indian Standards (BIS) for Health, Safety & Environmental Aspects of Nanotechnology. She has successfully led a major DST-funded research project and is recognized for developing high-yield, eco-friendly nanomaterials for multiple critical applications.

Social Impact of the Work:

Dr. Joshi's research is deeply rooted in addressing real-world environmental challenges. One of her major projects, funded under the Water Technology Initiative (DST/WTI), focuses on the reclamation of produced water from oil refineries using advanced nano composites. The work on the eco-friendly synthesis of nano materials is aimed at sustainable solutions for wastewater treatment, energy applications, and sensing technologies, contributing directly to environmental conservation and resource management.

Message highlighting topics for research for future Generations:

Nanomaterials show great promise for environmental applications supporting the Sustainable Development Goals (SDGs), including pollution control, clean energy, sustainable agriculture, and water purification. As eco-friendly, potentially biodegradable materials, they offer innovative solutions for food, agriculture, and sensor technologies while addressing water scarcity, food security, and climate change. However, their development must be carefully assessed for risks to ecosystems and human health.

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 ISBN:978-81-932733-5-7

Sangita Shrikrishna Yawale (Pakade)

Introduction:

Dr. Sangita Yawale, born and brought up in Morshi town of Amravati district in Maharashtra is currently, working as the Director of Pre-Indian Administrative Services Training Institute, Amravati. She has contributed to both Physics and administration. She has served as Joint Director, Higher Education, Amravati; and Director, Govt. Vidarbha Institute of Science and Humanities. In 2017, she became Principal of Govt. Sydenham College, Mumbai, and Dean at Dr. Homi Bhabha State University, Mumbai. She also chaired the Faculty Development Centre under PMMMNMTT. She served on various state and university committees (Management Council, Senate, LAC, etc.) and was a member of the Mumbai Cricket Association and Maharatshtra Chamber of Commerce.

Education:

She obtained her M.Sc. in Physics from Govt. Vidarbha Mahavidyalaya, Amravati (1986), and M.Phil. (1989) and Ph.D. (1992) from Sant Gadge Baba Amravati University (SGBAU). She also holds a M.Sc. in Subject Communication (Physics) from Y.C.M.O.U. and an L.L.B. from SGBAU, Amravati. A fellow of the Indian Institute of Ceramics, Kolkata, she is an educational consultant, journal reviewer, and doctoral thesis examiner. She has been a member of the BoS in Physics at SGBAU and formerly at N.I.M.S. University, Mumbai.

Research Contribution:

With 39 years of experience: 23 in teaching, 16 in administration and 34 in research- she has guided 13 Ph.D. scholars and completed two UGC funded research projects. Her research areas are semiconducting glasses and conducting polymer gas sensors. She has introduced the novel concept of 'preparation of glasses and their study and exploitation for the fabrication of semiconducting devices'. She holds a patent for a 'High Performance Photoelectric Cell' and has published over 120 research papers, presented in national and international conferences.

Awards and Achievements:

She has received the Multidimensional Women Personality Award and recognition from local institutions. She is Co-author of a Springer-published book.

Social Impact of the work:

She actively promotes Civil Services awareness and organizes extension activities, especially for senior citizens and students through NSS, NCC and sports.

Message highlighting topics for research for future generations:

Quantum dots and nanotubes hold transformative potential in nanotechnology, with applications ranging from quantum computing and medical imaging to energy storage and flexible electronics.

"Without physics there is no life,

it starts from birth to end"

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 ISBN:978-81-932733-5-7

Introduction:

Dr. Kajal Jindal is a distinguished academician and researcher in the field of Condensed Matter Physics. She is currently serving at Kirori Mal College, University of Delhi.

Kajal Jindal

Education:

Her academic journey began at Miranda House, University of Delhi, where she earned both her B.Sc. (Hons) and M.Sc. in Physics with distinction. Demonstrating strong academic capabilities, she qualified for the prestigious CSIR-UGC NET with Junior Research Fellowship in 2009 and completed her Ph.D. in Physics from the Department of Physics & Astrophysics, University of Delhi in 2015. Her doctoral thesis focused on the "Development of doped ZnO thin film exhibiting multifunctional properties for sensing devices", laying a strong foundation for her future research in material science and device fabrication.

Research Contributions:

Dr. Jindal's research spans over 16 years, including valuable postdoctoral experience and international exposure. Her work is characterized by a deeply interdisciplinary approach that integrates both experimental techniques and theoretical modelling. She has authored more than 53 research papers in Scopus-indexed international. Her core research interests include the fabrication of Bio-FETs and junction less transistors, the development of two-dimensional materials for advanced photo detectors and biosensors, the application of Density Functional Theory for gaining theoretical insight into materials, and the integration of ferroelectric materials in next-generation semiconductor devices. As a Principal Investigator, she has led several prestigious government-funded research projects. Her collaborative work has also resulted in multiple patented innovations, reflecting her contribution to the advancement of functional materials for healthcare and sensing technologies.

Awards and Achievements:

Dr. Jindal's is recently awarded the KMC Research Excellence Award (2025) in recognition of her pioneering research work during the academic years 2023 and 2024. She previously received the MRSI Prize for best paper presentation by the Materials Research Society of India in 2012. In addition, she has received several Best Presentation Awards at prominent national and international conferences. Her role as a mentor and academic leader is evident from her active participation as an invited speaker, session chair, and resource person in various conferences, workshops, and scientific events, where she has helped shape discussions on advanced materials and sensor technologies.

Social Impact of the Work:

The translational nature of Dr. Jindal's research has resulted in tangible societal benefits, particularly in the healthcare and defence sectors. One of her most impactful contributions is the development of a Bio-FET chip-based thrombosis detection kit, designed for field deployment and delivered to DIPAS, DRDO, for soldier health monitoring. She has also developed low-cost, self-powered biosensors that are ideal for point-of-care diagnostics, especially in resource-limited settings where access to sophisticated medical infrastructure is minimal. Beyond the laboratory, she has taken the lead in student mentorship, particularly through her role in the Mars Rover Project at Kirori Mal College. Under her guidance, students gained hands-on experience in space robotics and engineering and received recognition

at the national level, including acknowledgment from the Hon'ble Prime Minister of India. Dr. Jindal has also contributed to academic development by actively training both students and faculty members through workshops and faculty development programs.

Message highlighting topics for research for future Generations:

"The true purpose of scientific inquiry lies not only in discovery but in application — use your knowledge to create meaningful change in the world. Stay curious, stay committed, and never lose sight of the human impact of your work."

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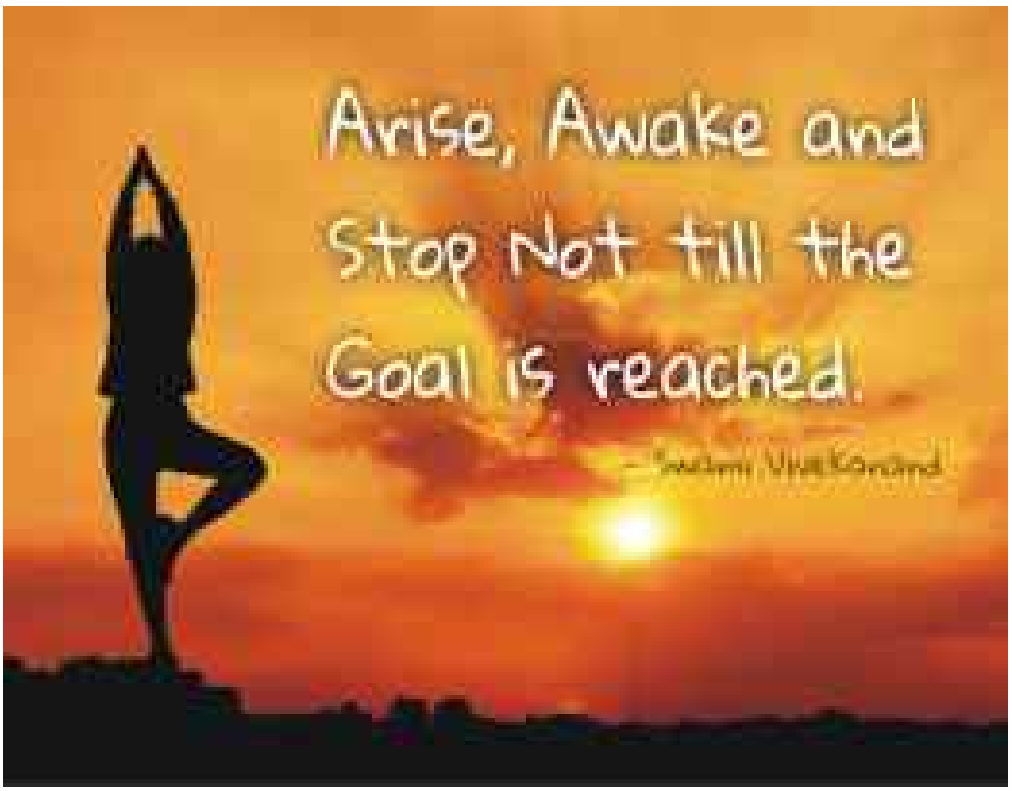

 ISBN:978-81-932733-5-7

Introduction:

Dr. Reema Gupta is a Professor in the Department of Physics at Hindu College, University of Delhi.

Reema Gupta

Education:

Dr. Gupta completed her B.Sc., M.Sc., and Ph.D. from the University of Delhi, earning her doctorate in 2017 on "Development of Multi-component materials for energy harvesting and microwave resonator".

Research Contribution:

Dr. Gupta's research expertise spans the fabrication of microwave resonator devices using ferroelectric thin films, energy harvesting through cantilevers and magneto-acoustic systems, and PZT-based magneto-electric devices. She also works on surface acoustic wave (SAW) devices and silicon-based cantilevers for biosensing and gas sensing applications, along with research in nonlinear optics and MEMS technologies. She has presented research works worldwide in around 11 countries and has 50 research publications in peer-reviewed journals.

Awards and Achievements:

Dr. Gupta is the Co-Principal Investigator (Co-PI) of two major DRDO-funded projects: one focusing on MxOy thin films for UV sensing using SAW (2025–2028; ₹181.44 lakh) and another on bioassay development for thrombosis diagnosis (2023–24; ₹27.42 lakh). Additionally, she leads and contributes to two internal research projects at Hindu College on non-invasive detection of adulterants and microplastics. Recently she received outstanding researcher award for her research and academic excellence in "Energy Harvesting" in 2023. Who awarded

Social Impact of the Work:

Dr. Gupta's research contribution to energy harvesting technologies offers sustainable solutions to the growing global energy demand, especially in remote and self-powered sensor applications. Through her work on bio-sensing and gas-sensing using MEMS and SAW devices, she supports the development of early diagnostic tools and environmental monitoring systems, directly contributing to public health and safety. The non-invasive detection of adulterants in food and water, and micro plastic degradation techniques, further reflect her commitment to societal well-being and environmental sustainability. By combining cutting-edge research with real-world relevance, Dr. Gupta's work bridges the gap between science and its social responsibility.

Message highlighting topics for research for future Generations:

To the young minds stepping into science and technology: let curiosity lead you and let purpose shape your path. Research is not just about discovery — it's about making a difference. Whether it's improving lives, protecting our planet, or pushing the boundaries of what's possible, your ideas have the power to shape the future. Stay passionate, stay persistent, and above all, use your knowledge to serve society.

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 ISBN:978-81-932733-5-7

Minal Bafna

Introduction:

Dr. Minal Bafna is an accomplished Physicist, Educator and Researcher having teaching experience of 27 years. She is presently working as Head of Physics, Agrawal P G College, Jaipur.

Education:

Dr. Minal Bafna obtained B.Sc. and MSc Physics degree from Mohan Lal Sukhadia University, Udaipur. She earned a Ph.D degree in 2010 from University of Rajasthan, Jaipur on "A study of thermal properties of potential polymeric materials and their use in solar thermal appliances."

Research Contribution:

Dr. Minal Bafna is Principal Investigator for a ₹68 lakh project grant from DST, Govt. of India (2023-24) and author of 40+ books in Physics, covering XI-XII, B.Sc., B.Tech., M.Sc., and competitive exams in both Hindi and English. Published 50+ research articles in Scopus-indexed and UGC-CARE-listed journals, proceedings. Besides being HoD (Physics), have held key administrative roles-Dean (FoSc.), Coordinator (Comp.Sc.); Master Trainer for Entrepreneurship and Convener of various Cells/Clubs/Committees. She is Vice Chairperson, Advisory Board, ACT Academy, Tamil Nadu, India (since 2022).

Award and Achievements:

She is the recipient of National-level awards and scholarships, including: Ministry of Human Resource. Department, Govt. of India (1990, 1992); Platinum Jubilee Appreciation Award in Physical Sciences, IIT Mumbai (National Academy of Sciences, India, 2006); Jaipur Ratna Samman for research (2021). Appreciation Award for Women in Science, DST Rajasthan (2022); Felicitation for research contributions, International Conference, Dubai (2022); WOFTA Awards (2023). She is 4-time recipient of the "Best Paper Presenter Award" by Department of Atomic Energy (DAE) and National Academy of Sciences, India (NASI).

Social Impact:

She acts as Master Trainer in Entrepreneurship Development with I-Create Jaipur 2008-2012. Principal Investigator of DST-SEED, GOI sponsored project DST/SEED/TSP/ STI/ 2021/447 entitled Establishment of Solar Appliances Fabrication Hub 'SAFH' for livelihood generation in 5 tribal villages of Jaisamand Block Udaipur District, Rajasthan State worth Rs 67,54,292/- during 2023-24.

Message highlighting topics for research for future generations:

Renewable energy and sustainable resources. Renewable energy being a key component of sustainable development. Renewable energy sources, like solar, wind, hydro, and geothermal, are naturally replenished and provide a low-carbon alternative to fossil fuels, contributing to reduced greenhouse gas emissions and a more sustainable energy future. Renewable energy comes from sources that are naturally replenished, like sunlight, wind, water, and geothermal heat.

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 ISBN:978-81-932733-5-7

Leena Chetan Joshi

Introduction:

Dr. Mrs. Leena Chetan Joshi is serving as an Assistant Professor in the Department of Physics at St. Xavier's College, Mumbai since 2013. She teaches subjects such as optics, solid state physics, and digital image processing at both undergraduate and postgraduate levels.

Education:

Dr. Joshi completed her B.Sc. and M.Sc. degrees from Vikram University, Ujjain and obtained Ph.D. in Physics from Birla Institute of Technology, Mesra, Ranchi.

Research Contribution:

Her doctoral research on the magneto-transport properties of LCMO manganite and its composites was carried out under the supervision of Prof. Sunita Keshri.

Award and Achievements:

From 2006 to 2008, Dr. Joshi worked as a project fellow in a UGC-sponsored project at BIT Mesra. She was awarded the CSIR Junior Research Fellowship in 2008 and the CSIR Senior Research Fellowship in 2009. In 2012, she worked as a research associate for a DST-sponsored project at IIT Bombay.

Dr. Joshi is involved in national science outreach programs. Since 2013, she has been a resource person for the Physics Olympiad training camp conducted by the Homi Bhabha Centre for Science Education (HBCSE), Mumbai. In 2022, she served as a Scientific Observer for the Asian Physics Olympiad, and in 2023, for the International Physics Olympiad.

Social Impact of the work:

She uses open-source software tools in her teaching, including Tracker, Python (via Google Colab), Octave, and Fiji (ImageJ), especially in the context of experiments and image analysis. Her vision for education goes beyond the textbook. Dr. Joshi invests time in developing new, syllabus-relevant experiments that are not only scientifically rigorous but also relatable to students' everyday experiences.

Message highlighting topics for research for future Generation:

Pursuing research in the field of image processing and nanomaterials with strong focus on technological applications.

Contact : 8268828282
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The Indian mind needs to be familarised with the principles of modern progress,
a universal impulse for enquiry and enterprise awakened,
and earnest thinking and effort promoted. A new type of Indian citizenship
purposeful, progressive and self-respecting should be created,
and self-reliant nationhood developed.

- M Visvesvaraya

 ISBN:978-81-932733-5-7

Introduction:

Dr. Omwati Rana is presently working as Assistant Professor at Daulat Ram College, University of Delhi.

Omwati Rana

Education:

She has completed her B.Sc and M.Sc in Physics from the Department of Physics & Astrophysics, University of Delhi. She was awarded CSIR-UGC NET Junior research fellowship. She completed her Ph.D on topic "Transport and Interface study of hole transporting organic semiconductors" from Jamia Millia Islamia in association with National Physical Laboratory New Delhi and was later selected as Assistant Professor in Daulat Ram college, University of Delhi.

Research Contribution:

Dr. Rana is involved in research related to organic light emitting diodes and transport studies in organic materials. She has published more than 15 research papers in various reputed national and international journals and 2 Chapters in a book. She has presented research papers and talks at national and international level. She is guiding students in their graduate level projects and has organized seminars, workshops, students & faculty development programs and many physics related activities for graduate students. She is actively involved in organising various co-curricular activities at college level.

Awards and Achievements:

She is a member of Indian Association of Physics teachers (IAPT).

Message highlighting topics for research for future Generations:

Dr. Rana inspires and motivates students to get in depth knowledge of physics and encourages them for research, innovative ideas and their practical applications in day- to-day life. Many physics areas are still not explored and many opportunities are still waiting for future generation.

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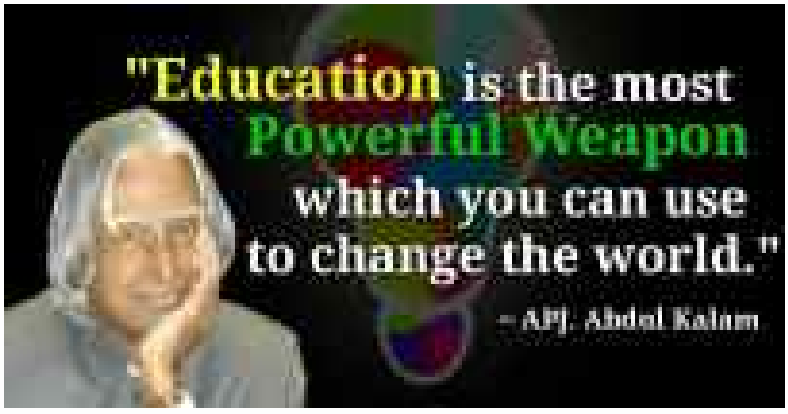

 ISBN:978-81-932733-5-7

Introduction:

Dr. Alka Garg is a Professor in the Department of Physics at Gargi College, University of Delhi, since 1993.

Alka Garg

Education:

Dr. Garg holds a Ph.D. in Physics from the University of Delhi, with her research focusing on condensed matter physics, particularly in materials science, optoelectronics, and superconductivity.

Research Contribution:

Dr. Garg has made significant contributions to the field through her research on polymer-BiI_3 composites for room-temperature radiation detectors and investigations into the optical properties of BiI_3 thin films. Her work has been published in several reputed national and international journals, and she has presented her findings at conferences in Singapore, Switzerland, France, the Netherlands, the USA, and India. Dr. Garg has supervised numerous M.Sc. and Ph.D. students, many of whom have gone on to pursue successful careers in academia and industry.

Awards and Achievements:

Dr. Garg's received the Best Performing Teachers' Award (2020) from the Directorate of Higher Education, Government of NCT of Delhi. She received Ecological Education Award at the Eco-Philosophy Summit during the 34th World Environment Congress at India International Centre, New Delhi. She was honoured with a Certificate of Recognition for completing 25 years of dedicated service at Gargi College.

She plays key academic and administrative roles at Gargi College, contributing to quality assurance through Internal Quality Assurance Cell (IQAC), leading the Fine Arts Society "Hues" as a Teacher Convenor and supporting environmental initiatives through the Eco Club "AVNI."

Social Impact of the work: Dr. Garg has nurtured a passion for research at Gargi College, mentoring numerous projects and inspiring students, many now working on environmental sustainability. She introduced Research-Based Pedagogical Tools (RBPT) in labs, trained teachers nationwide under MHRD–IISER Pune, and co-created an "RBPT Package" resource for STEM educators. Through initiatives like Vigyan Sarvatra Pujyate, she bridges school–college education in line with NEP 2020, while also promoting science outreach, art, and traditional culture. Her work reflects a deep commitment to research, teaching, and holistic education.

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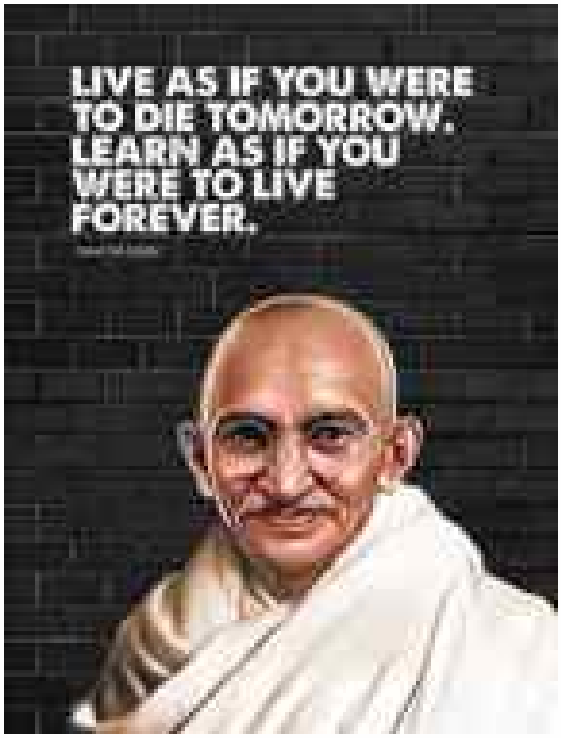

 ISBN:978-81-932733-5-7

Introduction:

Prof. Vaishali Bambole is a Highest Academic Grade (HAG) Professor in the Department of Physics, University of Mumbai, with an illustrious career spanning over 33 years. She is widely respected for her leadership in teaching, research, and innovation, and has made significant contributions to the advancement of science and technology at national and international levels.

Vaishali Bambole

Education:

Prof. Bambole holds an M.Sc. and Ph.D. in Physics, along with a B.Ed. and a Postgraduate Diploma in Computers and Systems Engineering. Her strong educational foundation across multiple disciplines has enriched her research and academic endeavours, enabling her to contribute innovatively to both education and technology.

Research Contribution:

Prof. Bambole has made outstanding contributions through her extensive research work, with over 150 publications in reputed national and international journals and four chapters in international books. She holds thirteen patents, seven of which have been granted. She has led 22 government-funded research projects worth nearly ₹2crores and has guided several M.Phil., Ph.D., and postdoctoral scholars. Her innovations include increasing the shelf life of cooked food by three years and developing an indigenous, low-cost PECVD system, demonstrating her commitment to practical and impactful research.

Social Impact of this work:

Prof. Bambole's work has had a meaningful social impact, particularly in promoting food sustainability and supporting national initiatives like Atma Nirbhar Bharat (Make in India). Her research outputs have addressed real-world problems, thereby contributing to technological self-reliance and enhancing societal well-being. She has also been actively involved in academic administration and policy-making at the University of Mumbai.

Awards and Achievements:

Her excellence has been recognized with several prestigious awards, including the Global Gandhi Award at the British Parliament (2023), the International Women Scientist Award (2023), the Outstanding Women Scientist Award from FABO London (2022), and the Stree Shakti Samman by LIC of India. She has also been felicitated by the Governor of Maharashtra and honoured with numerous innovation and leadership awards.

Message highlighting topics for research for future generations:

Brain Computer Interface (BCI) for movement of cursor through Brain Waves, 6D Printing of all body parts with the Principle of Tissue Engineering, Quantum Dots: New Materials for Quantum Computing, Early Detection of Neurodegenerative disease through conducting polymer-based Biosensor.

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 ISBN:978-81-932733-5-7

Introduction:

Nameeta Brahme

Illuminating the World Through Materials Science Prof. Nameeta Brahme is a distinguished Indian physicist known for her expertise in Materials Science, especially the optical properties of phosphors at bulk and nanoscale levels. Currently working as Professor and Head of the School of Studies in Physics and Astrophysics at Pt. Ravishankar Shukla University, Raipur, she is dedicated to both cutting-edge research and nurturing the next generation of scientists as well as teaching. Apart from the above she has been handling various responsibilities at Pt. RSU, Raipur: Coordinator -Centre for Nano Science and Nano technology, Chairperson- Internal Complaint Committee, Director, Skill development Cell, Head, University Science Instrumentation Centre, USIC

Education:

Prof. Brahme laid her academic foundation by obtaining her B.Sc. and M.Sc. degrees in Physics from the esteemed Dr. Harisingh Gour Central University, Sagar. She successfully completed her M.Phil. (1996) and Ph.D. (2003) degrees from Guru Ghasidas Central University, Bilaspur, marking the beginning of her impactful journey in materials science.

Research Contribution:

Prof. Brahme embarked on her professional career as an Assistant Professor in Physics at Govt. College Kota in 1996. The University Grants Commission (UGC) awarded her a Teacher Fellowship for two years in 2000. She joined Pt. RSU in 2004 and has since led impactful research in phosphorescent materials, with applications in lighting, bio-imaging, and sensing. Prof. Brahme's extensive research has resulted in the publication of an impressive 140 research papers in various highly reputed journals and has h-index of 28 and a total of 2191 citations. Beyond publications, Prof. Brahme's has two Indian research patents, translating her fundamental research into potentially physical technological advancements. 20 research scholars have been awarded Ph.D. degrees under her guidance. She has visited more than 7 countries for Invited talk/paper presentation and gave 35 invited talks in various National/International Conferences. As a Convener she has organized many International/National Conferences.

Awards and Achievements:

She received Young Scientist Award 2004 by CGCOST, Raipur, and Fellow, Luminescence Society of India (LSI), conferred on 9th December 2021. She is felicitated by the Governor of Chhattisgarh on 8th March 2022, for her exemplary work in the field of education.

Social Impact of Research Work:

Prof. Brahme's research on phosphorescent materials advances sustainable lighting, energy efficiency, and innovative applications in healthcare and security. Her mentorship has guided students to success in CGPSC exams and placements at premier institutes like BARC, ISRO etc.

Message highlighting topics for research for future generations:

Advances in phosphor materials science offer vast potential. Future research should focus on efficient luminescent materials, biocompatible nano-phosphors for healthcare, and integration into sensing technologies. Computational tools will accelerate discovery, driving innovation in displays, lighting, environmental monitoring, and medicine.

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 ISBN:978-81-932733-5-7

Introduction:

Prof. Savita Roy is a renowned Indian physicist and academic administrator serving as the Principal of Daulat Ram College (DRC), University of Delhi, since December 2014.

Savita Roy

Education:

Prof. Roy completed her undergraduate studies in Physics from Miranda House, University of Delhi, and obtained her Master's degree in Physics with a specialization in Electronics from the Department of Physics & Astrophysics, University of Delhi in 1987. She was among the first batch to qualify the NET-JRF examination. She earned her Ph.D. in 1992 from the same department, with a thesis titled "Effect of Annealing on Electrical, Optical and Structural Properties of $Hg_{1-x}Cd_xTe$." Prof. Roy completed a prestigious academic leadership program on Global Trends in Academics and Administration at the London School of Economics and Political Science (LSE), London.

Research Contribution:

After completing her Ph.D., Prof. Roy joined Kalindi College, University of Delhi, as a Lecturer in Physics, where she taught and mentored students for over 25 years. Later, as Principal of Daulat Ram College, she spearheaded institutional growth and promoted a culture of research and innovation across disciplines. She has published more than 30 research papers in national and international journals, holds two patents, and has led several innovation projects.

Awards & Achievements

Prof. Savita Roy has received numerous accolades, including:

- 2nd APJ Abdul Kalam National Dedication Award (2021) – Corona Warrior
- Excellence Award for Promoting and Inculcating Gandhian Values Among Youth
- Excellence Award for Progressive Administration and Environmental Leadership
- Dr. S. Radhakrishnan Memorial Award for Outstanding Contribution to Teaching and Learning
- Excellence Award for Promoting the Spirit of Reuse, Refuse, and Recycle
- Green Earth Award on World Environment Day
- Lifetime Achievement Award by Deen Dayal Upadhyay Smriti and the Ministry of Environment
- Life member of Semiconductor Society of India and Plasma Science Society of India.

Under her leadership, the college established several advanced research laboratories, including those for Zebrafish, Drosophila, Neuro pharmacology, Drug Delivery and Cancer Research, and Ornamental Fish, thereby strengthening academics and student skill development. A firm believer in continuous faculty development and capacity building, she has also ensured that the faculty at DRC actively participate in professional development programs. She also promoted holistic growth by integrating social sciences and cultural values, founding the Centre for Happiness and the Psychology Resource Centre. Her initiatives, such as in-house skill development programs and the Navdhara projects, have benefitted faculty and thousands of students while fostering a strong culture of research.

Social Impact of the work:

Under her leadership, students have gone on to secure prestigious positions as scientists in institutions such as IISER, BARC, and IITs, as well as in Indian Civil Services, chartered accountancy, and academia. Prof. Roy has played an active role in the implementation of the National Education

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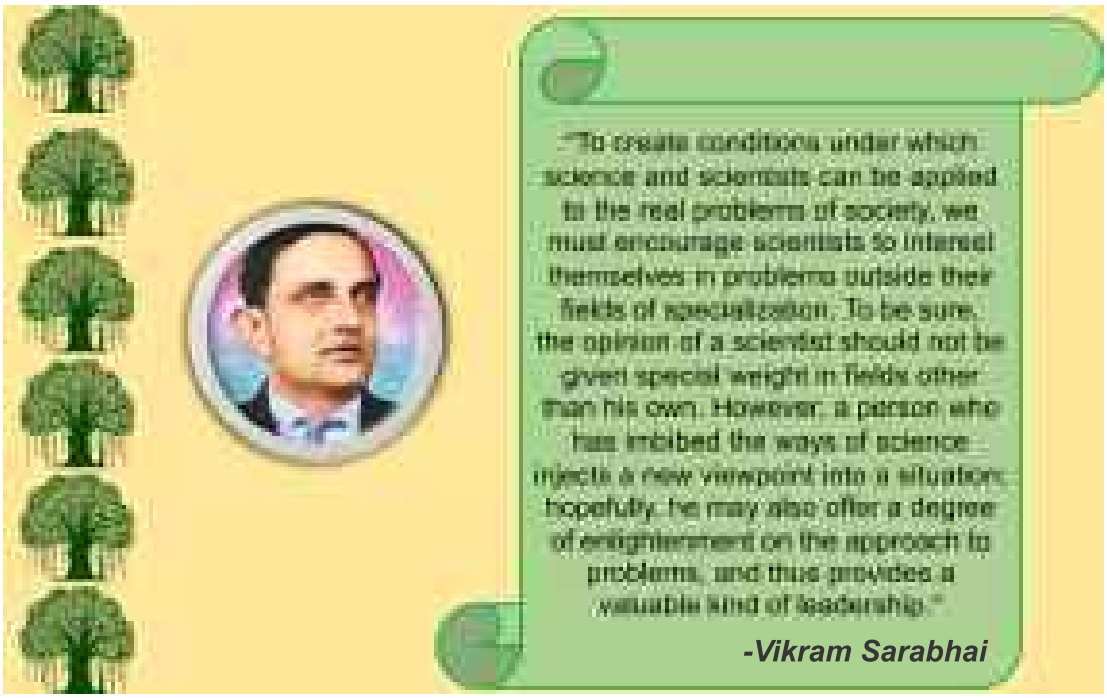
Policy (NEP) 2020. She is a member of several committees of the University of Delhi, including the Skill Enhancement Committee, the Committee on Multiple Entry and Exit Schemes, and the Committee on Digitalization of the Enrolments Process. She has also served on key statutory bodies of the University, such as the University Court, Academic Council, and Executive Council. At the national level, her contributions include serving as the President's nominee to Manipur Central University, as a member of the Academic Advisory Board of the Lal Bahadur Shastri National Academy of Administration, and as Secretary of both the Delhi University Principals' Association and the Indian College Forum.

Message highlighting topics for research for future generations:

Young researchers are key to India's growth as a leading economy. To harness the demographic dividend, students must pursue research in areas like climate change, sustainable energy, health, food security, and space exploration. Passion and dedication to research will shape both their future and the nation's.

Contact: 8130407373, E-mail : savitaroy64@gmail.com



 ISBN:978-81-932733-5-7

Introduction:

Dr. Swati Raman is a physicist and academician with research and teaching experience in optics, photonics, and nanotechnology. Currently she is serving as Assistant Professor (Physics) at Lady Irwin College, University of Delhi.

Swati Raman

Education:

Dr. Raman earned her Ph.D. in Physics from the National Physical Laboratory and Jamia Millia Islamia in 2011, with a focus on coherent optics. She completed her M.Sc. (Physics) and B.Sc. from C.C.S. University, Meerut, securing first division throughout. She was awarded a gold medal for being the best student in her M.Sc. program.

Research Contribution:

Her research explores the frontiers of coherent optics, chalcogenide waveguides, and nanophotonics. Her work has significantly contributed to understanding spectral anomalies, optical signal processing, and waveguide fabrication. Dr. Raman has presented papers at various national and international conferences and has co-authored a laboratory manual for undergraduate students. She has published extensively in reputed journals like Optics and Lasers in Engineering, Optics Communications, and Journal of Modern Optics.

Awards and Achievements:

Dr. Raman is a recipient of the CSIR-SRF and CSIR-RA fellowships and has received a DST travel grant to attend an international conference in Singapore. She holds memberships in Optical Society of India, Indian Science Congress, IAPT, and Vibha.

Social Impact:

Deeply committed to science communication and environmental awareness, Dr. Raman has organized and coordinated numerous national webinars, science quizzes, plantation drives, and public awareness events on topics like sustainability, biodiversity, and health. She also mentors non-teaching staff and contributes to the educational upliftment of science students from diverse backgrounds.

Message highlighting topics for research for future generation:

Physics teaches us that even the smallest particle has significance—so does every action you take. Stay inquisitive, stay humble, and always let the light of knowledge guide your journey.

Let curiosity be your compass and integrity your foundation. Embrace challenges as opportunities to discover, question, and innovate.

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 ISBN:978-81-932733-5-7

N. Thejo Kalyani

Introduction:

Dr. N. Thejo Kalyani is currently working as an Assistant Professor (Sl.Gr.) in the Dept. of Applied Physics, Laxminarayan Innovation Technological University, Nagpur.

Education:

She obtained master's degree in physics from Sri Venkateswara University, Tirupati, Andhra Pradesh and completed her doctoral research from RTM Nagpur University, Nagpur.

Research Contribution:

Her research interests include synthesis, characterization and fabrication of OLED devices and displays using various organic complexes by vacuum deposition and solution techniques. She published 52 research articles in various National and International peer-reviewed journals. She owns a UK design and has published an Indian patent on OLED materials. She has authored 12 textbooks and 4 research books, published by Pearson, Cambridge Scholars and Elsevier. She authored e-books for YCM Open University, Nashik, Maharashtra. Two of her research students have been awarded Ph.D degree, and two more are currently working under her able guidance. She is a reviewer of 11 international journals.

Award and Achievements:

She has been honoured with "Best Teacher Award for the year - 2021" in the field of higher technical education by RTM Nagpur University, Nagpur. She bagged "Young Scientist Award "Best Research Paper Presentation Award" in six different National and International Conferences. She is a recipient of Mrs. Seetha Gopalakrishnan award for securing university 1st rank at M.Sc level and Ruthrabatla Krishna Mohan award for securing Ist rank in Electronics at B.Sc. level. She delivered Technical Talks at various National/International conferences and also worked as a judge at college/University level competitions. She chaired various sessions in National/International Conferences.

Social Impact of the work:

Her research work on OLEDs is pretty significant as they are energy efficient. OLED displays proffer enhanced resolution, thereby enhancing user experience in displays and domestic solid-state lighting – the need of today's world.

Message highlighting topics for research for future generations:

Cost effective materials for Ultra-Low Power and Energy-Efficient OLEDs and displays are the future research topics.

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 ISBN:978-81-932733-5-7

Kamlesh Makkarh

Introduction:

Smt. Kamlesh Makkrah has been teaching physics to UG and PG classes at Govt. M.H. College of Science and Home-science for Women, Jabalpur; for 40 years and retired as Professor and Head of Physics department on 31st Dec. 2014.

Education:

She graduated from Vikram University Ujjain and did her Masters' in Physics from Govt. Science College Jabalpur with 2nd rank in Merit in 1970. She was selected by P. S. C. Madhya Pradesh securing 3rd rank in merit in 1974.

Research Contribution:

Smt. Makkrah was awarded Junior Research Fellowship by CSIR and carried some research work of BARC, Mumbai and TIFR Mumbai on luminescence. She participated in number of Seminars (National and State level), workshop and refresher courses.

Award and Achievements:

Smt. Makkrah worked as a Course Co-coordinator of U.G. Self-financing subject -Electronics. In order to enrich students with professional teaching, they were trained to fabricate various E.T.B. for their experimental work in electronic Lab.

Social impact of the work:

Smt. Makkarh has been instrumental in fostering the holistic development of students, inspiring them to pursue advanced learning across various academic disciplines to secure a promising future.

Message highlighting topics for future generations:

As the global World technology is changing fast, AI is emerging so continue your journey of learning with hard work, dedication and devotion. As science student be innovative, explore your new ideas, be creative to improve your academic skills. Believe in yourself keeping positive attitude. Be a good human being with high moral values. Your contribution will build bright future of our country.

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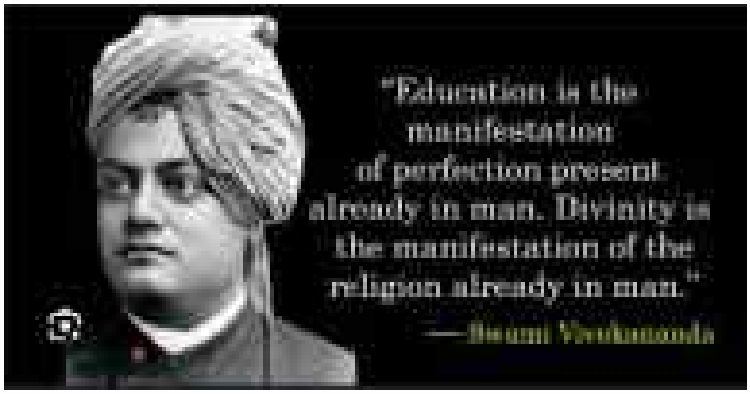


 ISBN:978-81-932733-5-7

Introduction:

Vipasha Mishra is a Professor of Applied Physics at Indira Gandhi Engineering College Sagar (MP) an autonomous Institute under Technical Education Department of Madhya Pradesh. She has 39 years of rich experience of teaching undergraduate (B.Tech) and postgraduate (M.Sc) classes.

Vipasha Mishra

Education:

She has graduated from Govt. M.H. College Jabalpur (MP) in the Year 1980, and post-graduate from Rani Durgavati Vishwa Vidyalaya (RDVV) Jabalpur (MP) in 1982, her Ph.D is from RDVV Jabalpur (MP) in the Year 1986.

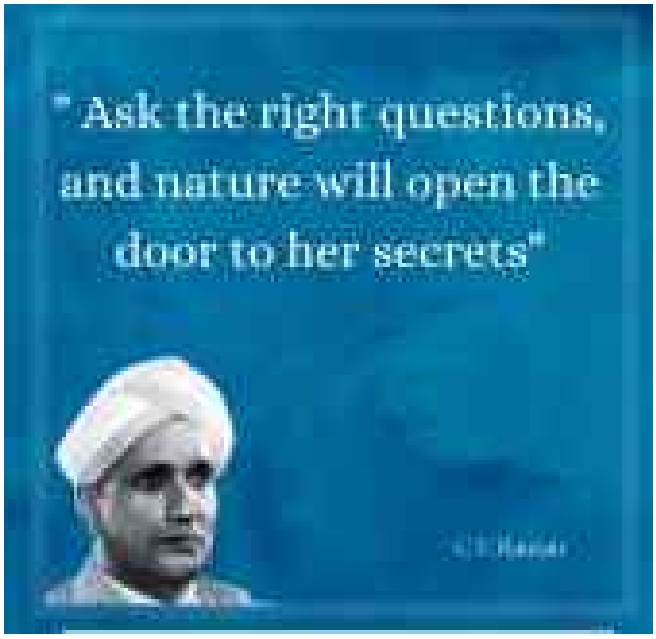
Research Contribution:

Area of Specialization is in Solid State Physics; she has 14 Publications in National and International Journals of Repute. She has guide more than 10 M.Sc student during the period of 2000 to 2012. She has served as Head of Department for more than 12 years at IGEC Sagar (MP), served as Chairperson for Board of studies at RGPV Bhopal (Since 2023), was warden for Girls Hostel between 2013 to 2024 at IGEC Sagar. Other important administrative duties performed at JEC Jabalpur and IGEC Sagar.

Social Impact of the work:

Her area of research is Solid State Physics which is the foundation block of all modern digital technologies. Being a woman in an engineering institution inspires lot of Girls students of rural and semi urban areas of Madhya Pradesh to take admission in Engineering colleges and learn state of the art technologies which is crucial to the development of our country.

Contact : 9993450743, E-mail : vipashamishra@gmail.com



 ISBN:978-81-932733-5-7

Introduction:

Dr. Vaijayanti Govind Asolkar, Associate Professor and Head, Department of Physics, L. A. D. & Smt. R. P. College for Women, Nagpur, India is a distinguished physicist with a strong academic background and a deep commitment to scientific research, education, and social outreach. She has made significant contributions in the fields of structure and bonding, spectroscopy, and has actively promoted scientific temper and education throughout her career.

Vaijayanti Govind Asolkar

Education:

Dr. Asolkar completed her schooling in Bhandara, Maharashtra, and featured in the S.S.C. Merit List. She pursued B.Sc. (1984) from Institute of Science, Nagpur and M.Sc. (Physics) (1986) from P.G.T.D., Nagpur University. She qualified the prestigious CSIR-JRF exam. Later, she obtained her M.Phil. (1992) from the University of Poona, under the guidance of eminent physicist, Dr. Arun S. Nigavekar. She participated in the School on the Use of Synchrotron Radiation in Science and Technology: 'John Függle Memorial' held at International Centre for Theoretical Physics (ICTP), Trieste, Italy. This training was fully funded by IAEA (International Atomic Energy Agency) and UNESCO. Under this programme, she had opportunity to visit the Italian Synchrotron Facility 'Elettra'.

Research Contributions:

Dr. Asolkar's research work spans atomic and molecular spectroscopy, structure and bonding, optics, nanomaterials, and X-ray absorption spectroscopy (XANES/EXAFS), particularly using synchrotron radiation. Her research contributions include original estimations of inter-nuclear distances in several diatomic molecules and C-F bond lengths in fluoro-methanes, which have been internationally recognized and cited in the CRC Handbook of Chemistry and Physics. She has published extensively in reputed international journals and has presented her work at numerous academic and research conferences.

Social Impact of the Work:

A passionate science communicator, Dr. Asolkar has delivered numerous invited and popular lectures on topics in Science & Technology and has been an invited resource person in UGC Refresher Courses. She has actively contributed to the popularization of science, environmental awareness, and elderly care. During 2015–2017, she wrote nearly 100 articles on the life and work of eminent women physicists in the children's magazine 'Twinkle Club' of 'The Hitavada', under the popular page 'Physics Corner'. She organizes student-centric activities such as seminars, science quizzes, exhibitions, and mentoring sessions. She has represented Maharashtra in the XIX All India Civil Services Swimming tournaments, and has won several prizes in essay writing, debates, dance, and dramatics.

Awards and Achievements:

Dr. Asolkar has served as convener/member of various institutional committees such as academics, examinations, library, scholarships, mentorship, and student welfare. She has contributed to organizing several national level seminars and conferences.

She was awarded 2 years UGC fellowship under Faculty Improvement Program for her Ph.D. (2003) research work on "Some Considerations about Electronegativity of Atoms – Applications to Physico-Chemical Properties and Bonding in Some Molecules", under the supervision of Prof. C. Mande and Prof. V. B. Sapre. Being proficient in Marathi, Hindi and English, she also has working knowledge of Bangla and holds a Higher Diploma

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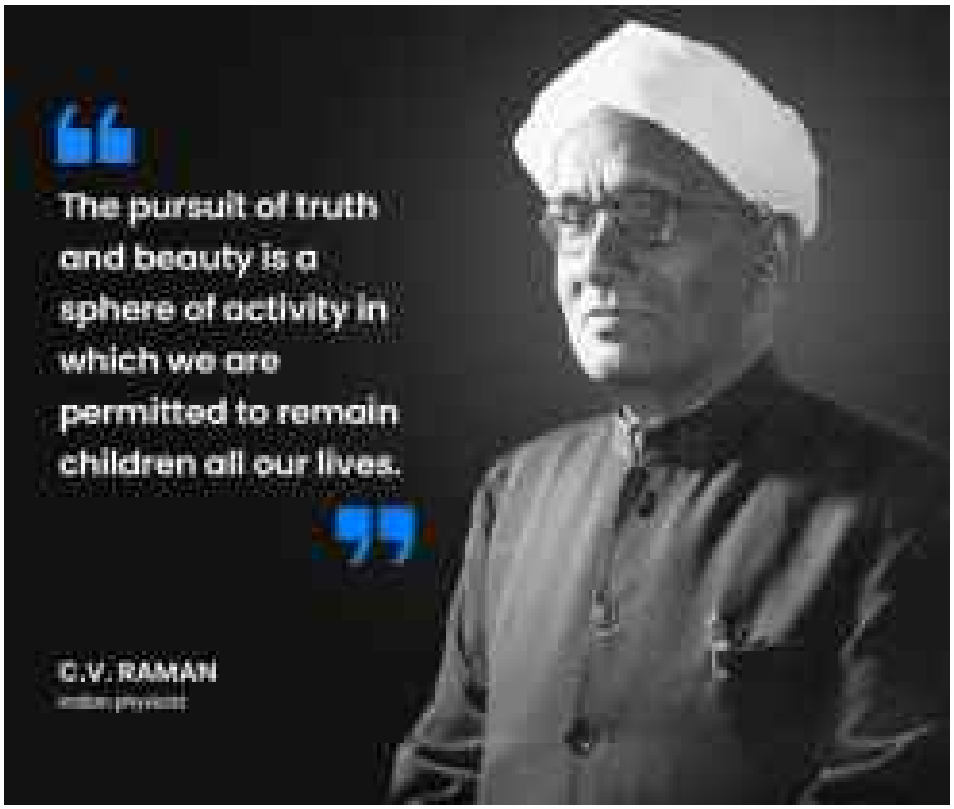
in German. She has been a member of the Board of Studies and Special Task Committee of R.T.M. Nagpur University and has served on faculty selection panels as Subject Expert and Vice-Chancellor's Nominee. She is a life member of Indian Science Congress, Indian Women Scientists' Association (IWSA) and Vidarbha University Physics Teachers' Association (VUPTA).

Message highlighting topics for research for future generations:

Nanomaterials and novel materials represent the future of research, offering key opportunities in synthesis, characterization, structural, computation and quantum computing across STEM.

Contact : +91- 9975229224, E-mail : vgasolkar.lad@gmail.com



 ISBN:978-81-932733-5-7

Introduction:

Dr. Nisha Gupta is an academician and a physicist. She served as associate professor in the Physics department of Gargi College, Delhi University. She was the Head of the Deptt. of Physics in Gargi College, Delhi University for four years.

Nisha Gupta

Education:

Dr Nisha Gupta was born in 1952. She obtained her Ph.D. degree in Fiber Optics from Deptt. of Electronic Science, South Campus, University of Delhi in 1994 with Dr. Enakshi K. Sharma. She completed M.Phil from Chandigarh University in 1984. She did MSc in Physics with a specialization in Electronics in 1972 from the Govt. Science college Jabalpur and BSc from Home Science college Jabalpur in 1970.

Research contributions:

She started her career as a lecturer in Physics in 1984 in DAV College, Chandigarh and then shifted to Delhi in 1987 at Gargi College, Delhi University. She was very actively engaged in teaching and Research. She was the convener for two National level Seminar one was" Optical Fibre based probes" and other was "Human tolerance to Physical and Chemical factors "related to environment. Her research papers were published in International Journals like Journal of Optical Communication USA, other papers were in Journals of United Kingdom and Germany. She has also presented 5 research papers in the National Seminars. She has attended various National and International Seminars.

Awards and Achievements:

She is a sincere and dedicated teacher and an avid reader. She obtained a Gold Medal for standing first in B.Sc in Jabalpur University. She was awarded a Merit scholarship during B.Sc. and M.Sc. course. She taught the IGNOU classes during summer vacations. She worked effectively to make awareness among students about Conservation of Electricity and Conservation of Environment by doing projects and Seminars.

Social impact of her work:

Dr. Nisha Gupta was instrumental in inspiring students to pursue Advanced Add on course on Photonics with the title "Photonics: a Technology for future." She mentored students to present research papers in the National Symposium. She has also done an Interdisciplinary Project with the title "To Device a Cost-Effective Setup for Cell Identification Characterization and Separation", using advanced Technology with Optical Fiber at Delhi university. She also organised Summer Schools on Optoelectronic for students to make them familiar with Advanced Optical Fibre Technology and its Applications.

Message for Future Generation:

As you explore the wonders of physics, remember that curiosity, creativity and perseverance are key. Your discoveries will shape our understanding of the Universe and derive technological advancements. Stay open-minded, collaborate and push the boundaries of human knowledge. The universe is full of mysteries waiting to be unravelled - go forth and make your mark.

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 ISBN:978-81-932733-5-7

Introduction:

Dr. Nisha Pandey is a physicist from India with expertise in Polymers and nanomaterials. She is working as Assistance Professor in Department of Physics, St. Aloysius College, Jabalpur. having 18 years of teaching experience.

Nisha Pandey

Education:

Dr. Nisha Pandey completed her B.Sc. from Govt. Science College, Jabalpur and M.Sc. in Physics from Rani Durgawati University, Jabalpur. She completed her Ph.D. (2014) in Quantum Dot Lasers at Rani Durgawati University under the guidance of Dr. S.K.Pandey and Dr. Meera Ramrakhiani.

Research Contribution:

Dr. Nisha Pandey has 15 years of research experience. She has published 7 research papers in International Peer reviewed journal, 2 chapters in national renowned publications. She has presented 20 research papers in different international and national conferences/seminars. She has also attended and conducted many international and national conferences/seminars/workshops. She is approved Ph.D. guide. She has guided 30 M.Sc. Students for their M.Sc. Projects. 01 student is registered for P.h.D work under her. She has Completed the Minor Research Project entitled "Theoretical study on various parameters of Quantum Dot lasers" sanctioned by UGC.

Social Impact of work:

Dr. Pandey expands students' interests and pushes them to succeed by assisting them in understanding abstract and difficult concepts and exposing them to novel concepts and subjects.

Message highlighting topics for research for future generations:

Promising research areas for physicists of the future include investigating quantum technologies, expanding our knowledge of fundamental forces and particles, and addressing difficult societal issues like energy sustainability and climate change. Condensed matter physics, astrophysics, biology, quantum computing, nanotechnology and quantum information science are important fields that are ready for investigation.

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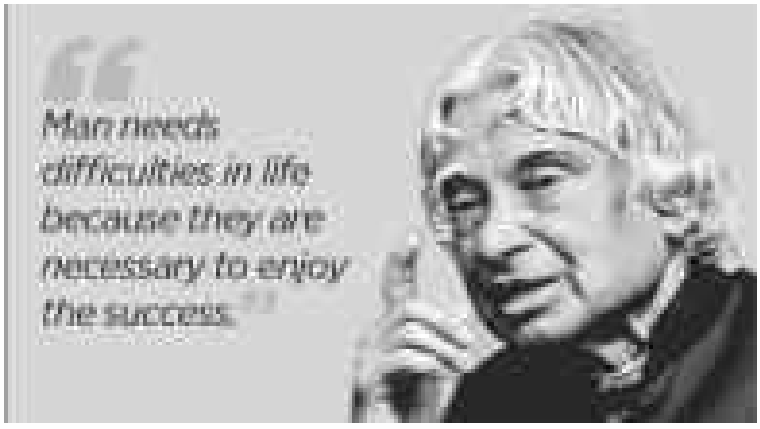

 ISBN:978-81-932733-5-7

Introduction:

Seema Gupta

Dr. Gupta an accomplished physicist, past served as an Assistant professor in Department of Applied Sciences (Physics) at Faculty of Engineering & Technology, Agra College, Agra (UP) India, Born in Shamsabad Agra. She completed her early education in her hometown, excelling in science. A Dedicated Researcher Physicist & Educator in the field of electronics and research field of solid State Physics. With over 17 years of teaching at the undergraduate and postgraduate levels and 20 years research experience. She is currently coordinator of Braj Shakti, Braj Prant (UP) India.

Education:

Dr. Gupta completed her schooling at a UP Board in Shamsabad (Agra) and pursued her B.Sc (Physics, Chemistry, mathematics) and M.Sc in Physics (Electronics) from Agra College, Agra (Dr. B.R. Ambedkar University Agra). She carried out her doctoral work under the supervision of Dr. S.C. Goyal, Ex-HOD, Department of Physics, Agra College, Agra and was awarded Ph.D. in Solid State Physics in 2003.

Research Contribution:

Dr. Gupta has been awarded Research Associateship (CSIR, Pusa Road, New Delhi) under supervision Dr. S.C. Goyal in 2004 at Department of Physics, Agra College, Agra. She has been twice awarded a young scientist project SERC-Fast Scheme, DST-Delhi during Mar. She was twice awarded the Young Scientist Project under the SERC-Fast Track Scheme, DST-Delhi, for the periods 2005–2008 and 2009–2012. She has twenty-one years of research experience. She has worked on Theoretical analysis in the field of Solid-State Physics i.e. Mechanical, Dielectric, Piezoelectric Properties, Equation of State of Solids, Elastic properties of solids Under High Pressure and high Temperature, High Tc Superconductor and Geophysics.

Dr. Gupta has published 30 research papers in reputed international and nation journals alongside more than 85 conferences papers and symposium presentations.

Social Impact of the Research Work:

Her work has scientific community's understanding of Solid-State Physics, Geophysics, thereby contributing meaningfully to both theoretical and experimental.

Message highlighted topics for research inspires:

Science, Spirituality & Gender: Integration of science and spirituality in women's empowerment. Scientific validation of tradition spiritual practices led by women.

Education Empowerment of Girls: Revival of Vedic education system for girls- comparative analysis. Skill-based education for modern Indian daughters based on traditional practices (e.g., weaving, embroidery)

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 ISBN:978-81-932733-5-7

Introduction:

Tapati Dutta

Tapati Dutta is a woman physicist who graduated with specialization in Solid State Physics from the University of Calcutta. She joined as an Associate Professor in the Physics Department of St. Xavier's College, Kolkata, being the first lady professor of the department. She continues to teach at the institute while being involved in active research spanning over the last 35 years.

Education:

Tapati Dutta completed her B.Sc. (Physics Honours) with a first class from Bethune College, Kolkata under the University of Calcutta, and her M.Sc. (Physics) from the Rajabazar Science College, University of Calcutta, with a specialization in Solid State physics. Upon her graduation, she immediate joined as an Associate Professor in the Physics Department of St. Xavier's College, Kolkata, under University of Calcutta. While teaching full-time at St. Xavier's College, she completed her Ph.D. on 'Anisotropy in polycrystalline materials" from Jadavpur University in 1995.

Research Contribution:

Dr. Dutta has been teaching physics to undergraduate and graduate students, along with Ph.D. guidance in Physics along with an active research contribution for the last 35 years. Her research interests cover several areas of physics - Physics and application of Drying droplet, Desiccation Crack, Self organisation in disordered systems, Fractals and multifractals, Porous media; sedimentary rocks and their transport properties, Hydrodynamics, Modelling non-linear and disordered systems, Topological mapping of dynamical systems and have contributed to the completion of Ph.D. of 11 students. Her research mainly involves modelling and simulation, experiments and some analytical methods and has resulted in 114 research publications in top international peer reviewed journals, 1 book and 4 book chapters. She has over 1950 citations, an h-index of 23 and i10-index of 42. She is a member of the Academic Committee of Condensed Matter Physics Research Centre, Jadavpur University, India and of Indian Society of Non-linear Analysis, India. Dr. Dutta has acted as Principal Investigator co-Principal Investigator in several national and international projects, been invited to present papers at national and international conferences and acts as reviewers to many journals of repute. Dr. Dutta has held several administrative positions that include, Head of Department, Dean of Science, Ph.D. Co-ordinator, Research Convenor, Academic Council member and Coordinator of a Diploma course on Medical Physics which is a collaboration between St. Xavier's College, Kolkata, and Tata Medical Centre, Kolkata. Dr. Dutta has spearheaded several facilities in her institution that include the revamping of the Observatory originally created by a Jesuit, Fr. Lafont, to a mechanised and modern observatory; establishment of a Central Research Facility, setting up the Ph.D. course, introduction of Microsoft Teams as a platform for online education and facilitating the academia-industry collaborative venture with Tata Medical Centre, Kolkata. She was instrumental in introducing multidisciplinary papers in the PG curriculum of St. Xavier's College, an undisputable necessity of today.

 ISBN:978-81-932733-5-7

Introduction:

Dr. Savita Sharma is presently working as Assistant Professor, Kalindi College, University of Delhi.

Savita Sharma

Education:

Dr. Sharma holds a Ph.D. in Material Sciences from Delhi Technological University, M.Sc. in Physics with a specialization in Electronics from Hindu College, University of Delhi, and a B.Ed. from GGSIPU. Her academic journey reflects a strong foundation in physics and a deep engagement with interdisciplinary scientific exploration.

Research Contribution:

Her core research areas include nanotechnology, thin film technology, ferroelectric materials, memory devices, solar cells, and sensors. She has published over 50 peer-reviewed research papers in reputed international journals and contributed towards 6 book chapters with Elsevier, Springer, and Nova Science. She is a co-inventor of two Indian patents involving biosensor technologies for disease detection in crops.

Awards and Achievements

Dr. Sharma was awarded a DST International Travel Grant for presenting her work abroad. She had secured all India Rank 1 in the CSIR-NET (Dec 2024), qualifying GATE and CTET, and receiving the Best Oral Presentation award at an international symposium.

Social Impact of the work:

Her work in developing affordable biosensing technologies and sustainable polymer solutions demonstrates a commitment to societal welfare, particularly in healthcare, agriculture, and environmental monitoring. She also contributes to educational innovation by mentoring students, developing e-content, and actively participating in outreach through seminars and workshops.

Message highlighting topics for research for future Generations:

Dr. Sharma urges future researchers to explore green technologies, biodegradable materials, AI-driven material science, and energy-efficient devices—advancing technology while supporting global sustainability.

Let curiosity guide you, and let your innovations serve science and society.

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"The main function of a university is not to grant degrees and diplomas but to develop the university spirit and advance learning."

- Dr. Sarvepalli Radhakrishnan

 ISBN:978-81-932733-5-7

Sadhana Agrawal

Introduction:

Dr. Sadhana Agrawal is currently Professor (HAG) of Physics at National Institute of Technology, Raipur, India. Professor (HAG), Department of Physics NationalInstitute of Technology Raipur Raipur – 492010,

Education:

Sadhana completed her bachelor's and master's degree in Physics from Rani Durgavati Vishwavidyalaya Jabalpur, India And Obtained M. Phil. (1984) And Ph.D. (1990) In Physics From the same university. Her Ph.D. title is "Charge storage and transport studies in pure and iodine doped polystyrene thermo electrets". She achieved University gold medal for ranking first in M.Sc. Physics in the year 1983 and awarded Junior Research Fellowship, UGC in 1983. She has served in various positions in Govt. Engineering College Jabalpur, in Govt. Engineering College Raipur, and National Institute of Technology Raipur from 1985 to till date. During her tenure she has dedicated to creating a supportive and stimulating academic environment.

Research Contribution:

Her Research Interests includes Electronic, Optical, Electrical and Dielectric properties of ceramics, Luminescence and its applications in the field of radiation dosimetry, Nano Composites, Polymer thermo electrets etc. She has more than 40 years of Research, PG and UG teaching experience. She has supervised 10 Doctoral theses. She has published more than 75 research articles in peer reviewed international and national journals and 4 books/book chapters. Also, she has published about 55 research papers in international and national conference proceedings. She is reviewer of various reputed international and national journals. She has visited USA, UK, Thailand, and Malaysia etc. for delivering talks.

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I Believe That Modern Physics Owes Much of Its Remarkable Progress Through Recognition of The Same Concepts (ancient Indian Philosophy) And Through The Discovery of A Mathematical Framework Within Which They Could Be Quantitatively Formulated.

- Vikram Sarabhai

 ISBN:978-81-932733-5-7

Rashmi Jaiswal

Introduction:

Dr Rashmi Jaiswal involved in teaching for the last 19 years. Presently working in St Aloysius Institute of Technology Education Gaur, Jabalpur. She has worked at various capacities in Academic and Administration in several colleges.

Education:

She has completed her M.Tech in Nanotechnology (Gold Medalist) M.Sc in Physics, PhD in Physics from RDVV Jabalpur.

Research Contribution:

She has one patents to her credit for "A method for Mathematical modelling of the responses of focus group participants" in accordance with section 44(1) of the patent Act No. 57 of 1978, Republic of South Africa. She has published some Books: Polymer Nanocomposites- Emerging Trends in Polymer Nanocomposites, Scientific Approach for Self-Reliant India'–Role of Education in making India Self Reliant and Globally competent, –'Shiksha aur Atmanirbhar Bharat'. She is an Editorial Member of Edwin Group of Journal and has Life Membership of STAMI (Society for Technologically Advanced Material, India) and Luminesence Society of India.

Awards and Achievements:

She is a recipient of Research Excellence Award AOTA 2023 in the category of Electronics and Condensed matter Physics IN International Conference on Advanced Optimization Techniques and Application, Ramgarh Engg College, Jharkhand, Winner of International Young Scientist Congress Award mid -Western University Surkhet, NEPAL, MAY 2019.

Message for future Generations:

Science research is a fantastic way to develop critical thinking, problem-solving, and analytical skills – skills that are valuable in any field. "Engaging in science research, especially in nanotechnology, can open doors to exciting career paths and opportunities you may not have even considered yet. Your curiosity and passion for science are valuable assets. Let's channel them into meaningful research and make a difference in the world.

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Introduction:

Dr Pratima Parashar Pandey is an academician and Scientist in the field of Materials Science and Nanotechnology. She has been Professor of Physics, School of Basic and Applied Sciences, IILM University, Gr. Noida, Uttar Pradesh.

Pratima Parashar Pandey

Education:

Dr. Pandey has obtained B.Sc. degree in Pure & Applied Mathematics and Physics Rani Durgavati University, Jabalpur (RDVV). She secured M.Sc. degree in Electronics and Solis State from RDVV. She has been awarded a P.hd. degree from RDVV under the supervision of Dr. S.C. Datt.

Research contributions:

After completion of her doctorate degree, she did her post doctorate from RDVV and Thapar Institute of Engineering and technology (deemed University) in the field of Materials science. She has carried out her project in the field of Nanotechnology at Mangalore University Mangalagangotri. She has been in the teaching field across India for more than twenty-five years. Lately, she is a Professor in the Department Of Physics, School of Basic and Applied Sciences, IILM University, Greater Noida. In her career, she has published thirty-one research papers, four chapters and two books. She has got a patent as well. She is lifelong member of Materials Science Society.

Awards and Achievements:

She has received National Scholarship through her student life. She has been awarded Junior Research Fellowship for doing her P.hd. She has been awarded an UGC, New Delhi Research Associate ship for carrying her post doctorate work. She has been awarded a Women Scientist Project from DST, New Delhi for implementing her project at Mangalore University Mangalagangotri.

Social impact of her work:

She has been a key member for setting of various physics labs as a part of new established Institutions. During her long span of teaching and researcher, she was Assistant, Associate Professor. She was Professor and Head of Department of Physics,School of Basic and Applied Sciences, IILM University, Greater Noida for a long period. She has been reviewer, Editor, technical programme member and invited speaker for many international and National conferences.

Message Highlighting Topics For Research For Future Generations:

Metal nanoparticles deposited on polymer composite, their characterization, Morphology, and applications.

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 ISBN:978-81-932733-5-7

Introduction

Dr. Rekha Suhas Joshee retired as an Associate Professor from Fergusson College, Pune

Education

She completed her M.Sc. in Physics and went on to earn a Ph.D. in Materials Science on the topic 'Conversion Electron Mossbauer Spectroscopic study of ion beam induced atomic mixing in some iron based binary systems'.

Rekha Suhas Joshee

Research Contribution

Her area of research was Materials Science, with a focus on binary systems such as Fe-Si, Fe-Mo, and Fe-Ag. She published three papers in renowned international journals, including two in Journal of Applied Physics and one in Thin Films and Interfaces II. After completing her Ph.D., she continued her research at the Physics Department of Fergusson College, working on complex systems such as LCMO and LSMO. This work was reported in three additional international publications, including two in Materials Letters and one in Ceramics International. She has authored multiple chapters on 'Foundations of Physics' for first year Engineering Students.

Social Impact of the work

In her post-retirement years, she has been associated with a group dedicated to improving the quality of education in schools in remote areas. Solid teaching material has been prepared under this initiative and made freely available to students and teachers through the internet. Content in Physics and Mathematics for standards 8 to 10 has been written by her with an emphasis on conceptual clarity, supported by visuals such as pictures and videos. Whenever teachers are unavailable, online teaching has also been undertaken by her to support students.

During her college tenure, along with regular teaching, students were prepared for academic competitions, quizzes, lectures, essays, and laboratory skills organized by the Indian Physics Association. This included their training, preparation for multiple competitions, the organization of inter-college events, and her service as a judge at various competitions. Since the college drew students from diverse social and financial backgrounds, their academic and personal challenges were understood and addressed whenever needed.

At present, as part of her contribution to improving rural education, students are also encouraged to participate in various competitions. The improvement in their examination results has been one of the most rewarding outcomes of her efforts.

Message highlighting topics of research for future generation:

Currently environmental changes, alternative energy sources or developing new materials to replace conventional batteries, nanotechnology for development of novel materials, use of quantum mechanics for quantum computing are frontline research areas in Physics. Good opportunities are available in the country for students to pursue research in pure science.

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 ISBN:978-81-932733-5-7

Introduction:

Dr. Dipti Jha is a Professor of Physics at Dr. R.B. Government Navin Kanya Mahavidyalaya, Raipur, Chhattisgarh. With a distinguished career span of nearly four decades, she has made significant contributions to scientific research, higher education, and academic leadership.

Dipti Jha

Education:

Dr. Jha's academic journey began with a Master of Science (M.Sc.) in Physics, followed by a Doctor of Philosophy (Ph.D). Her doctoral thesis, titled "Studies on Photoconducting Properties of Some II–VI Compounds," explored the electrical and optical behavior of semiconductor materials, contributing valuable knowledge to the growing field of material sciences and thin film technologies.

Research Contribution:

Dr. Dipti Jha's research interests focus on photoconductivity, thin film fabrication, and the behavior of rare-earth doped materials. Her major contributions include 17+ research papers in reputed journals and conferences with key publications in journals like Materials in Electronics and Indian Journal of Pure and Applied Physics along with participation in national and international seminars on luminescence, material science, and environmental challenges. Her research work provides important insights into the development of new materials with applications in electronics, energy, and environmental sustainability.

Awards and Achievements:

Dr. Jha was awarded several leadership and academic services in the institute. She has organized and coordinated several national workshops, with special focus on sustainable environmental practices, role of women in science and education, emerging trends in materials research. She has co-authored two books on Indian classical music theory - Sangeetika Pratham and Sangeetika Dvitiya, alongside Shri Sharad Chandra Bhoke, an esteemed music educator that has been recognized as a part of the syllabus of Indira Kala Sangeet Vishwavidyalaya, Khaeragarh, thus, transcending disciplinary boundaries. Dr. Jha's contributions to education and community service have been recognized with Samman Patra by the Inner Wheel Club of Raipur (2010) for contributions to education and Samman Patra by Rakt Daan Maharastra Mandal, Raipur (2013) for community service.

Social Impact of the work:

Dr. Jha has initiated and participated in several programs like - Nutrition support drives for tuberculosis patients, Mental health awareness programs focused on stress management, Installation of public utilities like water coolers, Awareness workshops on sustainable living and environmental protection. Her work reflects a consistent dedication to both scientific excellence and social responsibility.

 ISBN:978-81-932733-5-7

Message highlighting topics for research for future generations:

"Science must be driven not only by curiosity but by compassion — to create technologies and solutions that improve lives and protect our environment. To the young women aspiring to build a career in STEM: embrace learning, persevere through challenges, and believe in the transformative power of your work. Innovation, when combined with empathy, has the power to create a better future for all."

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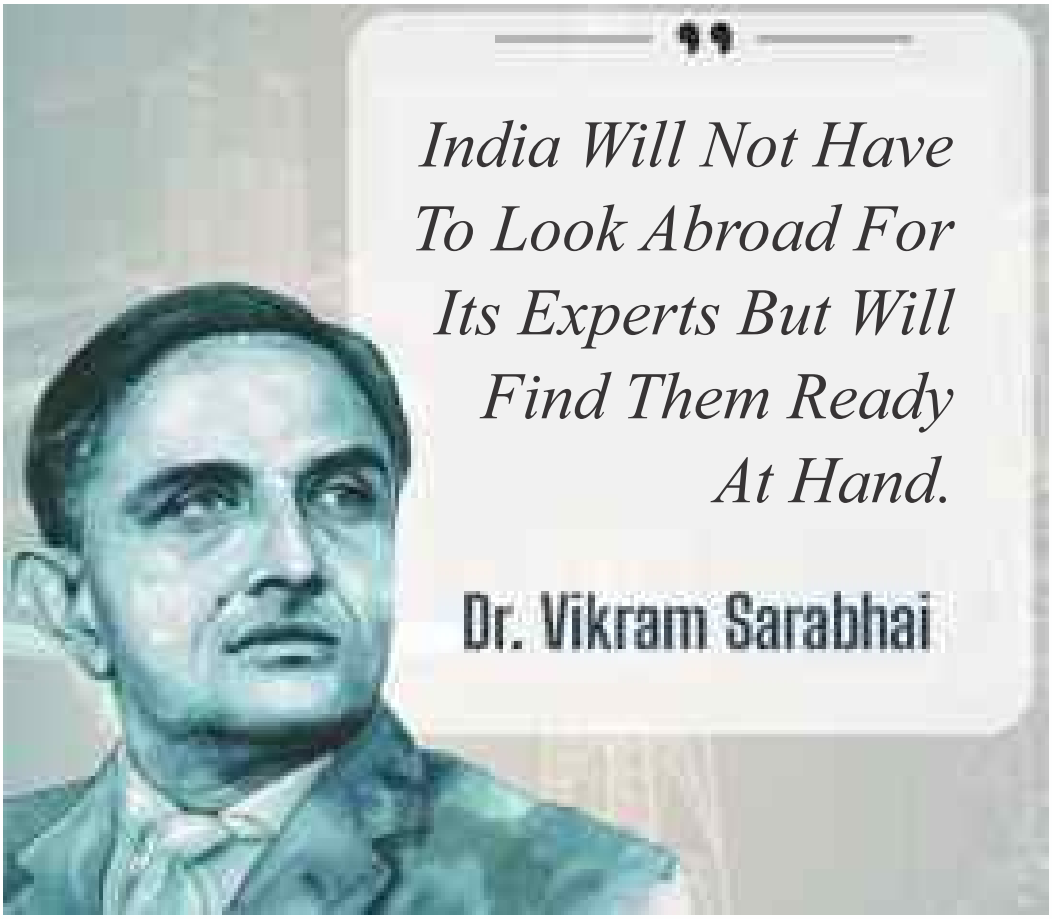

Introduction:

Dr. Rekha Agarwal is serving as a Professor in the Department of Physics, Government Science College, Jabalpur.

Rekha Agarwal

Education:

Dr. Agarwal did her Master of Science in Physics (1987) with specialization in Digital Electronics,

M. Phil Research Degree (1989), PhD (2002) on Space Science. RDVV, Jabalpur.

Research Contribution:

She has published 103 research papers in Journals (2002-2024), 10 at National Conference and 94 at International Conferences. She has authored 06 Books and a Book Chapter. She has reviewed nanotechnology books.

Award & Achievements:

She received Teacher Research Fellowship UGC (2002). She has attended several Conference/ Workshop/Seminar/Symposium. She has attended workshop on "Integral Human Science" organized by Government Model Science College (Autonomous), Jabalpur, on Promoting Technology Development, Utilization and Transfer in Mahakoshal Region jointly organized by Department of Scientific and Industrial Research, New Delhi and Tropical Forest Research Institute, Jabalpur, "E Learning and Effective Teaching" sponsored by UGC, New Delhi and organized by Academic Staff College, Rani Durgawati University, Jabalpur. National seminar on "Progress in life science for human welfare" sponsored by University Grants Commission, CRO Bhopal and organized by Govt. Model Science College, Jabalpur. She organized workshop on "Semester Systems" organized by the Govt. Science College, Jabalpur during 27-28th October 2006.

Social impact of the work:

She is a Life member of Indian Physics Association. Women Scientist Association, Plasma Science Society of India, Division of Plasma Physics and Association of Asia Pacific Physical Societies (AAPPS-DPP).

Message highlighting topics for research for future generations:

Nanotechnology, Cosmic rays, geomagnetic activity, Space Weather Perspective, recent solar cycle. GIS in Agroforestry. Digital Electronics and Space Science.

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 ISBN:978-81-932733-5-7

Introduction:

Prof. Sunita Gupta is a distinguished academic in the field of Nuclear Physics, with a specialized focus on Nuclear Reaction Dynamics. With 27 years of teaching and research experience at the UG and PG levels, she is currently a Professor of Physics at Agra College, Agra.

Sunita Gupta

Education:

Prof. Gupta completed her schooling at a convent school in Aligarh and pursued her B.Sc. and M.Sc. in Physics from Aligarh Muslim University (A.M.U.), where she emerged as the university topper at the undergraduate level. Her academic brilliance earned her several accolades including the Ishrat Usmani Science Award, J.D. Dheer Science Award, Raja Jai Kishan Das Medal, and three additional university medals. At the postgraduate level, she was awarded the F.D. Murad Imamuddin Medal and a National Merit Scholarship under the UGC-DSA program.

She carried out her research under the mentorship of Prof. R. Prasad at A.M.U., focusing on nuclear reaction dynamics involving heavy ions, in collaboration with the Inter University Accelerator Centre (IUAC), New Delhi.

Research Contribution:

Prof. Gupta has published 15 research papers in reputed international and national journals, alongside more than 40 conference papers and symposium presentations. She began her academic career in1996, teaching at the Women's College and Department of Physics, A.M.U., and in 1999, joined Agra College through UPHESC, where she continues to teach and mentor. A life member of several professional and academic bodies such as IPA, AHA, IAPT, ISCA, and Vigyan Bharti, Prof. Gupta has contributed significantly to the DST-FIST program at Agra College, promoted ICT-based teaching methods, and played a vital role in curriculum design for vocational courses at the UG level. She is also a Ph.D. supervisor, an invited subject expert, judge, and instructor at various academic events, and remains actively involved in research.

Social impact of the research work:

Her work has enriched the scientific community's understanding of nuclear reaction mechanisms, thereby contributing meaningfully to both theoretical and applied nuclear physics.

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" One best book is equal to hundred good friends,
but one good friend is equal to a library."
- A. P. J. Abdul Kalam

 ISBN:978-81-932733-5-7

Bhavana Singh

Introduction:

Dr. Bhavana Singh is a physicist working as an Associate Professor in the Department of Applied Physics at Jabalpur Engineering College, Jabalpur, for the last 18 years.

Education:

She earned her M.Sc. in Physics from Vikram University, Ujjain. She was awarded her PhD under the guidance of Dr. S.B. Srivastava on the topic entitled "Slow Positron Studies in Surfaces and Nanoparticles (Preparation and Characterization of Nanomaterials)" from Vikram University, Ujjain, in 2008.

Research Contribution:

Dr. Bhavana is active in the field of nano materials, specifically in the synthesis and characterization of nanoparticles and thin films, to explore their potential applications in memory devices. More than 20 research papers have been published in various reputed international and national journals. According to Google Scholar and Research Gate, her h-index is 9 and her i10-index is 8, with over 240 citations to date. She has more than 20 years of teaching experience at both graduate and postgraduate levels. A research project awarded under TEQIP collaborative research scheme, India titled "Investigation of Proximity Effect Between Mixed Ortho Ferrite and YBCO Hetero-structure " has been successfully completed. She has organized a five-day course on " Nanomaterials: By Design for Energy Applications " in 2022, approved by the Global Initiative on Academic Network (GIAN) under MHRD India. She has also co-organized national and international conferences, served as a session chair at various technical events, and delivered several expert lectures based on her research field.

Social Impact of the Work:

Through her teaching style, she has influenced students to pursue their careers, and many of them are now successful and working in their dream jobs.

Dr. Bhavana is a life member of the Indian Association of Physics Teachers, Nano and Molecular Society of India, Solar Energy Society of India, and the Indian Physics Association. She is also a member of the Board of Studies (Physics) at RGPV Bhopal.

Message for Future Generations: Consider every challenge an opportunity to become stronger and move towards your dreams with enthusiasm and courage; surely, you will find success.

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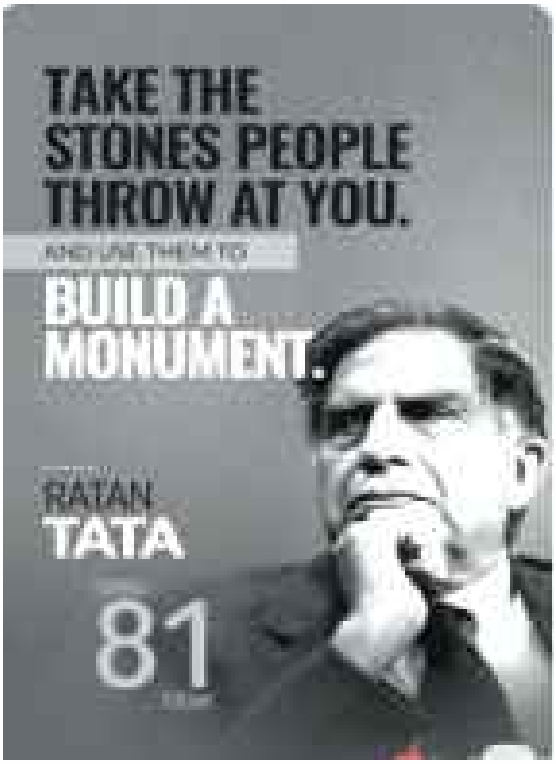

 ISBN:978-81-932733-5-7

Introduction:

Dr. Kirti Vishwakarma is an Indian physicist and academician. She is currently serving as the Principal of Gyan Ganga College of Excellence, Jabalpur, Madhya Pradesh. She has been former Professor and Head of the Department of Physics and Nanotechnology at Gyan Ganga College of Technology, Jabalpur.

Kirti Vishwakarma

Education:

Dr. Kirti, born in 1974, earned her Ph.D. in Physics from Rani Durgawati University in 2008 under the mentorship of Dr. Meera Ramrahiani. She completed her M.Sc. in Physics in 2000 from RDVV, Jabalpur. She has also completed three years polytechnic diploma in Electronics and Telecommunication with first class. Her areas of interest include Nanotechnology, Laser Physics, Quantum Well and Quantum Dot Lasers, and Material Science.

Research Contributions:

Dr. Kirti began her career as a lecturer in Physics in 2000. Over the past 24 years, she has been actively engaged in teaching and research, including introducing a postgraduate course in Nanotechnology. In 2018, she joined Gyan Ganga College of Excellence as Principal under Code 28. Apart from Nanotechnology, she teaches Laser Physics, Quantum Physics, Condensed Matter Physics, and Material Science. She has supervised over 18 M.Tech students. She has contributed significantly to research, publishing numerous articles in reputed journals. Her research work includes over 50 research papers in national and international journals, along with more than 70 papers presented at various national and international conferences. Additionally, she has authored six books. Dr. Kirti has also organized and participated in multiple national and international seminars, conferences, workshops, and short-term training programs.

Awards And Achievements:

Dr. Kirti is deeply dedicated to her work. She was appointed as the District Sustainable Mentor (DSM) by MGNCRE for the Jabalpur region. She is a former Vice Chairman and a lifetime member of the Institution of Electronics and Telecomm engg. (IETE). Additionally, she has been honored multiple times by the District Collector for her efforts in the Swachhta Campaign and voter awareness initiatives.

Social Impact:

Dr. Kirti has been instrumental in fostering the holistic development of students, inspiring them to pursue advanced learning across various academic disciplines to secure a promising future. Her forthcoming textbooks, Nanotechnology and Its Applications and Physics Beyond Classical Theory, highlight her expertise and dedication to cutting-edge research.

Message Highlighting Topics for Research for Future Generations:

Condensed matter, polymer physics, Electronics, Nano physics, opto-electronics.

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 ISBN:978-81-932733-5-7

Introduction:

Dr. Preeti Pathak is an Indian Physicist who specializes in the field of Nanotechnology and solar cell. Owning a Teaching experience of 27 years she is presently serving in Mata Gujri mahila Mahavidyalaya Autonomous as Associate Professor and Head of the Department of Physics. Owning a Teaching experience of 27 years.

Preeti Pathak

Education:

Dr. Preeti Pathak obtained a B.Sc and M.Sc Physics degree from Govt. Home Science college. She earned a Ph.D degree in Nanotechnology from Rani Durgawati University under the Supervision of Dr. P. Mor and Dr. Meera Ramrakhiani.

Research Contribution:

After serving as PGT Physics in Arya Kanya Higher Secondary School She joined Mata Gujri college as Assistant professor in Mata Gujri Mahila Mahavidyalaya Autonomos Jabalpur in 1999. In the year 2007 Preeti took in charge as Head of the department of Physics in the college. Subsequently in 2022 she got promoted to the post of Associate professor in the college. Preeti in her carrier authored 11 research paper in International Peer reviewed journal, 5 books, 15 Lab Manuals from Indian publication and 2 chapters in international renowned publication.

Award and Achievements:

National Award for Best Educationist. This award was given by Society for Technological Advance Materials of India (STAMI). Nodal Centre coordinator of IIRS-ISRO outreach Programme since July 2020.50 certificate courses were coordinated in which approximately 60 students got participation certificate and 8 got Merit certificate. Chairperson of Board of Study of Physics (9 years). Board of Study member of Maharshi Mahesh Yogi University Jabalpur as a subject expert since, 3 years. Certified Faculty of IGNOU since 2007 (18 years). Head of the Department since 2007(18 years). Keynote speaker of National Webinar. E-Content Creator and video upload in LMS portal for Higher Education Department. Convener of International Conference, National webinar. Nodal Center Coordinator of MP Urja sakshrata Abhiyan 2022-23 to till now.

Social Impact:

Teaching in a girls' college in Jabalpur since 1999 Preeti promotes and fosters social change by empowering women, promoting gender equality, and impacting community development by educating future leaders and healthcare providers, ultimately contributing to a more equitable and prosperous society. Female teachers serve as positive role models, demonstrating the capabilities of women and inspiring students to achieve their full potential.

Message highlighting topics for research for future generations:

Future research should focus on critical areas like sustainable development, ethical AI Explore the ethical implications of artificial intelligence (AI) in various sectors, including healthcare, education, and governance, climate change solutions, Quantum Computing and Emerging Technologies, Renewable Energy and Sustainable Resources, Sustainability and the Environment, AI in problem solving Techniques of Physics. AI in research Methodology Techniques and equitable access to education and resources, ensuring a better future for all.

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 ISBN:978-81-932733-5-7

Ramneek Kaur

Introduction:

Dr. Ramneek Kaur is an Indian Physicist who specializes in the field of Lyoluminescence. Owning a Teaching experience of 27 years she is presently serving in Mata Gujri mahila Mahavidyalaya Autonomous Jabalpur (M.P.).

Education:

She graduated from Hawabag College Jabalpur M.P. (1993) and postgraduate in Physics from Govt science college Jabalpur M.P. (1995). She was awarded Ph.D (Lyoluminescence) from RDVV Jabalpur in March 2006.

Research Contribution:

Dr. Ramneek Kaur in her career authored 06 research paper in international journal, 01 research paper in national journal,7 books, 4 Lab Manuals from Indian publication and 4 research paper in book of renowned publication. Participated in International /National level Conference /seminar with paper(s)-20. She worked as Coordinator/Co-coordinator/ Organizer in National Conferences/ Webinar/ Workshop/ SDP/.

Award and Achievements:

She held numerous administrative posts in her carrier some of them are Exam Controller (MGMM), Administrative officer in MGMM from 2023. Head of Department of Physics from 1 November 2019 to 6 Jan 2021 (MGMM) Jabalpur (M.P.). She was Chairman for Board of Studies, Physics MGMM(Auto.) Jbp. In July 2021 she was Superintendent of Examination of RGPV (BE/MCA GRKIST), she was Head of department of Physics (GRKIST) Jabalpur. Member of Board of Governors of Guru Ramdas Khalsa Institute of Science and Technology, Head of department of Applied Science (GRKIST) Jabalpur (M.P.). Member of Various Committee at MGMM/ GRKIST Jabalpur (M.P.)

Social Impact of the work:

Lyo-luminescence is not directly apparent to the general public, but it has significant scientific and technological implications that can lead to broader social benefits. Forensic Science and Crime Investigation improved tools for law enforcement, leading to more accurate crime scene analysis and potentially higher crime resolution rates. Radiation Dosimetry and Safety is valuable for workers in nuclear plants, medical radiology, and during nuclear accidents, enhancing public health and safety. These indirectly benefit society by advancing technology and improving quality of life.

Message Highlighting Topics for Research for Future Generations:

For future generations, who are interested in luminescence, the exploring topics are Forensic application, Radiation Dosimetry, Medical Diagnostics, Nano-scale mechanism.

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 ISBN:978-81-932733-5-7

Neelam Gupta

Introduction:

Dr. Neelam Gupta is an Indian Physicist, specializes in Condensed Matter Physics and an experienced educator. She is presently working at Government Girls college Kishanpole, Jaipur. (Higher Education, Government of Rajasthan, Jaipur) as a Professor (Physics).

Education:

Dr. Neelam Gupta obtained B.Sc. and M.Sc. Physics degree from University of Rajasthan, Jaipur (Rajasthan). She earned a Ph.D degree in year 1992 from Department of Physics, University of Rajasthan, Jaipur specializes in Condensed Matter Physics.

Research Contribution:

She has published total 28 Research papers published in National and International Journals. One minor research project "Study On Thermal And Mechanical Properties On Cnt/ Polymer Composites" completed in the year 2013. She has Published 22 Textbooks (National Publisher)

Award and Achievements:

Awarded Best paper Presentation in Multi-Disciplinary International conference sponsored by ICSSR at St Xavier's College, Jaipur held on 18-19 February 2022. Dr. Neelam Gupta is a distinguished professor in the Department of Higher Education, Government of Rajasthan, with a Ph.D. in Physics and a strong academic and research background. My primary area of expertise lies in condensed matter physics, where She has made significant contributions through both theoretical and experimental work. Throughout her career, she has fostered interdisciplinary collaboration, notably with the field of chemistry, enriching her research and opening new avenues in material science and nanotechnology. In recent years, she has expanded her focus to study the impact of COVID-19 on human health, integrating scientific perspectives from physics, chemistry, and biology to understand the broader implications of the pandemic. As a passionate educator and researcher, she continues to mentor students, lead innovative research projects, and contribute to the advancement of science in higher education. As a prolific academic author, she has published around 20 textbooks for undergraduate students, which are widely adopted in higher education curricula.

Social Impact of the work:

Dr. Neelam Gupta promotes social change by empowering women, promoting gender equality and impacting community development by educating girls in government college.

Message highlighting topics for research for future generations:

The impact of COVID-19 on human health, integrating scientific perspectives from physics.

Comprehensive and critical evaluation of the impact of COVID-19 on scientific research and funding.

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 ISBN:978-81-932733-5-7

Anita Shukla

Introduction:

Dr. Anita Shukla has been serving as an Assistant Professor of Physics since 1993 at Govt. V.Y.T. PG Autonomous College, Durg, which is affiliated to Hemchand Yadav University, Durg, Chhattisgarh.

Education:

Dr. Anita obtained her Ph.D. in Physics from A.P.S. University, Rewa (M.P.) in 2017, with her thesis titled "Solar variability and their effect on cosmic ray modulation during 22-23 solar cycles." She completed her M.Sc. in Physics from A.P.S. University, Rewa (M.P.) in 1988, and her B.Sc. with subjects Mathematics, Physics, and Chemistry in 1986.

Research Contribution:

Dr. Anita's research areas include Astrophysics, with a focus on cosmic ray modulation, geomagnetic storms, and the relationship between cosmic ray intensity and solar-interplanetary parameters. She is currently guiding two Ph.D. scholars. She has published 9 research articles in reputed national and international journals, and 14 articles in various seminars and conferences.

Awards and Achievements:

Dr. Anita Shukla has served in various academic and administrative roles, including Convenor of the Physics Society, Examination Coordinator, and Convenor of the Women Cell. She was a judge at the Chhattisgarh Council of Science and Technology in 2023 and has also chaired sessions at various national and international conferences.

Social Impact of the Work:

Dr. Anita actively promotes Physics education and awareness by delivering lectures, organizing workshops, and mentoring students through various outreach programs. She also facilitates digital learning through her YouTube channel, which engages a growing community of over 300 subscribers.

Message highlighting topics for research for future generation:

To the aspiring researchers of tomorrow, your journey begins with questions. Never underestimate the power of curiosity. Research opportunities, whether big or small, are stepping stones toward deeper understanding, problem-solving, and societal impact. Embrace research not just as an academic exercise, but as a mindset. Seek out opportunities in your colleges, collaborate with your peers, reach out to mentors, and don't be afraid to take initiative. The best researchers are not those who had everything handed to them but those who made the most of what they had.

Let your time in labs and libraries mold you, not only into a scientist, but into a thinker, a problem solver, and a contributor to a better future.

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Suparna Roy Chowdhury

Introduction:

Dr. Roychowdhury is Assistant Professor in Physics at St. Xavier's College (Autonomous), Kolkata, India, affiliated with the Post-Graduate and Research Department of Physics.

Education:

Dr. Roychowdhury completed her B.Sc. and M.Sc. in Physics from Jadavpur University between 1995 and 2000, and Ph.D. in 2006 under the supervision of Prof. Biman B. Nath at the Raman Research Institute, Bengaluru, in the field of Astronomy and Astrophysics.

Research Contribution:

Dr. Roychowdhury's core research lies in astrophysics and cosmology, focusing on accretion disks, dark matter, non-linear and galactic dynamics. She has broadened her research into interdisciplinary areas such as mathematical biology and disease modelling. Currently supervising two Ph.D. students, with one nearing submission. Her work has been published in approximately 30 front-end peer-reviewed journals and book chapters, with 276 citations. Notable contributions include the paper "Shining Bright: AI-Driven Classification of Stars, Galaxies, and Quasars," and significant studies on chaotic behavior in pseudo-Newtonian compact objects.

Awards and Achievements:

She received the Annual Award for Merit in Academic Activities from the Jadavpur Alumni Association (N.C.E. Bengal) in 1998.

Social Impact of the Work:

Through outreach initiatives at St. Xavier's College, she actively involves students in astronomy projects, particularly low-cost telescopes, to bring astrophysics closer to underprivileged youth in Kolkata. She serves as the Professor-in-Charge of the Xaverian Astronomical Society and mentor students to cultivate scientific temper. She has co-organized a teacher training workshop under the IAU-OAE, with partners including Presidency University and Modern High School International, promoting effective astronomy education.

Message for Future Researchers:

The future of science lies in collaboration and cross-disciplinarity. She encourages young researchers to explore intersections between physics, data science, and life sciences. Emerging areas such as AI applications in astrophysics, climate modelling, and pandemic simulations hold tremendous promise. Passion, curiosity, and integrity must guide scientific exploration for societal advancement.

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 ISBN:978-81-932733-5-7

Richa Saxena

Introduction:

Dr. Richa Saxena is a highly respected academician with over a decade of experience in the field of Physics. She currently holds the dual roles of Assistant Professor in the Department of Physics and Assistant Dean at the Directorate of International Affairs at Shri Guru Ram Rai University, Dehradun. Prior to this, she served as the Head of the Department of Physics at IFTM University, Moradabad. Known for her research-oriented mindset and approachable teaching style, Dr. Saxena brings academic rigor, leadership, and compassion to her work.

Education:

Dr. Saxena holds a Ph.D. (2011) in Physics from H.N.B. Garhwal University (a Central University). She completed her M.Sc. in Physics in 2003, and her B.Sc. in Physics, Mathematics, and Statistics in 2001 from the same institution. Her background in both theoretical and experimental physics has laid a strong foundation for her successful academic and research career.

Research Contributions:

Dr. Saxena has published over twenty research papers in reputed journals and currently mentors three Ph.D. scholars. Her core areas of expertise include Nuclear and Particle Physics, Atomic and Molecular Spectroscopy, Classical Mechanics, and Laser Physics. She has filed and published several patents addressing diverse topics, such as the environmental impact of air pollution, acoustic material properties, and solar energy systems. Her ability to combine research with practical application highlights her relevance in today's scientific landscape. She has also played an important role in organizing academic workshops and conferences, fostering dialogue among students and fellow scholars alike.

Social Impact of the work:

As the Assistant Dean of International Affairs, Dr. Saxena has helped foster global academic collaborations, making international education more accessible to Indian students. She has helped many young students, particularly women, find confidence and direction in STEM fields. Through her leadership roles and outreach efforts, she continues to create meaningful change within and outside the academic community.

Awards and Achievements:

Dr. Saxena has held several leadership roles and led collaborative research projects. She has authored book chapters, earned recognition in academia and applied research. As a respected speaker, mentor, and collaborator, she continually inspires students and peers through her dedication to knowledge.

Message highlighting topics for research for future generation:

Dr. Saxena urges today's youth to go beyond textbooks, to ask "why" instead of just "what," and to engage with their studies not as a burden but as a means to understand the world around them. Her advice to young learners is to remain humble, focused, and open to growth, because the true purpose of education is not just to earn a degree, but to evolve as a thoughtful, responsible individual.

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 ISBN:978-81-932733-5-7

Introduction:

Prof. Jyoti Choubey is a retired professor (Applied Physics) of Jabalpur Engineering College, Jabalpur, MP. Her total teaching experience of UG and PG classes is about 38 years.

Jyoti Choubey

Education:

Prof. Choubey graduated from Govt. H. S. College (1973) and post-graduated in Physics from Govt. Science College in 1975 with 2nd position in merit of RDVV University, Jabalpur. She was awarded Ph.D in Theoretical Physics by RDVV, Jabalpur in 1980. During her Ph.D degree, she had been awarded Junior and Senior Research fellowship (4 years) by UGC New Delhi.

Research Contribution:

Her academic achievements cover five publications - (Two international & three national). For her first publication in PRAMANA, about 10 appreciation letters were received from various international universities wiz .Canada, Poland, France, Chile etc. She had guided several post graduate students in their project work. She participated as Co-coordinator, Coordinator and Chairperson in several Short term courses, National and International conferences in various leading institutions of India.

Award and achievements:

Prof. Choubey had been Chairman, Board of studies RGPV Bhopal, Member, Academic Council RGPV Bhopal, Head of Department of Applied Physics JEC, Dean Student welfare JEC, Chairperson women's grievances cell JEC, Member of Women in Development of Canada India industry linkage project.

Social Impact of the work:

Theoretical physics employs mathematical models and abstraction of physical objects and systems to explain and provides knowledge of many technologies like computers , smart phones etc Prof. Choubey's work on Perturbation techniques in Quantum mechanics (which is extension of work of German Prof Dr Muller-Kirsten) is useful in operation of lasers ,quantum computing and other electronic devices

Message highlighting topics for research for future generation:

For future students, who are interested in theoretical physics and quantum mechanics, the exploring topics are particle physics , condensed matter physics and quantum gravity etc.

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" If you fail, never give up because F.A.I.L. means "First Attempt In Learning". End is not the end, if fact E.N.D. means "Effort Never Dies." If you get No as an answer, remember N.O. means "Next Opportunity", So let's be positive."

- Dr. A.P.J. Abdul Kalam

 ISBN:978-81-932733-5-7

Pramila Suresh Lahoti

Introduction:

Dr. Pramila Suresh Lahoti, retired as an Associate Professor from Fergusson College, Pune.

Education:

She holds an M.Sc. and a Ph.D. degree.

Research Contribution:

Her area of research was Nuclear Physics, and her Ph.D. thesis focused on the 'Fabrication of 14 MeV Neutron Generator and its application in calculating 14 MeV neutron cross-sections of certain elements and Neutron Activation Analysis experiments. She has published 5 papers in journals and conferences.

Awards and Achievements:

Best teacher award given by Indian Physics Association (Pune Chapter) in 2012. Best teacher award given by Uttar Bharatiya Sangh, Pune in 2013. Vice President of Indian Physics Association (IPA, Pune chapter) 1995-2000. Chief Coordinator of Pune Intercollegiate Consortium (PICC) 2009-2014. Principal, Willingdon College, Sangli, MH 2013-14. Member of Executive Committee of Vidnyan Bharati, Pashchim Maharashtra

Social impact of the work:

She has organized and conducted different Inter-collegiate competitions on topics such as Physics Quiz, Lectures, Essays, Projects, and Experimental Skills on behalf of Indian Physics Association. She has guided more than 100 college students (UG and PG) to participate and win accolades in above competitions to broaden their horizons and interest in pure and applied physics. From 2015 till date, engaged in various activities of Vidnyan Bharati for promotion of science and technology, particularly at school/college level students and teachers, in addition to the society in general.

Message highlighting topics for research for future generations:

Students should focus on cutting-edge research, finding import-substitutes, and solving different problems faced by the Indian society in the fields of agriculture, industry, and medicine etc.

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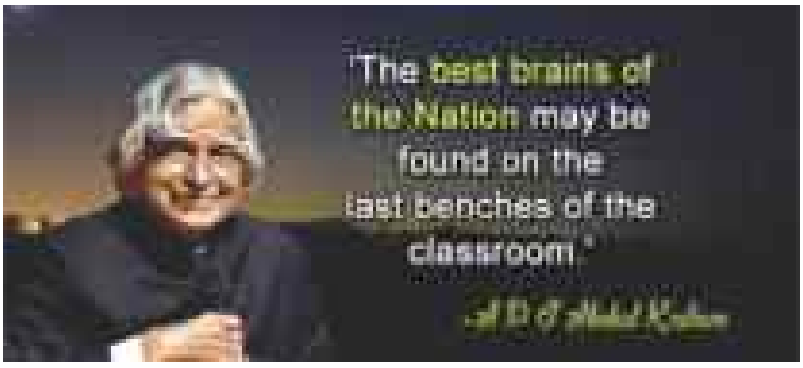

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Jyoti Mayekar

Introduction:

Dr. Jyoti Mayekar is an Assistant Professor in Physics at Jai Hind College, Mumbai since 2010. Her dedication to teaching, research, and academic leadership has made her a respected figure in the field of Physics education.

Education:

Dr. Mayekar graduated in Physics (2004) from Jankidevi Bajaj College of Science, Wardha and pursued M.Sc. (2006) with a specialization in Solid State Physics from the Institute of Science, Nagpur. She earned her Ph.D. (2023) from the University of Mumbai under the guidance of Dr. Radha Srinivasan, focusing on the field of Metal oxide nanoparticles for Biomedical applications.

Research Contribution:

Dr. Mayekar has published 13 research papers in reputed international journals and contributed three chapters in academic books.

Awards and Achievements:

Dr. Mayekar graduated as the university topper and received four medals and four cash prizes for her academic excellence. She has received Best Teacher Award (2016–17) at Jai Hind College (Internal award) depending upon performance and student feedback matrix. She has served as the Editor of Jai Hind College's annual science magazine Eureka since 2019. She holds key academic positions including: Board of Studies Member at autonomous Jai Hind College and Jankidevi Bajaj College of Science (as alumni), Vice-Chancellor's Nominee on the Board of Studies at Bhavan's College, Andheri.

Social Impact of the work:

She is recognized as an IOP Trusted Reviewer by IOP Publishing for her valuable contributions to the peer review process. Additionally, she supports educational outreach as a translator for NPTEL-SWAYAM courses.

Message highlighting topics for research for future generations:

In a world focused on professional courses, we must not forget the vital role of basic sciences like Physics in driving innovation. Strong fundamentals and research—in labs and classrooms alike—are the roots of true discovery.

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 ISBN:978-81-932733-5-7

Seema Ubale

Introduction:

Dr. Seema Ubale worked at Dharampeth M.P.Deo Memorial Science College, Nagpur and retired as Professor and Head of Physics Department. She is an honorary director of Professor Rajendra Singh Science Exploratory, Nagpur.

Education:

Dr. Ubale obtained B.Sc. (Nagpur University) and M.Sc. degree in Physics from Amravati University and was second in order of merit. She carried out her doctoral research on semi conducting glasses under the supervision of Dr. C. S. Adgaonkar, Reader, Govt. Institute of Science, Nagpur and received Ph.D. degree in 2003 from Nagpur University.

Research Contribution:

Dr. Ubale has published several research papers in national and international journals and completed two minor research projects funded by UGCWRO. Two students received Ph.D. under her supervision. She has filed a patent which is currently under publication. She has jointly written and published a Physics textbook for B.Sc. students.

Awards and Achievements:

Dr. Ubale's name was included in the 7th edition of Marquis Who's Who in Science and Engineering (2003-2004) published from USA in recognition of the research papers published in different scientific journals. As a member of Indian team, she represented India in 4th and 5th IUPAP's International conference of Women in Physics at Stellenbosch, SA (2011) and Waterloo, Canada (2014) respectively and presented paper on Status of Women in Physics in India. She also attended 12th Asia Pacific Physics Conference in Tokyo Japan in 2013 and presented a paper on Women in Physics.

Social Impact of the Work:

Dr. Ubale is a life member and executive committee member of NGOs such as the Indian Women Scientists Association (Nagpur branch), which promotes basic science among school children and homemakers. She has conducted numerous science workshops under its banner. She is associated with an NGO named Ashadeep, which focuses on the development and rehabilitation of students with disabilities. She guides visually impaired students in science subjects and competitive exams, and also prepares audio books for them

Message highlighting topics of research for future generations:

Presently along with her Ph.D. students, Dr. Ubale is working on recycling fly ash and biomass ash. It is the dire need to recycle fly ash into some value-added products.

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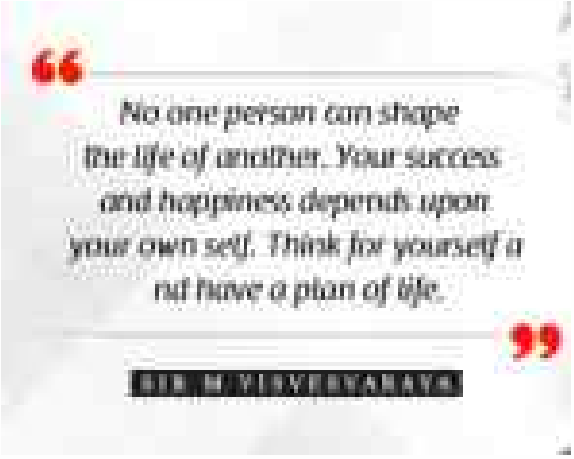

 ISBN:978-81-932733-5-7

Introduction:

Dr. Siteshwari Chandraker, Assistant Professor (Physics) at Govt. V.Y.T.PG Autonomous College Durg (C.G.) (Affiliated to Hemchand Yadav University) Durg Chhattisgarh)

Siteshwari Chandraker

Education:

She did her Ph.D. from Pt. Ravishankar Shukla University Raipur (2022), The topic was "Studies On Photoluminescence & Thermoluminescence of M2ZnSi2O7 (M: Sr, Ca, Ba) Doped with Dy3+". She is M.Phil. from the same university (2008). The topic of M. Phil Dissertation was "Photoconductivity Studies on Chemically Deposited Copper Doped Films of CdS". She did her M.Sc. in Physics from Govt.V.Y.T.PG Autonomous College Durg (2006) Specialization was Electronics.

Research Contribution:

She has expertise in Thermoluminescence, Photoluminescence, Mechanoluminescence, Luminescence Materials, Solid State Reaction method and Photoconductivity. She has guided 2 Ph.D. students and 2 Scholars currently enrolled. She has 5 Research articles in reputed national and international journals, 2 Book Chapter, she has a patent on "Composite nature of thermoluminescence studies in Dy3+ activated Sr2ZnSi2O7 phosphor" Republic of South Africano. 2023/07886, 28 Feb 2024. She has more than 15 Paper Presented in national and international conference as ITT and oral presentation.

Awards and Achievements:

She was appointed Vice President in Govt.V.Y.T. PG Autonomous College Durg (2004-05), Department gold medalist, and M.Sc. Topper. Apart from studies she is a National Hockey and State Badminton Player

Social Impact of the Work:

She has worked towards Advanced Lighting and Display Technologies, Enhancing Public Safety Through Radiation Monitoring, Contribution to Clean Energy and Green Technologies, and boost Scientific Education and Innovation.

Message to Future Generations:

Future generation should Development of White LEDs, Flexible and Wearable Radiation Sensors, work on Data Storage and Security Applications and Improved Radiation Dosimeters

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 ISBN:978-81-932733-5-7

Introduction:

Dr. Durgesh Nandini Nagwanshi Associate Professor Department of Applied Physics at Jabalpur Engineering College Jabalpur (MP).

Durgesh Nandini Nagwanshi

Education:

She perused M.Sc. from (Dr. Hari Singh Gour Vishwavidyalaya Sagar), her Ph.D. Thesis Titled: "Synthesis and characterization of nanocrystal polymer composites" was guided by Dr. Meera Ramrakhiani Professor and Head of Department of Post Graduate Studies & Research in Physics and Electronics, Rani Durgavati Vishwavidyalaya Jabalpur)

Research Contribution:

She has published 18 research papers in national and international Journals. Participated in and presented papers in numerous national and international conferences.

Award and Achievements:

She received the district level excellence award for Electoral Literacy Club and Lock Sabha Election and college level excellence award for conduction of exam as a deputy controller and valuation as a deputy organizer. She has organized many national and international conferences on hybrid mode, session chairs in different programs, and members in different societies such as women's welfare, gender equality, department lab in charge, Hostel warden, life member in IAPT and Vigyan Bharti. Attend many refresher courses and faculty development programs in IIT Roorkee, IIT Indore, IIM Raipur & other university and technical institutes. Industrial training in laser and fiber optics in western railway Jabalpur, number of excellent awards and expertise in quantum physics, electronics, nuclear physics, Laser & fiber optics.

Social Impact of the Work:

Research works play a crucial role for the researcher and scientific communities, especially those working in the area of polymer nanocomposites. I am interested in encouraging Indian youth to understand science and technology. I am to be a source of inspiration for many girls to pursue higher education and further studies.

Massage highlighting topics for research for further generations:

- Nanomaterials, Nanocomposites, Space Science,
- Climate change and sustainability
- Health and medical research
- Artificial intelligence and technology
- Education and social justice
- Energy and Environmental Conservation Researching These topics can shape a brighter future.

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 ISBN:978-81-932733-5-7

Kusumanjali Deshmukh

Introduction:

Dr. Kusumanjali Deshmukh is Assistant Professor (Physics) at Govt. VYT PG Autonomous college, Durg (Affiliated to Hemchand Yadav University, Durg, Chhattisgarh)

Education:

Ph.D. in Physics – Pt. Ravishankar Shukla University, Raipur (2012) her thesis tittled: Electro-optical Properties of Chemically Deposited Rare Earth Doped Semiconductor Films. She did M.Sc. in Physics from Pt. Ravishankar Shukla University, Raipur (1997) Project: Photoconductivity Studies on II-VI Semiconducting Thin Films and B.Sc. in Mathematics, Physics & Chemistry – (1995)

Research Contribution:

Research Areas: Thin Films, Luminescent II-VI Semiconductors, Nanostructured Materials, Photovoltaic Applications, Photoconductivity. She has guided: 2 Scholars awarded (2019, 2020), 4 Scholars currently enrolled. Her publications are over 30 research articles in reputed national and international journals Books and Chapters: Contributions in IOP Publishing and IGI Global. She has patent on: Preparation of Ho Doped Ag_2S Thin Films (Indian Patent: 202221039470 A, 2022)

Awards and Achievements:

She has been awarded with Guru Vishistha Award (2023) – National Recognition for Excellence in Teaching, Chhattisgarh 5th Young Scientist Award (2007), Several Certificates of Appreciation from NPTEL and SWAYAM, Elite Gold Certification for Experimental Physics-II (2020)

Social Impact of the Work:

Actively promotes Physics education and awareness in Chhattisgarh through lectures, workshops, and student mentorship programs. Contributor to NEP 2020 policy implementation and syllabus restructuring at the state and university level. Reviewer and evaluator for academic events and innovation competitions including Toycathon and Young Science Congress. Facilitator for digital learning and content translation in Hindi for better reach among rural and semi-urban students.

Message to Future Generations:

Future researchers must look at science as a bridge between innovation and social progress. Especially, In the context of Chhattisgarh, the rich natural resources and growing academic infrastructure provide fertile ground for research in sustainable energy, nanomaterials, and environmental physics.

There is a pressing need to develop affordable and locally relevant technologies. Young minds should explore interdisciplinary fields such as quantum materials, green energy solutions, and AI-assisted materials modeling. Also, pedagogical innovation is essential to reach students in tribal and remote areas, nurturing a new generation of scientists and educators. Learners need to Stay rooted, stay curious, and use their knowledge to light up both labs and lives.

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 ISBN:978-81-932733-5-7

Introduction:

G Nag Bhargavi

Dr. G Nag Bhargavi is Assistant Professor of Physics at Govt. Pt. Shyamacharan Shukla College Dharsiwa, Raipur, Chhattisgarh and a dedicated materials scientist with a passion for advancing scientific understanding and nurturing the next generation of researchers. Her academic journey has been driven by curiosity and a commitment to pushing the boundaries of materials science and its intersection with fundamental physics.

Education:

Dr. Nag Bhargavi completed her undergraduate studies in Physics in 2004, followed by Master of Science and Master of Philosophy in Physics, before pursuing a Ph.D. in condensed matter physics. She was admitted to the National Institute of Technology, Raipur for doctoral studies. Her educational foundation was laid with a strong background in Physics, followed by advanced studies in Materials Science. She worked under the esteemed supervision of Prof. Ayush Khare and was awarded with Ph.D. in 2018. While pursuing advanced studies in materials science, she specialized in the synthesis, characterization, and functional analysis of advanced materials.

Research Contribution:

Over the years, her research has focused on multifunctional materials, energy storage systems, and lead-free ceramics, with an emphasis on their physical properties and technological applications. She has published extensively in International Science Citation Indexed (SCI) journals and peer- reviewed journals. She has participated in and presented her research work at many national and international conferences of science materials. She has served editorial boards and reviewed many SCI journals. Dr. Bhargavi is research supervisor of Physics and Member of board of studies affiliated to Pt. Ravishankar Shukla University, Raipur.

Awards and Achievements:

Throughout her career, she has received several accolades recognizing both scientific contributions and pedagogical excellence. She has received Chhattisgarh Young Scientist Award 2018 in the discipline of Physical Sciences, organized by Chhattisgarh Council of Science and Technology. She is the recipient of Young Research Award 2021, honored by Institute of Scholars, Bengaluru. She has also received Sadbhavna Nari Shakti Samman 2018 on the occasion of International Women's Day 2018 and Savitribai Phule Samman 2025 by Chhattisgarh Sanskriti Sansthan Raipur. Many other best research paper awards in conferences. Among the honors she has received are awards for excellence in research and innovation in teaching.

Social Impact of work:

Her research work mainly focuses on material, environment and energy. In today's scenario the electronic industry is leading in the market. However, most of the electronic components are made of Lead (Pb), which possess health hazards for humans. Being a materials scientist, her passion is to develop lead-free systems for energy applications. Her work on sustainable materials and energy solutions has applications that can improve both technology and the environment. She is also deeply committed to mentoring underrepresented students in field of and to fostering scientific literacy through public outreach programs, ensuring that science reaches and benefits all segments of society.

 ISBN:978-81-932733-5-7

Message highlighting topics for research for future generations:

Future research in multifunctional materials should focus on sustainable development, advanced energy technologies, and biomedical applications. Specifically, areas like energy harvesting, self-healing materials, and bio-inspired design offer promising avenues for innovation. A lot of further studies on different aspects can also be undertaken for fundamental interest and novel device applications.

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 ISBN:978-81-932733-5-7

Introduction:

Dr. Alpna Ojha, an accomplished physicist, currently serves as an Associate Professor in the Department of Physics at Agra College, Agra, Uttar Pradesh, India. She was born in Kanpur. She completed her early education in her hometown, excelling in science and mathematics.

Alpna Ojha

Education:

She pursued her higher education at Kanpur University, earning a Bachelor of Science (B.Sc.) degree from P.P.N. Degree College, Kanpur, where she studied Mathematics, Physics, and Chemistry. She then obtained her Master of Science (M.Sc.) in Physics from Dayanand Anglo Vaidik Mahavidyalaya, Kanpur. Driven by a passion for teaching, she also acquired a Bachelor of Education (B.Ed.) from D.W.T. College, Kanpur. Dr. Ojha further demonstrated her academic excellence by qualifying for the National Eligibility Test (NET) and the Graduate Aptitude Test in Engineering (GATE) in Physics. She was awarded PhD in 2023.

Research Contributions

Dr. Ojha's research explores the complexities of heavy ion nuclear reactions, contributing valuable insights into nuclear reaction mechanisms through both experimental and theoretical approaches. Her work enhances the understanding of fundamental nuclear properties, with applications in nuclear energy systems. Her research integrates mathematics, computer simulations, and artificial intelligence, making it relevant for both basic physics studies and technological advancements. Her findings have been published in Physical Review C, a prestigious journal by the American Physical Society. Additionally, she has presented her work at national and international conferences and symposiums and has contributed a chapter to an academic book. She has published 8 research papers.

Inspiration for Future Generations:

After completing her studies, she began her teaching career as a lecturer at DAV College, Kanpur, where she served for nearly seven years. She later pursued research in nuclear physics, focusing on heavy ion-induced nuclear reactions under the guidance of Prof. Sunita Gupta at Agra College.

Through her dedication to education and research, Dr. Alpna Ojha serves as an inspiration for young scholars pursuing higher education and scientific inquiry. She firmly believes that education empowers individuals, providing them with the wings to soar in the vast sky of knowledge and success.

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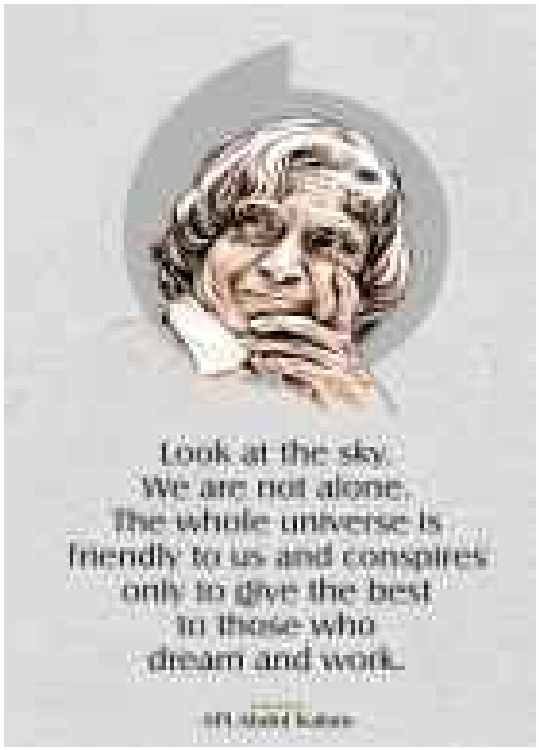

 ISBN:978-81-932733-5-7

Introduction:

Dr. Pallavi Shukla is an Indian physicist specializing in the field of Electronics and Physics. With a solid academic background and a commitment to education, she is currently working as Faculty in the Department of PG Studies & Research in Physics and Electronics at Rani Durgavati Vishwavidyalaya (RDVV), Jabalpur, Madhya Pradesh.

Pallavi Shukla

Education:

Dr. Pallavi Shukla obtained B.Sc. (Electronics) and M.Sc. Physics from Govt. Home Science College Jabalpur and joined Rani Durgavati Vishwavidyalaya for doctoral studies. She completed her Ph.D. under the supervision of Prof. Rakesh Bajpai, RDVV, and Dr. A.K. Bajpai, Govt. Science College Jabalpur and awarded the Ph.D. degree in 2018 in Physics.

Research Contribution:

She served as faculty in the renowned college of science background in Jabalpur such as Home Science college, St. Aloysius Sadar, Panagar Arts College and Govt. Model Science College. Served as a Member of the Board of Studies (BOS) during 2011–12 and 2012–13 at Govt. M.H. College of Home Science & Science for Women, Jabalpur (M.P.). Moreover, she is Reviewer for Materials Today: Proceedings, a reputed scientific journal. Also created educational video content for the Higher Education Department: Module 4.05 – Ballistic Galvanometer: Torque on a Current Loop, Module 5.5 – Life Cycle of a Star. She published her research papers in international journal such as Polymer Bulltein, Polymer-Plastics Technology and Engineering and a book chapter in ELSEVIER.

Awards and Achievements:

Dr. Pallavi Shukla won the best paper/poster presentation award in three international and two national conferences. And awarded, "Fellowship for Training of Young Scientist" by M.P. Council of Science & Technology, Bhopal, (M.P.)

Social Impact of the work:

Promoting quality education through digital content creation to support remote and inclusive learning. Active participation in curriculum design and academic decisions to enhance science education for women. Contributing to academic excellence through peer reviewing and academic service. Dr. Pallavi Shukla holds a B.Sc. in Electronics and M.Sc. in Physics, culminating in a Ph.D. in Physics. Her academic journey reflects her deep interest in electronics and interdisciplinary scientific advancement.

Massage highlighting topics for research for future generations:

Future research should focus on key areas that address global challenges and drive innovation. These include sustainable development, renewable energy, climate change solutions, and environmental conservation. Emphasis should also be placed on the ethical use of artificial intelligence across sectors like healthcare, education, and governance. Advancements in quantum computing, AI-driven problem-solving in physics, and integration of AI in research methodologies are essential. Ensuring equitable access to quality education must also remain a central goal for inclusive and impactful research.

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 ISBN:978-81-932733-5-7

Introduction:

Dr. Preeti Bala Taunk is Assistant Professor (Physics), HOD, Department of Physics, Govt. Digvijay College, Rajnandgaon (C.G.).

Preeti Bala Taunk

Education:

She is M.Sc. (Physics), M. Phil, Ph.D. She possesses excellent communication skills, critical thinking skills and has an ability to thrive in a challenging environment.

Research Contribution:

She has more than 35 years teaching experience to UG and 20 years' experience for PG students.

She thrust areas of research and Expertise: Optical properties of nanomaterials. Publications & other Academic Achievements: International paper: 09, National Paper: 05, Projects Completed: 02 (UGC and Autonomous)

Message highlighting topics for research for future generations:

I am working for inspiring a passion for learning, leadership, and service in first generation learners in Chhattisgarh, fostering a culture of curiosity, creativity, and critical thinking where students are encouraged to explore, innovate, and embrace lifelong learning and research on Luminescence (LEDs).

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Introduction:

Dr. Rinku Kathuria is the Professor and Principal in Hitkarini College of Engineering & Technology Hitkarini Hills, Dumna Airport Road, Jabalpur-482005 M.P, India.

Rinku Kathuria

Education:

She did M.Sc. (Physics) Ph.D (2002) from RDVV, Jabalpur.

Research Contribution:

Anti Stoke's Luminescence; Design and Development of Infrared Detector Using Tm3+ Doped Ceramic Materials. She has published the book 'Textbook of Engineering Physics with Experimental Approach (Satya Prakashan, New Delhi)' ISBN: 81-7684-647-3 and has published 9 National papers, 3 International papers.

Award and Achievements:

Dr. Rinku Kathuria is Life Member of "INDIAN ASSOCIATION OF PHYSICS TEACHERS" Member of Board of Studies in Department of Physics, Government (Auto.) Science College, Jabalpur; P.M. Shree College (Mahakoshal), Jabalpur and Mata Gujri College, Jabalpur

Social Impact if work:

IR detectors are Used in devices like thermal imaging cameras to monitor body temperature (very important during COVID-19 for fever detection. Critical for night vision equipment, surveillance cameras and fire detection systems. Help detect gas leaks, monitor pollution levels and study climate change effects. Key tool in night –vision equipment, missile guidance systems. Designing such syllabus for Undergraduates and Post-graduates which promotes critical thinking, problem solving skills, and a research mindset, impacting how societies approach challenges.

Message highlighting topics for research for future Generations:

Physics is such a subject which has vast reach in various fields and is the basis of all scientific works. We find physics in almost every machine that is used now-a-days in the areas of healthcare, defense, global communications, Space exploration, etc. In short, physics powers technology makes us understands nature in much better way, drives the economy, improves health and safety, and shapes our point of view towards world and universe. Future research may be undertaken on -

- Quantum physics – Quantum computing, Quantum Gravity
- Astrophysics and Cosmology- Black Hole physics, Dark matter and dark energy
- Particle Physics

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 ISBN:978-81-932733-5-7

Introduction:

Dr. Samiksha Tiwari is a physicist and academician. She has been involved in teaching for the last 19 years. She is serving as an Assistant Professor at S.S.Y. Govt. College, Patan, Jabalpur since 2021. She has served as Head of Department of Physics at Gyan Ganga College of Technoloy, Jabalpur from 2007 to 2017 and as an Assistant Professor at Govt. College Niwas (Mandla) during 2018 to 2021.

Samiksha Tiwari

Education:

Dr. Samiksha has done B.Sc. from Barkatullah University and M.Sc. Applied Physics (Electronics and Semiconductors) under the faculty of Engineering from Barkatullah University, Bhopal. She completed her Ph.D. (Physics) under the guidance of Prof. Dr. Rakesh Bajpai on the topic "Structural and Mechanical Characterization of Polystyrene- fly ash composites", from R.D.V.V., Jabalpur. In addition, she has done L.L.B. degree from R.D.V.V., Jabalpur.

Research Contribution:

Dr. Samiksha has published 8 international and 3 national research papers on Polystyren- fly ash based composite material. One National research paper on entrepreneurship and innovation in NEP-2020. One chapter published on Intellectual Property Rights Special Reference to copyright in and around world, ISBN-978-93-92446-05-4. One remembrance published on "Smriti Ke Pal" ISBN: 978-81-957627-7-4

Award and Achievement:

Dr. Samiksha secured 1st position on research paper poster presentation in R.D.V.V., Jabalpur, Coordinator of 'International Gita Mahotsav 2024-25', Co-coordinator of N.S.S. Camp Ghurner, Niwas from 18/03/2021 to 24/032021. Member of Mahakoshal Vigyan Parishad (NKVP).

Message highlighting topics for research for future generations:

Exploring the properties of solids such as composite material with specific characteristics. Hence Research for Smaspectso-Friendly material with excellent compatibility in all aspect.

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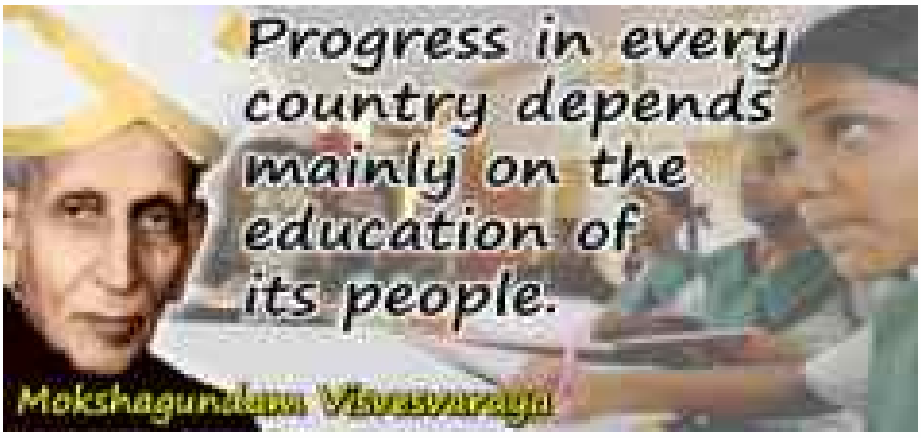

 ISBN:978-81-932733-5-7

Introduction:

Dr. Shubhra Mishra is an Assistant Professor of Physics at Government Naveen College, Gudhiyari, Raipur, Chhattisgarh. She has 18 years of teaching experience, with 15 years spent teaching in private engineering college. Her work is guided by a strong interest in physics and a desire to make learning interesting and useful for students.

Shubhra Mishra

Education:

Dr. Mishra completed her Bachelor of Science (B.Sc. 1997) from Guru Ghasidas University, Bilaspur, followed by a Master of Science (M.Sc.1999) in Physics from Pt. Ravishankar Shukla University, Raipur. She later pursued her Ph.D. (2017) in Physics at the National Institute of Technology (NIT), Raipur. She worked under the esteemed supervision of Dr. Ayush Khare and was awarded her Ph.D. degree in 2017. Her educational journey provided her with a strong foundation in core Physics, along with advanced research skills in materials science.

Research Contribution:

Dr. Shubhra Mishra's research work is mainly in the field of thin film fabrication, luminescent materials, and optical studies of nano- and micro-sized phosphors. She has published many research papers in international SCI journals and other well-known journals. Dr. Mishra also has many design patents and 2 utility patents for her innovations in material science and different technology. She has presented her research at several national and international conferences. She also works as a reviewer for important SCI journals. She also gave 18 invited talks in various National/International Conferences. Along with her research work, she guides students in their academic pursuits, serves as a research supervisor in Physics, and is an active member of academic committees associated with Shri Shankaracharya Institute of Professional Management and Technology (SSIPMT), Raipur.

Awards and Achievements:

She received the Best Paper Award at the National Conference on Recent Trends in Physics (NCRTP-2014) held from 12th to 14th March 2014 in Raipur. She has also received the Nari Shakti Samman 2018 on International Women's Day in 2018, in recognition of her contributions to education and women empowerment.

Social Impact of the work:

She works passionately for the welfare of mental health patients, elderly individuals, and in the field of stress management. As a certified yoga teacher, she promotes physical and emotional well-being in the community.

In research, her primary focus is on thin film fabrication, particularly for sustainable and advanced material applications. She is currently engaged in an innovative project on cow dung-based products, aiming to create eco-friendly solutions that contribute to rural economy and sustainability.

Message highlighting topics for research for future generations:

In the future, research should focus on making new materials that are useful, safe for the environment, and help improve our lives. Some important areas for research are:

- Making better thin films and devices for use in technology.
- Improving luminescent materials for lights, displays, and healthcare.
- Designing better solar panels to produce clean and renewable energy.
- Creating environment-friendly materials to replace harmful ones.
- Using small-sized (nano) materials to make stronger and smarter products.

 ISBN:978-81-932733-5-7

Hira Joshi

Introduction:

Dr. Hira Joshi is a theoretical physicist specializing in condensed matter physics, born and brought up in Delhi. She is currently a Professor at Gargi College, University of Delhi, Delhi.

Education:

Dr. Joshi completed her under graduation from Miranda House College and post graduated in Physics from Delhi University. She earned a PhD degree from University of Delhi. She also earned B.ED degree in English & Physical Science from University of Annamalai. She has 39 years of teaching experience in Physics at Intermediate & graduate level.

Research Contribution

She has published 13 research publications in reputed National and International journals & also written 4 chapters. She has participated in more than 50 international and national conferences, conventions, scientific programmes and workshops during her long academic career and presented her research papers in several national and international conferences. She has been a speaker & research reviewer, technical committee member in these conferences.

Award and Achievements

Dr. Joshi is Life Member of: Indian National Science Congress &Indian Association of Physics Teachers. She qualified Joint CSIR-UGC Test for JRF& Eligibility for Lectureship - National Eligibility Test held in 1989.

Social Impact of the work

She has been involved in community outreach programs at various levels. Role model for students, demonstrating the values of life long learning, critical thinking & intellectual curiosity.

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 ISBN:978-81-932733-5-7

Introduction:

Ms. Alka Choudhary serves as a Senior Physics Teacher and Head, Department of Science at Modern School, Vasant Vihar, New Delhi. A trained and certified B.Ed. professional, she combines deep subject knowledge with a strong pedagogical foundation, making her one of the most respected educators at Modern School — a prestigious institution with a legacy of over 100 years.

Alka Choudhary

Education:

Ms. Alka Choudhary is an alumna of Garhwal University, Srinagar, where she completed her M.Sc. in Physics with distinction, alongwith a degree in education, consistently securing top ranks throughout her academic journey.

Research Contribution

With more than three decades of experience in teaching Physics at the senior secondary level, Ms. Choudhary has played a vital role in shaping young scientific minds and leading them toward national and international excellence. She is particularly focused on the integration of technology in Physics education and promoting student-led innovation in applied sciences. She has written extensively for various educational forums on effective methods of Physics teaching, STEM integration in classrooms, and the importance of experiential learning. Her articles have been featured in national education journals and CBSE teaching circulars. Currently, she is guiding students on an innovative project aimed at addressing the ecological challenge of declining bee populations. The project involves designing drone-based pollination mechanisms to support agricultural sustainability— a perfect blend of environmental science and physics.

Awards and Achievements

Ms. Choudhary received special achievement certificate at the hands of Ms. Smriti Irani for significant contribution to education. She has been awarded Best Teacher Award at both the School and CBSE levels and multiple accolades at CBSE science exhibitions and national-level student research contests. She mentored a student project on prosthetic leg design, which won the National Innovation Award.

Social Impact of the work:

Ms. Choudhary is not only a passionate educator but also a committed environmentalist and social advocate. A firm believer in the power of youth-led change, she actively mentors students on projects that address critical real-world issues. She champions the "Reduce, Reuse, Recycle" movement within the school and community, organizing awareness drives and eco-friendly campaigns. She is currently guiding a student working on a project related to social hygiene in economically backward sections, which has been widely recognized for its impact. Through her guidance, students are encouraged to take up independent, research-oriented projects that intersect science, society, and sustainability. Her holistic approach to education—blending academic rigour, technological innovation, and social consciousness—continues to inspire a new generation of learners and leaders.

Message for the Young generation –

The future belongs to minds that stay curious and hearts that remain kind. Challenges will arise, but each brings a chance to grow stronger and wiser. Curiosity fuels discovery, empathy shapes progress, and integrity defines greatness. With wonder as a guide and courage as a companion, every step forward builds a brighter and more thoughtful world.

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 ISBN:978-81-932733-5-7

Vibha Chaudhary

Introduction:

Dr. Vibha Chaudhary Presently working as Assistant Professor in Pradhanmantri college of Excellence Government Mahakoushal college, Jabalpur, M.P.

Education:

She is M. Sc. (2001) & PhD (2008), titled "Theoretical Approach to the Fracto-Mechano-Luminescence of organic and inorganic solids" a dedicated and enthusiastic physics assistant professor with over 18 years of teaching, Research and academic leadership in both undergraduate and post graduate programs. Her academics is based on Luminescence and Astrophysics.

Research & Contribution:

She has reviewed research exploring the mechanics of Luminescence in advance material and their applications and cosmic rays in Astrophysics.

Award & Achievements:

It is essential to inspire the next generation of physicist to explore the frontiers of knowledge. Emerging areas of research hold the potential to unlock the profound nderstanding of the universe and revolutionize technology, dark matter and energy, Quantum Gravity, high energy particles are some examples of research topics for future generations. The universe is Vast and largely unexplored. So future scientists illuminate it.

Social impact of the work:

She has attended 46 workshops, FDP and conferences in National and international level. She was the convenor of 2 national workshops on lab instrumentation in physics and computer science.

Message Highlighting Topics For Research For Future Generation:

Instrumentation in physics, Quantum Gravity, Luminescence and Astrophysics.

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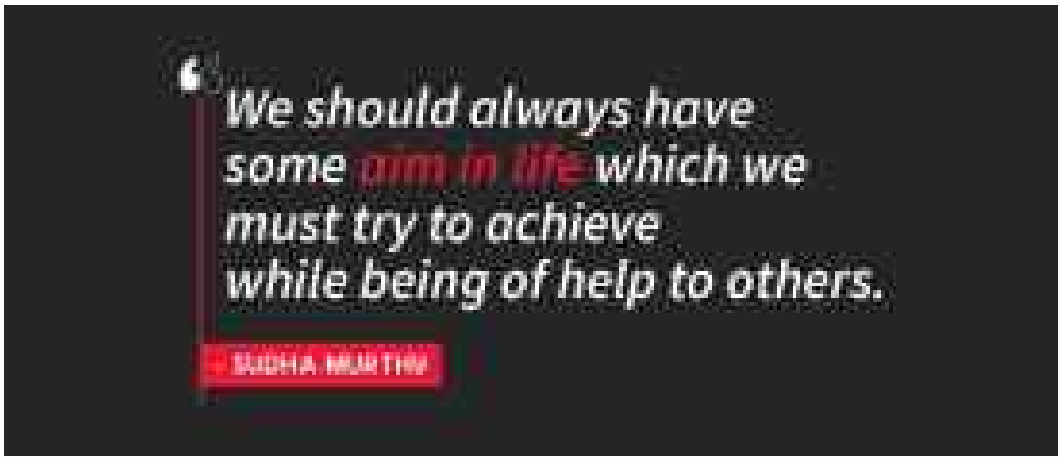

 ISBN:978-81-932733-5-7

Mamta Shrivastava

Introduction:

Dr. Mamta Shrivastava is serving as a Professor of Physics at H.M. Science & H. Sci. Jabalpur. Her total teaching experience of UG and PG classes is about 40 years.

Education:

Dr. Shrivastava graduated from Govt M. H. Science and post-graduated from Science College in 1982. She was awarded Ph.D in 1996 from RDVV University, Jabalpur.

Research Contribution:

Luminescence produced during deformation of γ-irradiated KI crystals. Kinetics of mechano-luminescence in colored alkali halide crystals are the areas of research of Dr. Shrivastava. She has published her work on luminescence in several reputed journals. She has expertise in microprocessor, micro controller interfacing device & computer programming as well.

Awards & Achievement:

Dr. Shrivastava has been Controller of Examination of autonomous Exam cell. She has successfully completed minor research project sponsored by UGC.

Message Highlighting Topics For Research For Future Generations:

Solid state physics & digital electronics etc.

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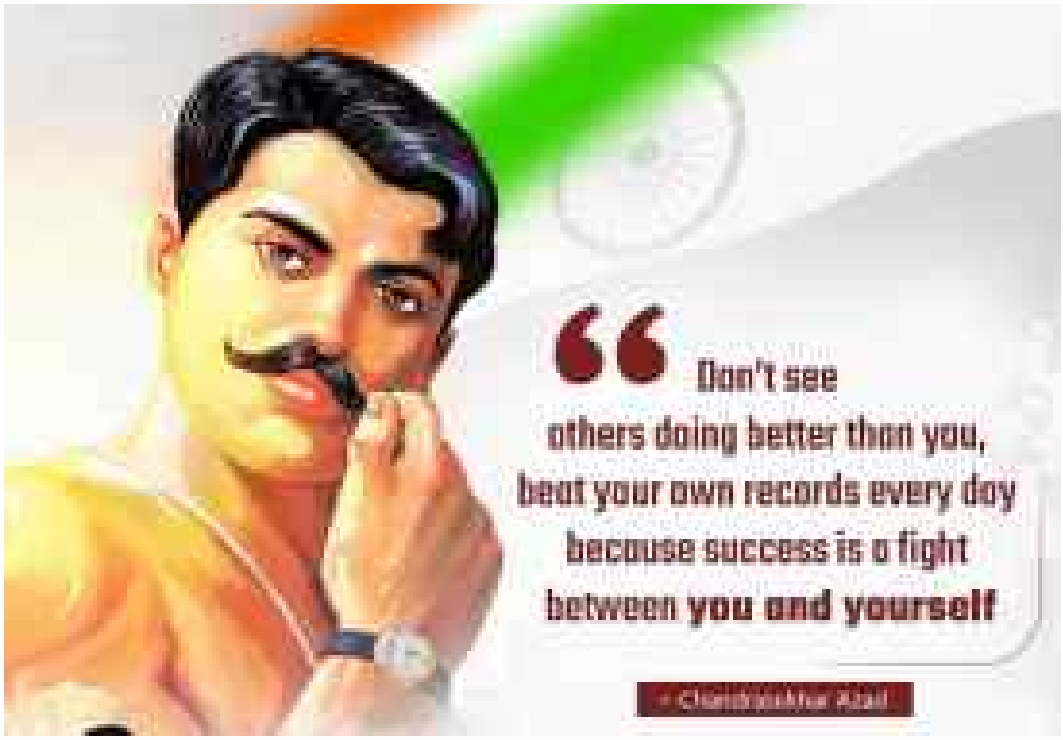

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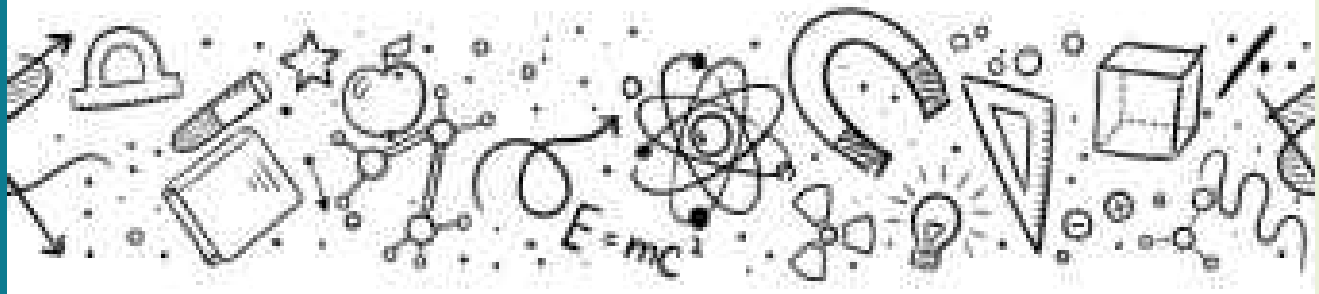
Section -2

ARTICLES



 ISBN:978-81-932733-5-7

Physics in India

■ **Nivedita Bhide**
Vice President,
Vivekananda Study Centre, Kanyakumari

In the search of Truth, Indian seers followed two paths of enquiry. The first path was - Look within and get established- in the Being of all beings to know the Truth of everything. The other path was looking around, observe, note, go beyond of what is seen, to know the apparent and ultimate Truth of everything. Interestingly, both ways reached the same conclusion about the ultimate Truth that existence is the manifestation of One as many. Therefore, existence is conscious, whole, singular and integrated. This truth of oneness of existence, was expressed in various cultural and traditional ways and therefore is inculcated in most of the Indians. The purpose of the study of any science in India was to know and realize this truth. Therefore, there never was a dividing line between the Rishis and the scientists.

Swami Vivekananda in one of his remarkable lectures "The Real and the Apparent Man", says, "Science is nothing but the finding of unity. As soon as science would reach perfect unity, it would stop from further progress, because it would reach the goal. Thus, Chemistry could not progress further when it would discover one element out of which all others could be made. Physics would stop when it would be able to fulfill its services in discovering one energy of which all the others are but manifestations. And the science of religion becomes perfect when it finds the one Being who is the only Soul of all souls."- Swami Vivekananda, Complete Works, Vol. II

This is the context in which the galaxy of Indian physicists wrote the text. Therefore, Indian physics has a rich and diverse history that spans thousands of years, from ancient philosophical insights to cutting-edge research in modern times.

Ancient Indian Physics

India has a long tradition of scientific inquiry, especially in fields like astronomy, cosmology, and atomic theory. Ancient Indian physics was deeply intertwined with philosophy, particularly the Nyaya, Vaisheshika, and Samkhya schools.

1 Vaisheshika Darshan (6th century BCE onwards) was founded by Kanada, who proposed one of the earliest atomistic theories of matter. Matter is made up of paramanu (atoms), which combine to form more complex structures. He also stressed on cause and effect and natural laws—an early form of empirical thinking in the history of physics in the world.

2 Samkhya Philosophy propounded by great Kapil Rishi proposed dualism between Purusha (consciousness) and Prakriti (matter). Samkhya Darshan introduced the idea of transformation of energies and the three gunas (sattva, rajas, tamas) which influenced Indian cosmology and psychology. Swami Vivekananda's lecture on Samkhya Darshan had inspired Nicola Tesla a great scientist to prove that matter and energy are interchangeable, which subsequently was proved by Einstein with his famous equation $E=mc^2$.

3 Aryabhata (476–550 CE) was a great mathematician and astronomer, known for calculating π (pi) and proposing that the earth rotates on its axis. He worked on planetary motion, eclipses, and time measurement.

4 Brahmagupta (598–668 CE) wrote on gravity ("objects fall towards the earth by a force") and advanced mathematics (zero, negative numbers etc.).

5 Bhaskara II (12th century) wrote Siddhanta Shiromani, covering astronomy, algebra, and motion. He also described forms of perpetual motion and planetary motion.

6 Jagadish Chandra Bose (1858–1937), great physicist and biologist was born in colonial India and thus faced many difficulties and discrimination against his work. He demonstrated radio waves and invented early wireless communication equipment. He also researched plant physiology using scientific instrumentation and proved that plants have emotions and respond to the thought currents of human being.

Thus, very few well known scientists are enumerated here. But it was the continuous tradition of science and technology which is generally not understood or missed by many. Sri Dharampal has compiled the papers on Science and Technology in India written by foreigners who visited India in 18th century. That book "Science and Technology in 18th century in India" by Dharampal demonstrates how science was the part of life of common people.

Naturally, even though colonial rule suppressed the growth of science and technology in India the tradition of illustrated mathematicians continued in Kerala. After independence, the glorious tradition in physics is getting vibrant.

Modern Indian Physics

India today is home to a vibrant community of physicists working in theoretical, experimental, and applied physics across major research institutions. A couple of the globally well known scientists are :

1 **C. V. Raman (1888– 1970)**

He discovered the Raman Effect (inelastic scattering of light), for which he won the Nobel Prize in Physics in 1930.This was a foundational contribution to quantum mechanics and optics.

2 **Homi J. Bhabha (1909 – 1966)**

He is known as the father of India's nuclear program. He established Tata Institute of Fundamental Research (TIFR). He also played a key role in developing India's capability in nuclear physics and cosmic rays.

3 **Satyendra Nath Bose (1894 – 1974)**

He worked with Einstein on Bose-Einstein statistics—the basis of bosons in quantum mechanics. His work laid the foundation for Bose-Einstein condensates, a state of matter.

Current Research Areas

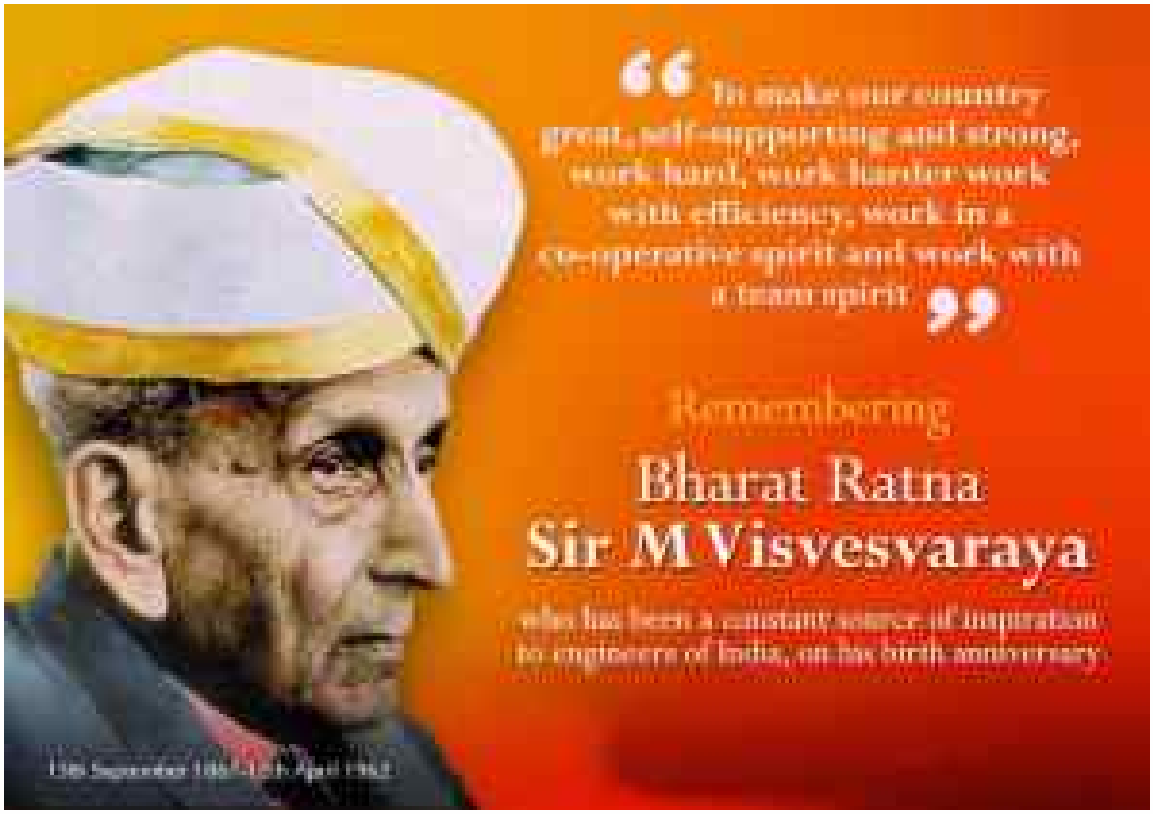
- **High Energy Physics:** India is a participant in global projects like the Large Hadron Collider (LHC) through CERN.
- **Astrophysics and Space Physics:** Institutions like ISRO and IUCAA (Pune) contribute to cosmology, gravitational wave research (LIGO-India).
- **Condensed Matter Physics:** Research on superconductors, quantum materials is going on.
- **Quantum Computing and Optics:** IITs, IISc, and other labs are pushing boundaries in quantum technologies.
- **Nuclear and Particle Physics:** Ongoing research in reactors.

Increasing investment in quantum technology, artificial intelligence, and sustainable energy is influencing physics research. Prominent Indian physicists continue to work at institutions like MIT, Caltech, CERN, and collaborate across borders.

Modern Indian quantum physics is a rapidly growing field that spans quantum computing, quantum optics, quantum communication, and quantum materials. India has made significant strides in both theoretical and experimental quantum research, and is investing heavily in future technologies through national initiatives and global collaborations.

 ISBN:978-81-932733-5-7

In India, the goal of science has been to live in harmony with nature and for enriching and elevating the human life. Therefore, the word for science in Indian tradition is Shastra. Shastra means shasanat trayati iti Shastra. It means Shastra protects the human being by moulding his life. The glorious tradition of science in India would also become unique tradition of science in the world if the Indian scientists develop science on these lines.



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Student Centric Learning in General and in Physics Particular

Kamal Singh
Former Professor and HoD,
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In our country almost all institutions are based upon teacher-centric education. Their system is embedded with rigid syllabi stringent functioning of BOS, academic council and examination depending upon the memory tests. Due to all this the crop ofa students is quite unhealthy and practically with low market value, non-entrepreneur and making hue and cry for employability. In order to seek a solution to overcome this difficulty we have to go for the student –centric educatio

In fact, we have not yet fully crystallized the concept of 'Student centric learning' has great benefits, such as students' interest, which drives education. At present we are following teacher delivered path and not the learner driven. The merit of Student Centric Learning (SCL) offers students complete freedom in the classroom and the opportunity to decide fundamentally what subject they learn and how they learn it. In fact, the student constructs knowledge through exploration, projects, collaboration, and reflection, that will enable them to communicate their ideas to their teachers, self-evaluation, proposing solutions, planning their projects and research. This is because learning is not only knowledge acquisition, but also encompasses diverse experiences such as field trips, participation in seminars, conferences, relearning, interaction with peers and experimental activities so as to gain general education experience. This becomes feasible through interactive classroom teaching, group discussions, peer teaching, and interactive tasks get students talking, debating, and thinking.

Moreover, Student Centric (SC) is quite in line with NEP where emphasis or focus is on critical thinking, critical consciousness, communication, teamwork, and creativity in classroom is given importance and not just memorizing facts. In fact, it would help in implementing NEP with ease.

At present our education system is oriented towards rigid curriculum (where, indigenous knowledge system is absent) and examination (only memory test, which lacks standardized testing), thereby, hindering holistic development include, institutional resistance and systemic barriers. No focus is put on Digital Ecosystem. Actually, students are ready to access digital tools and platforms for connectivity that foster collaboration and global engagement, challenges like cyber security. Decolonization of educational eco system (expressed by our Prime Minister) and Experience based learning with Indian Philosophies.

Merits of SCL in general:

When topics relate to students' own experiences or passions, learning become meaningful and personal that not only boosts engagement and motivation but also promotes deeper understanding through active participation, here knowledge is not just received, actually it's built, tested, and retold. Besides, students cultivate lifelong learning habits, and so curiosity, problem-solving, self-assessment becomes natural.

Student Centric learning in Physics:

The subject physics due to its reliance on abstract concept, critical thinking and rigorous mathematics

cannot be enjoyed by the students without understanding. Therefore, SCL in Physics is all the more essential and it is the need of time in context of NEP.

Physics is not far away. It is all around us. When you open a door, throw a ball, ride a cycle, or switch on a fan, that's all physics. It tells us how things move, stop, fall, or make sounds and light. When you ask, "Why did it happen?" or "How?" you are thinking like a scientist. So don't be afraid of physics playing with it, explore it, and enjoy it. Now you know we cannot move without it. In my opinion we have to make it so learnable that each and everybody understand the importance no matter what subject they study.

As such, this subject is used everywhere like medicine, all kinds of engineering, environmental science, chemistry, agriculture, use of solar energy, household devices including kitchen and garden. majority of students right from the middle school level face difficulties in grasping the fundamental concepts, principles, and theory as well as experiments. Every day the new materials are introduced day in and day out for various applications in running day to day life. Their physical properties are tested by the equipment / machines working on the principles of Physics. In my opinion this subject should be introduced right from the 4th class in the school. Then alone Indian students will dominate the days coming in 2047. Let us start now SCL in Physics.

How could we begin step wise student centric learning?

Step -1 Pre-class preparation:

First of all, get prepared to meet your students. Try to address them by name to win over the inertia of interacting with you as their academic mother. You are planning to have an interactive and lively class with a cheerful smile on face, love and affection in eyes. You will be kind and with full enthusiasm make enquiries about them to know their background, which will make them feel at ease with you. Tell them that they can ask any question anytime because we have to make them fearless, curious, inquisitive, competitive and ready anywhere, anytime for any examination. For next day assign them short videos on basic concept of forces and energy with examples (in small quanta).

Step -2 In-class activities:

We are required to build a LEGO catapult in the class to explore torque, energy, and momentum to exhibit physics action. Necessarily by shifting the focus from "teacher tells" to "student does and discovers," we are required to prepare learners not just to know physics but to think like physicists i.e. why, when and how. For that matter everyday applications while teaching physics through real-world examples like seatbelts (momentum), smartphones (optics), climate systems (thermodynamics) make learning relevant. The subjects like properties of matter, classical mechanics, quantum mechanics and statistical mechanics (without which no property had been possible to measure or understand) optics, electricity, magnetism, atomic and molecular physics at times become difficult to understand when it comes to try or their practical use. Teacher has to pose conceptual physics questions to make them curious and let students argue and then discuss answers so as to promote deeper thinking and reveal misconceptions. In fact, encourage students to express their views and ask questions as it is a cooperative learning process. Once the inertia of hesitation is gone students learn to question whose knowledge is centered and why broadening intellectual vision is a routine part of learning.

Step-3 Problem-solving method:

As such physics is inherently abstract and mathematically rigorous, which can discourage many students This technique clears the concept and gives proof of their level of understanding and

makes learning more engaging. Actually, hands-on demos and simulations in collaborative space-based learning is a very fundamental method to understand the concept and places students at the core of active learning versus lectures, which encourages self-learning, thereby lowers failure rates and enhances better retention in gaining confidence.

Step-4 Project based learning (PBL):

When students are assigned/ selected projects, it allows them to develop ideas, collect necessary information, plan experiments, design rain water filter, solar pond, solar water heater, energy measurement, differentiation between electricity and electronics, formulate questions, data collection, interpret results, and present findings. Research shows this boost science-process skills and creativity. Also encourages students to tackle real world physics problems and integration of knowledge. Through PBL in sight for research, critical thinking and spirit of hard work could be inculcated. Alternative assessments moved beyond the existing system use creative formats, portfolios, oral expressions and participatory projects.

Step-5 Reflection and feedback:

It helps in Students explain "why it works" their hypotheses, surprises, misconceptions. Use clickers or quiz apps for real-time checks. It requires critical consciousness, fosters critical thinking by contextualized scenarios in physics concepts with narratives about scientists. Continuous iteration using formative feedback to plan next session, adding more simulations, deeper projects, or focused discussions.

Step-6 Representation in curriculum:

In order to boost scientific confidence, engagement and self-esteem among underrepresented students, closing achievement gaps, their representation in BOS is necessary. In fact, teachers become facilitators, sharing authority and involving students in shaping curriculum content and assessments. Translating these ideas to physics unlocks deeper conceptual understanding and excitement, thereby improving inclusion & academic outcomes.

Conclusion:

Therefore, in Physics Student centered active learning environment providing personalized learning is quite essential as techniques involving guided enquiry, work sheets, peer explanation and labs have shown strong physics gain. Without students, centric teaching physics cannot be learnt. Actually, student centric education places students at the heart of learning. For them learning physics become a joy and not a burden.

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Role of Physics in the Field of Chemistry

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'All science is either physics or stamp collecting.' So, said Ernest Rutherford, the father of nuclear physics.

And it's true that Biology is based on Chemistry, which in turn is based on Physics – and this continuum can easily be taken to the point of absurdity. At risk of annoying pure mathematicians, we'll look at some examples of chemical phenomena to illustrate how physics is the driving force behind them. First, however, we'll think about how the chemical elements are organised, which itself is based on the principles of physics.

Physics plays a crucial role in the field of chemistry, shaping the way we understand chemical reactions, properties, and structures at a fundamental level. Here's how physics influences chemistry:

Atomic & Molecular Structure – Quantum mechanics, a branch of physics, helps explain how electrons behave in atoms and molecules, dictating their chemical properties and bonding.

Thermodynamics – The laws of thermodynamics govern energy changes in chemical reactions, helping chemists predict whether reactions will occur spontaneously.

Electromagnetism – The principles of electromagnetism explain interactions between charged particles, influencing molecular behavior, spectroscopy, and chemical bonding.

Kinetics & Reaction Dynamics – Physics-based concepts like force, motion, and energy transfer determine reaction rates and mechanisms in chemistry.

Spectroscopy & Analytical Techniques – Chemistry relies on physics-driven techniques like X-ray diffraction, nuclear magnetic resonance (NMR), and infrared spectroscopy to analyze substances at the molecular level.

Statistical Mechanics – This field bridges physics and chemistry, helping predict how groups of molecules behave collectively in different conditions.

Without physics, chemistry would lack a foundational framework to explain why and how substances interact. Essentially, physics provides the rules, while chemistry explores their practical applications. Does this help?

Physics and chemistry have been deeply interconnected throughout history, evolving together to shape our understanding of the natural world. Here's a glimpse into their historical relationship:

Early Foundations – In ancient times, natural philosophers studied matter and its transformations without distinguishing between physics and chemistry. Thinkers like Aristotle proposed theories about elements and substances that influenced both fields.

Alchemy to Chemistry – During the medieval period, alchemy sought to transform substances, laying the groundwork for modern chemistry. Alchemists unknowingly applied physical

principles, such as heat and pressure, in their experiments.

· The Rise of Atomic Theory – In the 19th century, John Dalton's atomic theory provided a bridge between physics and chemistry, explaining chemical reactions in terms of atoms and their properties.

Quantum Mechanics & Chemistry – The 20th century saw quantum mechanics revolutionize chemistry. Physicists like Niels Bohr and Erwin Schrödinger developed models that explained atomic behavior, directly influencing chemical bonding theories.

Thermodynamics & Reaction Kinetics – The laws of thermodynamics, formulated by physicists, became essential in chemistry for understanding energy changes in reactions.

Modern Interdisciplinary Science – Today, fields like physical chemistry and materials science merge physics and chemistry, using principles from both to develop new technologies, medicines, and materials.

The relationship between physics and chemistry has always been one of mutual influence, with discoveries in one field often leading to breakthroughs in the other.

Although physics and chemistry are branches of science that both study matter, they differ in the scopes of their respective subjects. While physics focuses on phenomena such as force, motion, electromagnetism, elementary particles, and spacetime chemistry is concerned mainly with the structure and reactions of atoms and molecules, but does not necessarily deal with non-baryonic matter. However, the two disciplines overlap in subjects concerning the behaviour of fluids, the thermodynamics of chemical reactions, the magnetic forces between atoms and molecules, and quantum chemistry. Moreover, the laws of chemistry highly depend on the laws of quantum mechanics.

In some respects, the two sciences have developed independently, but less so towards the end of the twentieth century. There are many areas where there is major overlap, for instance both chemical physics and physical chemistry combine the two, while materials science is an interdisciplinary areas which combines both as well as some elements of engineering. This was deliberate, as recognized by the National Academies of Sciences, Engineering, and Medicine there are limitations to trying to force science into categories rather than focusing on the issues of importance, an approach now common in materials science.

Here's a more detailed look at the relationship:

Underlying Principles:

Many physical laws, such as those governing forces between subatomic particles, are essential for explaining chemical reactions. For example, the forces between atoms and molecules dictate the nature of chemical bonds and the properties of materials.

Quantum Mechanics:

Quantum mechanics, a core branch of physics, provides the theoretical basis for understanding the behaviour of electrons in atoms, which is fundamental to chemistry. The Schrödinger equation, a mathematical representation of quantum mechanics, describes the electronic structure of atoms and molecules, impacting their chemical behaviour.

Thermodynamics and Kinetics:

Physics provides the principles of thermodynamics, which govern energy transfer and transformations in chemical reactions, and kinetics, which deals with reaction rates. These principles are crucial for understanding how and why chemical reactions occur.

Interdisciplinary Fields:

Fields like chemical physics, physical chemistry, and materials science exemplify the close

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connection between physics and chemistry, where physicists and chemists collaborate to explore complex phenomena. These interdisciplinary areas often tackle problems that require both the mathematical rigor of physics and the practical application of chemistry, according to a Wikipedia article.

Technology and Instrumentation:

Advances in physics-based technologies, such as spectroscopy and microscopy, have revolutionized chemistry by enabling scientists to study matter at increasingly finer scales and with greater precision.

In essence, while chemistry focuses on the structure, properties, and reactions of matter, it relies heavily on the fundamental principles of physics to explain these phenomena. The two disciplines are intertwined, with advancements in one often driving progress in the other.

Advancements in physics have profound implications for future chemistry research, shaping new discoveries and technologies. Here are some key areas where physics breakthroughs will influence chemistry:

Quantum Chemistry & Computation – As quantum computing advances, chemists will be able to simulate complex molecular interactions with unprecedented accuracy, leading to breakthroughs in drug discovery and materials science.

Nano Technology & Materials Science – Physics-driven innovations in nanotechnology will enable chemists to design new materials with tailored properties, impacting industries like electronics, medicine, and energy storage.

Spectroscopy & Analytical Techniques – Improved physics-based imaging and spectroscopy methods will allow chemists to analyze substances at atomic and molecular levels with greater precision, enhancing fields like environmental science and forensic chemistry.

Energy & Sustainability – Physics research in renewable energy, superconductors, and battery technology will drive chemistry toward more efficient energy storage and sustainable chemical processes.

Interdisciplinary Research – The growing overlap between physics and chemistry will lead to new hybrid fields, such as quantum biology and molecular electronics, expanding the possibilities for scientific innovation.

These advancements will not only refine our understanding of chemical processes but also open doors to revolutionary applications in medicine, technology, and environmental sustainability.

Example: Quantum Mechanics in Chemical Bonding

One of the most significant roles of physics in chemistry is seen in quantum mechanics, which explains how atoms and molecules interact. For instance, the Schrödinger equation, a fundamental concept in physics, helps chemists understand electron behavior in atoms. This principle is crucial in predicting molecular structures and chemical bonding.

For example, in covalent bonding, electrons are shared between atoms, forming stable molecules. Quantum mechanics explains why certain atoms bond in specific ways, leading to the formation of substances like water (H_2O) or carbon dioxide (CO_2). Without physics, chemists wouldn't be able to predict molecular behavior or design new materials.

Example: Thermodynamics in Chemical Reactions

Thermodynamics, a fundamental concept in physics, plays a crucial role in chemistry by explaining how energy is transferred in chemical reactions. For instance, the Gibbs free energy equation helps chemists determine whether a

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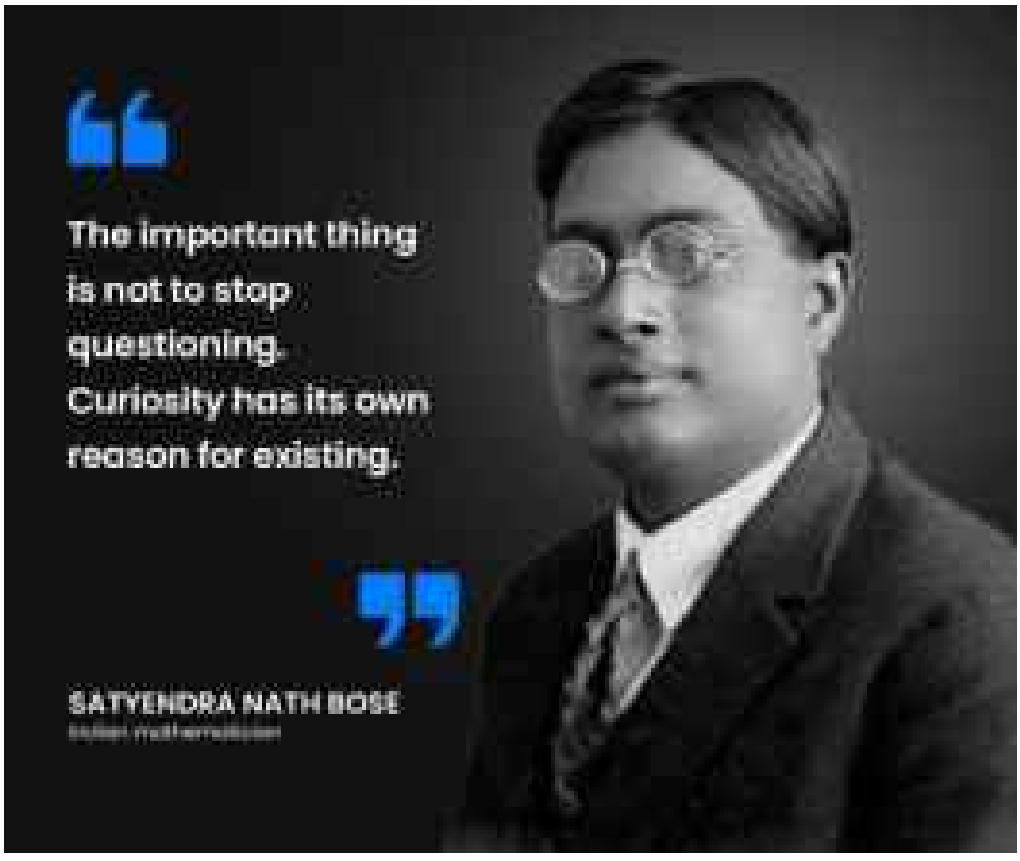
reaction will occur spontaneously. If the change in Gibbs free energy (ΔG) is negative, the reaction proceeds without external energy input.

A practical example is the combustion of methane (CH_4): [$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + \text{energy}$] This reaction releases heat, making it exothermic, and thermodynamic principles help chemists quantify the energy produced.

Conclusion

Physics provides the theoretical framework for understanding chemical processes, from atomic interactions to large-scale reactions. Thermodynamics, quantum mechanics, and electromagnetism are essential in predicting and controlling chemical behaviour. As physics continues to advance, chemistry will benefit from new analytical techniques, improved reaction efficiency, and innovative applications in fields like medicine, energy, and materials science.



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Physics in the National Education Policy: A Multidisciplinary, Crossdisciplinary and Transdisciplinary Perspective

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1. Introduction

Physics, traditionally defined as the study of matter, energy, and the fundamental forces of nature, has long served as the bedrock of scientific inquiry and technological advancement. In the evolving educational landscape shaped by India's National Education Policy (NEP) 2020, physics is no longer confined to disciplinary silos. Instead, it emerges as a central, integrative force that empowers learners to address real-world challenges through multidisciplinary, cross-disciplinary, and transdisciplinary approaches. The NEP strongly advocates for flexibility, academic mobility, and problem-based learning, and physics is uniquely positioned to actualize this vision through both foundational knowledge and applied problem-solving tools.

2. Physics in Multidisciplinary Education

2.1 Definition and Role

In a multidisciplinary context, physics interacts with other disciplines where each retains its own identity while contributing collectively to a broader understanding or solution. Physics serves as a foundational discipline, offering critical insights in mechanics, electromagnetism, thermodynamics, and quantum theory to fields like engineering, biology, chemistry, and earth sciences. [1]

2.2 Educational Integration

Physics is embedded in curricula for engineering, medical sciences, life sciences, and environmental studies. Initiatives like the NEXUS/Physics project have redesigned physics courses to be more contextually relevant for life science and engineering students, fostering interdisciplinary fluency.

➤ ***Examples***

- Engineering projects using physics concepts in thermal management, circuit design, and structural analysis.
- Environmental science applications like solar energy harvesting and climate modeling using principles of radiation and fluid dynamics.
- Modeling in traffic flow, epidemiology, and material failure analysis that requires physics-based simulations.

2.3 Physics in Cross-Disciplinary Learning

➤ **Definition and Role**

Cross-disciplinary education involves using the methodologies or tools of one discipline—here, physics—to solve problems in another. This method promotes conceptual transfer, where physics contributes to reinterpretation, modeling, or innovation in non-physics domains. [2]

➤ **Research and Innovation**

Institutes such as IFISC (Institute for Cross-Disciplinary Physics and Complex Systems) exemplify this model, using physics-derived frameworks—like statistical mechanics, chaos theory, and network dynamics—to tackle problems in biology, computer science, economics, and social sciences.

➤ ***Examples***

- Agent-based models derived from physics to study market behavior or opinion formation in political science.
- Using phase transitions and critical phenomena to understand traffic congestion, ecosystem shifts, or computational complexity.

- Application of Fourier analysis and imaging techniques in art restoration and archaeology.

2.4 Physics in Transdisciplinary Research

➤ Definition and Role

Transdisciplinary approaches transcend traditional disciplinary boundaries, often integrating academic and non-academic knowledge to solve complex societal issues. Physics plays a critical role here by providing universal laws, mathematical modeling frameworks, and systems-level thinking. [3-4]

➤ Integration and Societal Relevance

Such approaches are pivotal in addressing climate change, sustainable development, global health, and energy security, where physics must integrate with policy, economics, ethics, and community engagement.

➤ *Examples*

- Combining climate physics, economics, and public policy to model carbon pricing or evaluate renewable energy transitions.
- Development of econophysics and sociophysics, applying physical models to financial markets and social networks.
- Physics-informed approaches to urban planning, disaster mitigation, and healthcare technology deployment.

3. Curriculum Innovations: UG and PG Integration of Physics with Other Disciplines

3.1 Undergraduate (UG) Programs

Modern undergraduate programs increasingly integrate physics with complementary disciplines, preparing students for diverse careers:

Program	Complementary Fields	Focus	Career Pathways
Computational Physics	CS, Math	Modeling, algorithms	Data Science, Research
Biophysics	Biology, Chemistry	Medical imaging, biomechanics	Pharma, Biotech
Chemical Physics	Chemistry	Spectroscopy, nanoscience	Materials R&D
Planetary Science	Astronomy, GIS, Geology	Astrophysics, remote sensing	Space Agencies, Geoscience
Physics + Entrepreneurship	Business, Marketing	Tech innovation, product dev.	Startups, Consulting
Mathematics + Physics	Math	Theoretical modeling	Academia, Finance
Environmental Physics	Environmental Science	Climate models, sustainability	Policy, Renewable Energy

3.2 Postgraduate (PG) Specializations

At the postgraduate level, specialization becomes more targeted, involving advanced integration across domains:

- Photonics & Quantum Information – With CS and electronics; leads to quantum technology and photonic device careers.
- Condensed Matter & Materials Science – With chemistry and engineering; leads to roles in nanotechnology and semiconductors. Medical Physics – Blending physics with healthcare; enables roles in diagnostics, radiation therapy, and medical imaging.
- Computational and Data Physics – Equipping students for interdisciplinary work in AI, simulations, and finance.

4. Global and National Institutional Models

Several international and Indian universities exemplify NEP-aligned, interdisciplinary physics education:

- Towson University (USA): Offers flexible physics concentrations in computation, planetary science, and entrepreneurship.
- University of Göttingen (Germany): Interdisciplinary physics B.Sc. with minors in data science, biology, economics, and philosophy.[5]
- Ashoka University (India): Offers a liberal arts-based UG physics program integrated with humanities and data science.
- University of Regina (Canada): Combines physics with career prep for law, medicine, and business.
- 3+2 Engineering-Physics Dual Degree Programs: Found in institutions like Columbia University, these offer joint training in physics and engineering, aligning theory with application.

5. Physics as a Pillar of NEP 2020

The NEP 2020 envisions education that is holistic, flexible, multidisciplinary, and aligned with 21st-century skills. Physics, through its analytical rigor, modeling strength, and cross-domain relevance, becomes a natural catalyst for this transformation:

- Fosters scientific literacy across disciplines.
- Equips students for problem-solving in data-rich, dynamic contexts.
- Builds bridges between science, society, technology, and policy.
- Enables interdisciplinary research, innovation, and entrepreneurship.

Conclusion

Physics is no longer merely a "core science" it is a gateway to interdisciplinary learning, a toolkit for innovation, and a unifying force for understanding complex systems. In the NEP 2020 era, reimagining physics education to be multidisciplinary, cross-disciplinary, and transdisciplinary is not only desirable it is essential. It is through such integrative models that Indian higher education can empower students to become critical thinkers, innovators, and responsible global citizens.

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Exploring Connections between Vedic Philosophy and Quantum Mechanics

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'Everything in this universe has evolved from a single entity and is an extension of that and so everything, including living beings, is interconnected and exist in a dynamic relationship' *– Swami Dayanand Saraswati*

Vedic philosophy says that the 'Universal consciousness' is the Rudiment Element. Veda believes in the existence of a single fundamental being known variously as "Paramatma," Ishwar, Brahman, Maheshwar, or Universal Awareness. This fundamental element is formless, transparent, inert, and eternal. It is Omni present, Omni potent, and has limitless energy and size. This is a marvelous disclosure of the innate inside-out process that the universe employed to generate all living and nonliving things, beginning with a single being known as the cosmic energy (Universal Consciousness).

The modern philosophy of science is still struggling to answer the following 'hard questions' of fundamental and universal nature e.g.

- How the universe was created and functions
- The fundamental forces that affect it
- The fundamental elements that gave rise to visible matter
- The Origin of Conscious life

It's astonishing that the most modern branch of science is struggling to resolve similar problems. There is a quest to know the fundamental nature of reality, the fundamental element that is the source of all other elements in nature, the fundamental force that is the source of all other forces in nature

We need to amalgamate the experimental findings observed in Cosmology, Quantum Physics, and Nano Science, to answer all these questions. After seeming to have been abandoned for over a century, modern science has once again established important connections with philosophy through the creation of cosmology.

Quantum physics has established concepts similar to those discussed in the Indian knowledge system of Vedas. The behavior of a quantum system cannot be predicted in the absence of macroscopic conscious individual (as the static absolute frame of reference), an observer is essential to the understanding of quantum concepts. In the microcosmic world of atoms, an object does not exist independently of its observer; rather, there is an interaction between the observer and the observed.

Two quantum concepts that find practical expression are interconnectedness and the role of consciousness. The mind-body paradox is another fascinating area where philosophical ideas and scientific theories converge.

This study decodes ideas such as the genesis of the fundamental element, fundamental force along with quantum confinement of space - time by comparing findings of various branches of Modern Science in the light of Indian Knowledge System.

The Mechanism of Maya

Maya is the power of veiling time and space which limits the knowledge, strength and energy just like the quantum confinement. Technically the word 'Maya' means something measurable. Maya creates multitude of forms from the infinite

universal consciousness and makes them finite, measurable and limited.

According to Vedic traditions, "Paramatma," or universal awareness, possesses an inherent power known as Prakriti, Maya, or Shakti. This power is considered to be the primary source from which all forms of living and nonliving substances originate, initiating from the universal pure consciousness. This eternal power, linked to the cosmic consciousness, is the source of mass, matter, and all fundamental interactions.

The infinite Consciousness is first veiled in ignorance i.e. the veil of space-time; creating various forms, which are projected into the universe from the store of the Cosmic Memory (Samsakara) following an inherent blueprint or design.

As soon as the infinite universal consciousness is confined by the veil of space- time, the feeling of separating from the innate consciousness prompts action to become self-governing, and all-encompassing, akin to the universal consciousness. This is the mechanism of origin of the fundamental 'force' in nature. Sattva is a derivative of inherent consciousness, Rajas, the working energy, and Tamas which initiates inertia, to make the objects inactive and limits the infiniteness of Universal consciousness. n this context, the word "Cosmic Memory i.e. Samskara requires careful consideration.

This process clearly indicates that the confinement of universal consciousness within a limited space –time is the root cause behind every creation in the universe. As if a small amount of the primordial soup (Universal Consciousness) was put into the vessel of space-time and was kept on the stove of inherent infinite energy of the universe. A certain form was created after the completion of this process.

Nothing is arbitrary

Since atoms make up everything and they are aware of how to create bonds with other things and gain a stable form through their structures, it is highly plausible that awareness is the source of all things. In the universe, nothing is arbitrary. Every entity takes the course that requires the least amount of energy consumption and strives for stability to be in the minimum energy condition. The Cosmic memory contains all of these Standard Operating Procedures (SOPs). Cosmic Memory i.e. Samskara requires careful consideration. All that is created in the universe is built according to this design. This blueprint allows every order in the cosmos to function as a self-sustaining system.

A species' DNA controls its growth and behaviour, a plant's seed does the same, an atom's distinct structure determines all of its interactions, physical and chemical properties, and course of action

The dark energy

All forms in the universe originate from the fundamental substrate called the dark energy or primordial soup that current science believes to be the primary material for the genesis of the universe. The Dark Energy is invisible, doen't interact and is Omni presentIsn't the description of Paramatma and Dark energy strikingly similar!!!!

From formless to form

The universal consciousness has no boundaries and it has infinite energy. How do inactiveness and the limiting effect in form of various objects come into existence?

The only instrument available to it at the time of the creation of forms out of formless energy was the grid of space –time having the innate ability to veil space, time, capacity, knowledge, and working energy of any entity that emerged from the infinite sea of universal consciousness. Let us examine how forms originate from formless universal consciousness.

Mechanism of Confinement of space by Time:

As per Vedic philosophy 'Time' is thought to hold all of creation inside it, much like a full pot holds everything it can hold. The Time was there as the galaxies and worlds began to take shape. Time existed when the sky or the space originated. As a result, it is thought to have been a component of Super-Space (Param Vyom) before the universe

was created. Super space is conceptually related to an absolute frame of reference, which science has yet to validate. It represents Time as an infinite source that contains all of life's experiences and moments.

According to Sankhya philosophy, all of an object's qualities are predetermined at the instant it takes on a certain shape and the sense of 'individual awareness' (Aahamkar) emerges. The self-knowledge arises at the instant when Maya confines the boundless consciousness. Nature creates individual units that are separated from its infinite consciousness by means of the un-manifested energy associated with the universal consciousness united with Eternal ignorance (to accept individual entity separated from the universal consciousness) conjoined with latent tendencies (the inherent memory/blueprint for creation of all objects).

All conscious and unconscious creation originated from limitless consciousness, as everything has arisen from it. Put differently, an object's energy, internal forces, relationships, dispositions, and behaviors are all fixed at the time of formation, and it starts to behave a certain manner. This explanation has a close relationship to the quantum confinement phenomenon, in which the confinement of space produces a variety of forces (such as the Lamb shift and Casimir effect) and remarkably novel physical and chemical properties.

The Mystery of Maya and Quantum Confinement of space in Nano Regime

The Maya's five veiling powers were the only tool at its disposal when forms were created from formless energy, according to Saivism. These powers are inherently capable of veiling the working energy, capacity, space, time, and knowledge of every entity that has arisen from the boundless ocean of global consciousness. Quantum confinement is comparable to this procedure.

The study of phenomena that arise when materials are designed or structured at a scale smaller than roughly 100 nm is known as Nano science. This range of sizes comprises, among other things, the wavelength of light, the charge carrier de Broglie wavelength, the size at which plasmonic resonance takes place, and the size of big biomolecules. Additionally contributing to their novel qualities is the enormous surface area relative to volume of nanostructures.

A remarkable transformation is seen in all of a structure's attributes the instant any one of its dimensions falls below a predetermined length scale. In this length regime, a completely new physics called quantum physics appears. What is the trigger for the change at these lengths? It gives us a clear route back to the starting point.

At the quantum level, new physics arises from the spatial confinement into the length scale of Bohr Excitonic Radii or De Broglie wavelength. At this length scale, occurrences like quantum entanglement and the interconnectivity of the universe are common. At this length scale the role of consciousness comes into play.

Space confinement in the region of a few nanometers produces new forces, new mechanisms, and new forms, such as the Casimir effect and Lamb shift, in two empirically confirmed phenomena.

Concluding Thoughts

Indian philosophy has a holistic approach for explaining nature of reality, whereas Modern Science starts from the reductionist methodology. Interconnectedness is an integral part of understanding of the universal Laws in Indian philosophies.

By incorporating the Vedic concepts, which are quite close to the quantum view, Quantum Physics must integrate the concept of interdependent interconnectedness in the world, thus opening the door to an interesting dialogue between quantum physics and Vedic approach to solve the Hard Problems of quantum Physics.

It is evident from contrasting philosophical explanations for the universe's beginning with the conclusions of quantum evolution theories that the whole solution depends on our comprehension of consciousness. It's possible that the integration of quantum biology and quantum physics will result in the discovery of the ultimate theory of everything.

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Ancient India's Scientific Legacy: Concepts of Motion, Energy, and Matter

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India boasts a rich scientific heritage, closely intertwined with its philosophical and intellectual traditions. The Indian knowledge system—reflected in texts such as the Vedas, Upanishads, and various classical treatises—provides deep insights into the realm of physics. Concepts like time, motion, atomic theory, and cosmology were explored extensively in Indian thought long before the rise of modern Western physics. This article delves into the contributions of Indian scholars to the physical sciences and their influence on the evolution of scientific thought.

Ancient Indian Concept of Physics

In India, the development of physics emerged from a fusion of metaphysical inquiry and empirical observation, integrating philosophical thought with systematic study of the natural world. Physics is the study of matter and its motion, including related concepts like energy and force. In the Vedas and Puranas, this field is referred to as **"Vedic Physics"** or **"Bouthika Shastram."** Classical Physics mainly deals with matter and energy on a normal observational scale. However, modern physics often explores how matter and energy behave under extreme conditions or on very large or very small scales. For instance, atomic and nuclear physics examine matter at the tiniest levels, where individual chemical elements can be identified.

Through intense introspection and disciplined inquiry, Vedic sages explored the nature of reality in ways that often parallel modern scientific thought. Vedic Physical Sciences weren't just spiritual musings—they were systematic attempts to understand matter, energy, and the cosmos. The sages used their minds as laboratories, blending philosophy with empirical observation. Texts like the Vedas, Upanishads, Puranas, and the Shad-Darshanas (including Sankhya, Vaisheshika, and Nyaya Darshanas) proposed various theories about the universe and its atomic structure, each from their unique philosophical standpoint. The Rigveda (circa 1500 BCE) contains hymns that describe cosmic order (Rita), hinting at fundamental forces governing nature. The concept of the five elements—**Pancha Mahabhuta** (earth, water, fire, air, and ether)—provides an early classification of matter. Some of the important physical concepts which are discussed in the ancient indian scriptures long before the west described them are listed below:

Kanada's Atomic Theory

Kanada founded the **Vaisheshika school of philosophy**, which proposed an atomistic view of the universe long before the west. His atomic theory was outlined in the **Vaisheshika Sutras**, where he described the fundamental building blocks of matter.

Key Concepts of Kanada's Atomic Theory

- **Anu (Atom)**: Kanada suggested that all matter is composed of anu, or indivisible particles. These atoms are eternal, indestructible, and too small to be seen.
- **Paramanu (Subatomic Particles)**: He theorized that atoms could combine to form

dvyanuka (diatomic molecules) and tryanuka (triatomic molecules), leading to complex substances.

- **Combination and Transformation**: Atoms combine in different ways under the influence of heat and other forces, leading to the formation of various materials.
- **Motion and Interaction**: Kanada believed that atoms are in constant motion and interact based on their inherent properties.
- **Six Categories of Reality**: His philosophy classified reality into six fundamental

categories—**substance, quality, action, generality, particularity, and inherence**—which helped explain the nature of matter.

Kanada's atomic theory was remarkably advanced for its time and shares similarities with modern atomic concepts. His ideas influenced later Indian scholars and were integrated into broader philosophical discussions on matter and existence.

Gravity and Motion in Indian Vedic and Upanishadic Thought

Ancient Indian scriptures, including the **Vedas, Upanishads**, and various **Darshanas** (philosophical systems), offer deep insights into the fundamental laws of nature. Though not expressed in modern scientific terminology, these texts reveal early conceptual understandings of gravity and motion.

The idea of gravity, referred to as **Gurutva** or **Akarshana Shakti**, appears in several ancient sources. The **Vaisheshika Darshana**, attributed to sage **Maharishi Kanada**, introduces the notion of "Akarshana"—a force that causes mutual attraction between objects. This concept parallels the modern understanding of gravitational force. Furthermore, texts like the **Surya Siddhanta**, an ancient treatise on astronomy, explicitly describe a force that draws objects toward the center of the Earth, bearing a strong resemblance to the idea of gravitational pull. These references indicate a recognition of Earth's natural ability to attract and hold objects, suggesting a primitive but insightful awareness of gravity.

Motion, known in Sanskrit as **Gati** or **Vega**, is another well-developed concept in Vedic literature. The **Rig Veda** makes frequent mention of the movement of celestial bodies such as the Sun, Moon, and planets, noting their regular and predictable paths. The **Yajur Veda** and **Atharva Veda** discuss speed and the movement of air and ether, implying an intuitive grasp of motion and even early forms of fluid dynamics. Philosophical schools such as **Vaisheshika** and **Nyaya** further elaborate on the concept by categorizing motion into five types: **Utkṣepaṇa** (upward movement), **Avakṣepaṇa** (downward movement), **Ākūnchana** (contraction), **Prasāraṇa** (expansion), and **Gamana** (general movement). These categories were examined in relation to time, space, and causality, forming a foundational approach to physical science from a metaphysical perspective.

Additionally, the ancient Indian approach to celestial mechanics was remarkably advanced. The **Surya Siddhanta** offers precise calculations of planetary movements, eclipses, and orbital durations, showcasing a sophisticated level of astronomical knowledge. The **Upanishads** frequently emphasize the concept of **Rta**, or cosmic order—a fundamental principle that governs the rhythm and regularity of the universe, including the movement of heavenly bodies. This reflects an early appreciation for the natural laws that

govern the cosmos, similar in spirit to the principles underlying modern astrophysics.

Light and Optics in Vedic Physics

In **Vedic Physics**, the concept of **light and optics** is deeply rooted in both metaphysical thought and observational knowledge. Ancient Indian texts, particularly the **Rig Veda**, describe light (**Tejas**) as a fundamental element responsible for perception, energy, and transformation.

The **Nyaya** and **Vaisheshika** schools of philosophy delve into the nature of vision, explaining that light acts as a medium between the object and the eye, enabling sight—an idea that mirrors the principle of optical transmission. The **Sankhya philosophy** regards light as one of the five subtle elements (**Tanmatras**) and links it to the sense of sight, indicating an early understanding of the interaction between sensory perception and physical stimuli. Additionally, texts like the **Surya Siddhanta** analyze the movement of light, describing it as traveling at immense speed, hinting at a remarkable early awareness of light's dynamic nature. These insights collectively suggest that ancient Indian scholars had a profound and nuanced comprehension of **optics**, integrating spiritual philosophy with observational science.

Concept of thermodynamics in Vedic Physics

In **Vedic Physics**, the principles of **thermodynamics and energy** are explored through philosophical, cosmological, and elemental frameworks that reflect a profound understanding of natural processes. Energy, often referred to as **Tejas** (heat, brilliance) and **Agni** (fire), is regarded as a fundamental force driving transformation, motion, and life. The **Pancha Mahabhuta** (five great elements)—Earth (Prithvi), Water (Apas), Fire (Agni), Air (Vayu), and Ether (Akasha)—embody various forms of energy and matter, with **Agni** symbolizing both thermal and metabolic energy. The **Rig Veda** and **Atharva Veda** frequently reference heat and combustion, not just in ritual contexts but also as cosmic forces of creation and dissolution. Concepts akin to **conservation of energy** are implicit in Vedic thought, especially in the **Sankhya philosophy**, which proposes that all change in the universe arises from the transformation of **Prakriti** (primordial matter), without any loss or creation of new energy—an idea resonant with the **first law of thermodynamics**. Additionally, the **cyclical nature** of cosmic processes described in texts like the **Bhagavad Gita** and **Upanishads**—where energy alternates between creation (Srishti), maintenance (Sthiti), and dissolution (Laya)—illustrates a deep awareness of energy cycles and entropy. Though not quantified in the modern scientific sense, the Vedic conception of energy integrates physical, biological, and spiritual dimensions, offering a holistic view that foreshadows many core ideas of contemporary **thermodynamics**.

The Indian knowledge system, though ancient, remains relevant today. Concepts of atomism, planetary motion, and energy conservation find parallels in contemporary physics. Physics in Indian thought was deeply philosophical yet highly empirical, contributing significantly to science. From the atomic theory of Kannada to Aryabhata's celestial mechanics, the Indian knowledge system laid the foundation for several principles now fundamental in modern physics.

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भारतीय ज्ञान प्रणाली में भौतिकी

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परिचय

भारतीय ज्ञान प्रणाली (आईकेएस) अनिवार्य रूप से ज्ञान का खजाना है जो हजारों सालों से भारतीय धरती पर पनप रहा है। यह गणित, विज्ञान और प्रौद्योगिकी से लेकर चिकित्सा, खगोल विज्ञान, वास्तुकला और यहां तक कि हमारे दर्शन, कला, भाषा, साहित्य और हमारी सांस्कृतिक और सामाजिक परंपराओं के सुंदर ताने-बाने तक सब कुछ को कवर करने वाला एक विशाल परिदृश्य है। जब हम खोजते हैं कि भारत में ज्ञान को कैसे समझा जाता है, तो हमें छह गहन मार्ग मिलते हैं, जो हम सीधे अनुभव करते हैं (प्रत्यक्ष), जो हम अनुमान के माध्यम से समझते हैं (अनुमान), जो ज्ञान मौखिक गवाही (शब्द) के माध्यम से दिया जाता है, तुलना के माध्यम से सीखना (उपमान), जो हम पूर्वधारणा (अर्थपत्ती) से समझते हैं, और यहां तक कि जो हम गैर-आशंका (अनुपलब्धि) से जानते हैं। अपने मूल में, आईकेएस अंतर्दृष्टि, विश्वासों और प्रथाओं का एक अद्भुत समृद्ध और विविध संग्रह है जिसे भारतीय उपमहाद्वीप में मानवता ने हजारों वर्षों से विकसित किया है। अपने मूल में, भारतीय ज्ञान प्रणाली वेदों, उपनिषदों और पुराणों जैसे प्राचीन ग्रंथों के कालातीत ज्ञान में गहराई से निहित है, एक विरासत जिसे पूरे इतिहास में अनगिनत सभ्यताओं और संस्कृतियों द्वारा आकार दिया गया और समृद्ध किया गया है और इसमें पांच तत्व हैं,

ई.ए. "क्षिति जल पावक गगन समीरा, पंच रचित यह अधम शरीरा"

"Kshiti jal paawak gagan sameera] panch rachit yah adham sharira" (1)

आज, यह गहन प्रणाली हमारे कल्याण के लिए महत्वपूर्ण क्षेत्रें में गहन अन्वेषण को सक्रिय रूप से प्रेरित और समर्थन करती है, जैसे कि समग्र स्वास्थ्य, मनोविज्ञान, तंत्रिका विज्ञान, प्रकृति के साथ हमारा संबंध, पर्यावरणीय सद्भाव और जीवन जीने के स्थायी तरीके - इन सबका उद्देश्य हमें वर्तमान में हमारे सामने आने वाली सामाजिक चुनौतियों से निपटने में मदद करना है।

यह विचार करना वास्तव में उल्लेखनीय है कि दुनिया का पहला विश्वविद्यालय, तक्षशिला, 700 ईसा पूर्व में भारत में ही स्थापित हुआ था, जिसमें 60 से अधिक विषयों का अध्ययन करने के लिए दुनिया भर से 10,500 से अधिक छात्राए थे। बाद में, ईसा पूर्व चौथी शताब्दी में, नालंदा विश्वविद्यालय ने शिक्षा के क्षेत्र में भारत के लिए एक और महत्वपूर्ण उपलब्धि का प्रतिनिधित्व किया। वास्तव में, वैदिक काल (2) के दौरान, भारत की बौद्धिक उपलब्धियाँ सभी शैक्षिक क्षेत्रें में अपने शिखर पर पहुँच गई, जिसमें वैज्ञानिक उन्नति पर विशेष जोर दिया गया। हालाँकि, अक्सर जिस बात को अनदेखा किया जाता है, वह है यह गहन ऐतिहासिक वास्तविकता। प्राचीन भारत ने विज्ञान और प्रौद्योगिकी की दुनिया को जो महत्वपूर्ण योगदान दिया है, उसे आज के वैश्विक समुदाय द्वारा काफी हद तक मान्यता नहीं दी गई है। हमारे प्राचीन सिद्धांत, जो आज भी गूंज रहे हैं, आधुनिक चमत्कारों की एक आश्चर्यजनक संख्या को रेखांकित करते हैं, जिसमें मौसम के पैटर्न को समझने से लेकर ब्रह्मांड को नेविगेट करने तक, विमानन की जटिलताओं से लेकर गणित, भौतिकी और रसायन विज्ञान के मूलभूत नियमों तक शामिल हैं(3)। भारत ने मानवता के कुछ सबसे असाधारण विचारकों को जन्म दिया है। आर्यभट्ट पर

विचार करें, जिनकी गणितीय प्रतिभा चमक उठी, ऋषि भास्कराचार्य, एक महान भौतिक विज्ञानी, वराहमिहिर, जिनकी निगाहें सितारों को रोशन करती थीं, नागार्जुन, एक अग्रणी रसायनज्ञय ऋषि कपिल, जिन्होंने ब्रह्मांड के मूल स्वरूप पर विचार किया, भारद्वाज, जिन्होंने उड़ने का सपना देखने का साहस किया, सुश्रुत, शल्य चिकित्सा पद्धतियों में एक क्रांतिकारीय और ऋषि कणाद, जिनकी अंतर्दृष्टि ने परमाणु सिद्धांत का पूर्वाभास कराया - ऐसे कई अन्य लोगों के बीच जिनका योगदान आज भी प्रेरणा देता है। इतिहास का एक खेदजनक पहलू यह है कि इनमें से कई असाधारण भारतीय बुद्धिजीवियों को उनकी उल्लेखनीय उपलब्धियों के लिए उचित श्रेय नहीं मिला। उनकी वैज्ञानिक खोजों और आविष्कारों को मुख्य रूप से संस्कृत में दर्ज और समझाया गया था। दिलचस्प बात यह है कि ब्रिटिश शासन के दौरान ही इनमें से कई महत्वपूर्ण प्राचीन भारतीय पांडुलिपियों का अंग्रेजी और जर्मन जैसी भाषाओं में अनुवाद किया गया था, बाद में ब्रिटिश पुस्तकालयों में सुरक्षित रखा गया। इस प्रक्रिया से अंततः पता चलता है कि प्राचीन भारत वास्तव में नवाचार का एक केंद्र था, एक ऐसा स्थान जहाँ हमारे आधुनिक वैश्विक विज्ञान और प्रौद्योगिकी के लिए महत्वपूर्ण कई आविष्कार और खोजें हुईं(4)।

भारत की प्राचीन सभ्यता हमारी कल्पना से परे के समय तक फैली हुई है, जिससे इतिहासकारों के लिए इसकी कई महत्वपूर्ण खोजों और आविष्कारों की सटीक तिथियों को इंगित करना असंभव हो जाता है। फिर भी, यह स्पष्ट है कि एक मौलिक प्राकृतिक विज्ञान के रूप में भौतिकी ने वास्तव में प्राचीन भारत में आकार लेना शुरू किया। इस खोज में, हमने इनमें से कुछ उल्लेखनीय योगदानों को उजागर करने का लक्ष्य रखा है। हमारा लक्ष्य उन तरीकों को उजागर करना और साझा करना है जिनसे प्राचीन भारत ने उस आधार को तैयार करने में मदद की जिसे हम अब भौतिकी के रूप में समझते हैं। ऐसा करने के लिए, हमने प्राचीन ग्रंथों, महाकाव्य कथाओं, विद्वानों के लेखों और पूरे इतिहास में प्रकाशित ऑनलाइन पत्रिकाओं सहित विभिन्न स्रोतों से सावधानीपूर्वक जानकारी एकत्र की है(5)।

इस अक्सर भ्रमित करने वाली और विरोधाभासी दुनिया में, ऐसा लगता है कि हम में से कई लोग बाहरी मुस्कान के साथ आगे बढ़ रहे हैं, फिर भी भीतर अनिश्चितता की गहरी भावना रखते हैं। यदि आप किसी से उसके सच्चे स्व या जीवन के उद्देश्य के बारे में पूछते हैं, तो वे अक्सर खाली हाथ रह जाते हैं। यह चौंकाने वाली बात है, क्योंकि प्राचीन वैदिक शास्त्र वास्तव में एक स्पष्ट मार्ग प्रदान करते हैं और प्रत्येक व्यक्ति की पहचान के बारे में गहन अंतर्दृष्टि प्रकट करते हैं, फिर भी उन्हें बहुत अधिक अनदेखा किया जाता है(6)।

हम अक्सर अपनी आधुनिक वैज्ञानिक सफलताओं पर गर्व महसूस करते हैं, लेकिन हममें से कितने लोग वास्तव में उनकी जड़ों को समझते हैं? सच तो यह है कि ये खोजें अक्सर उन्हीं वैदिक ग्रंथों की नींव पर खड़ी होती हैं जिन्हें हम मिथक मानकर खारिज कर देते हैं, शायद बचपन से ही हमें मिली शिक्षाओं के कारण।

चूँकि आप सभी यहाँ इलेक्ट्रिकल, इलेक्ट्रॉनिक और मैकेनिकल क्षेत्रें पर ध्यान केंद्रित करने वाले इंजीनियरिंग छात्र हैं, इसलिए हम उन्हीं विषयों का पता लगाने जा रहे हैं जो आप पढ़ रहे हैं। लेकिन सिर्फ आपकी पाठ्यपुस्तकों तक सीमित रहने के बजाय, हम इस बात पर गहराई से विचार करेंगे कि ये विषय वास्तव में वैदिक शास्त्रें में पाए जाने वाले ज्ञान से कैसे प्रभावित हैं(7)।

गरज और बिजली की कच्ची शक्ति ने हमारे शुरुआती दिनों से ही मानवता को मोहित किया है। यह वास्तव में एक सम्मोहक विचार है कि बिजली और यहां तक कि बैटरी के उपयोग को 10,000 से 8,000 ईसा पूर्व तक समझा जा सकता था। वास्तव में, प्राचीन काल में लोग बिजली के बारे में उल्लेखनीय रूप से जागरूक थे। हमें ऋग्वेद के 5वें मंडल में इसका उल्लेख मिलता है, और महान ऋषि वेद व्यास द्वारा रचित महाकाव्य महाभारत में भी वायुमंडल से सीधे बिजली पैदा करने की एक विधि का वर्णन किया गया है(8)।

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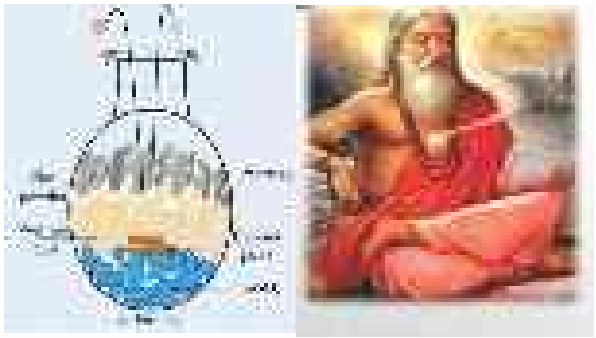
अष्टावक्रपाख्यान से इस आकर्षक आदान-प्रदान पर विचार करें- एक जीवंत बहस के दौरान, राजा जनक ने एक बार ऋषि अष्टावक्र से एक पहेली पूछी, "कौन सा देवता उन दो घोड़ों की तरह गर्भ धारण करता है, जो अचानक बाज की तरह गिरते हैं? और कौन सा गर्भ इन दोनों द्वारा बनाया जाता है?" अष्टावक्र का व्यावहारिक उत्तर था कि बादलों के देवता इन दोनों के गर्भ को धारण करते हैं, जिनका सारथी वायु (हवा) है। उन्होंने कहा कि ये दोनों बादलों की तरह गर्भ बनाते हैं। दिलचस्प बात यह है कि प्राचीन ग्रंथों में 'सकारात्मक' और 'नकारात्मक' आवेशों को संदर्भित करने के लिए तकनीकी शब्द 'रयि' और 'प्राण' का भी इस्तेमाल किया गया है(8)।

यह विचार करना दिलचस्प है कि सकारात्मक और नकारात्मक आवेश, जिन्हें हम अब बिजली कहते हैं,



हमेशा एक साथ एक प्राकृतिक, मिश्रित अवस्था में पाए जाते हैं। प्राचीन ग्रंथों में यह भी वर्णन किया गया है कि कैसे बादल, एक पोषण करने वाले गर्भ की तरह, इन आवेशों को ले जाते हैं। हम जानते हैं कि बादलों के बीच घर्षण से बिजली पैदा होती है, और तभी गरज के साथ गड़गड़ाहट होती है। दिलचस्प बात यह है कि थॉमस एडिसन, जिन्हें अक्सर आधुनिक बिजली के जनक के रूप में जाना जाता है, ने स्वीकार किया कि उनका ज्ञान **अगस्त्य संहिता** नामक पुस्तक का अध्ययन करके काफी समृद्ध हुआ था, जिसे आदरणीय अगस्त्य ऋषि ने लिखा था। उस प्राचीन ग्रंथ के श्लोक वास्तव में बिजली के उत्पादन के बारे में गहन अंतर्दृष्टि प्रदान करते हैं। अगस्त्य संहिता लगभग 7000 साल पहले ऋषि अगस्त्य द्वारा लिखी गई एक प्राचीन पुस्तक थी। अगस्त्य ने इलेक्ट्रिक बैटरी के निर्माण में शामिल कार्यप्रणाली की व्याख्या की। उन्होंने यह भी वर्णन किया कि पानी को ऑक्सीजन और हाइड्रोजन में विभाजित किया जा सकता है। एक मिट्टी का बर्तन लिया गया और उसे एक साफ तांबे की प्लेट से ढक दिया गया। तांबे की प्लेट पर कॉपर सल्फेट था जिसके ऊपर नम चूरा रखा गया था। इन सबके ऊपर जिंक अमलगम शीट रखी गई जिसे मित्र-वरुण के नाम से जाना जाता है। यहाँ मित्र का मतलब कैथोड और यारुण का मतलब एनोड है। बिजली की शक्ति को तीव्र करने के लिए, शत कुंभ के नाम से जाने जाने वाले ऐसे सौ जार को श्रृंखला में जोड़ा गया। जब प्रतिक्रिया हुई, तो पानी प्राणवायु (ऑक्सीजन) और उदानवायु (हाइड्रोजन) में विभाजित हो गया। तैरते हुए हाइड्रोजन को हवाबंद कपड़े में ले जाया गया और इसे आगे वायुगतिकीय अनुप्रयोगों में इस्तेमाल किया जा सकता है(9)।

वैशेषिक प्रणाली में, न केवल परमाणुओं को पदार्थ के निर्माण खंड के रूप में वर्णित किया गया है, बल्कि गर्मी, गति और अन्य बलों पर आधारित उनकी अंतःक्रियाओं पर आधुनिक आणविक गतिशीलता के समानांतर चर्चा की गई है। प्राचीन विचारकों ने यह माना कि विभिन्न पदार्थ परमाणुओं के विभिन्न संयोजनों और गतियों के कारण बनते हैं, जो आणविक रसायन विज्ञान और भौतिकी में एक बुनियादी अवधारणा है।

"वैशेषिक सूत्र' में कुछ श्लोक हैं, जो आचार्य कणाद के उदार ज्ञान को साबित करते हैं। अणुपरमाणूच्यम् त्रसरूपकं तत्तदवयवयोगजं नाम द्रव्यम। तस्य संयोगजवत्वादवयवत्वाच्च सत्त्वमात्रं सत्याम। अणवत्त्वादवयवत्वाच्च।"

सांख्य दर्शन, आध्यात्मिक होते हुए भी, पदार्थ और ऊर्जा रूपांतरण के 24 तत्त्वों (सिद्धांतों) का वर्णन करता है, जो ऊर्जा के संरक्षण और रूपांतरण के विचारों को प्रतिध्वनित करता है।

प्राचीन ऋषि भारद्वाज को पारंपरिक रूप से वैमानिक शास्त्र नामक ग्रंथ का श्रेय दिया जाता है - एक पांडुलिपि जो वैमानिकी और उड़ान मशीनों (विमानों) से संबंधित

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बताई जाती है। हालाँकि इस ग्रंथ की तिथि और लेखकत्व पर बहस होती है, लेकिन इसमें विमान के प्रकार, उनके भागों, प्रणोदन विधियों और यहाँ तक कि पायलट प्रशिक्षण (8) का तकनीकी विवरण शामिल है।

यान्यान्शौ सप्त प्रकृतिबुद्धिपूर्वास्तु कुरु पुमान्। आकाशे सूर्यमंत्रस्थं स्मरणं कुरुते यदा॥

अर्थ : इस श्लोक में महर्षि भारद्वाज ने कहा है कि बुद्धि, प्रकृति और सूर्य मंत्र की सहायता से विमान का निर्माण किया जा सकता है।

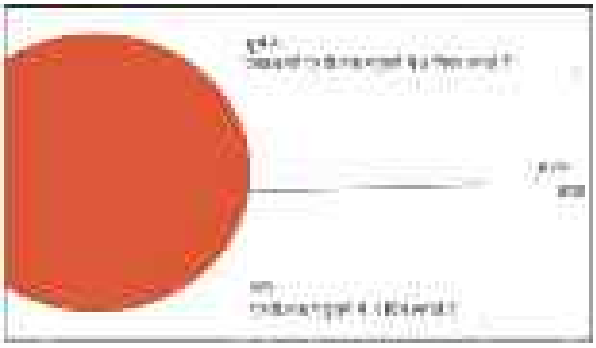
पाठ का संदर्भ है :

- गुरुत्वाकर्षण-विरोधी और प्रणोदन प्रणालियाँ
- पारे और जाइरोस्कोप का उपयोग
- हवाई मार्ग और मौसम नेविगेशन की अवधारणाएँ

यद्यपि आधुनिक विद्वान इन दावों की वैज्ञानिक व्यवहार्यता पर सवाल उठाते हैं, लेकिन वायुगतिकी जैसी सोच की उपस्थिति यांत्रिक भौतिकी के साथ गहन जुड़ाव का संकेत देती है(10)।

अन्य उल्लेखनीय योगदान

प्रकाश की गति : ऋषि सायण ने ऋग्वेद पर एक टिप्पणी में सूर्य के प्रकाश की गति का अनुमान आधे निमेष में 2202 योजन लगाया था, जो मोटे तौर पर 186,000 मील प्रति सेकंड के बराबर है - जो आधुनिक मान (5,6,10) के काफी करीब है।

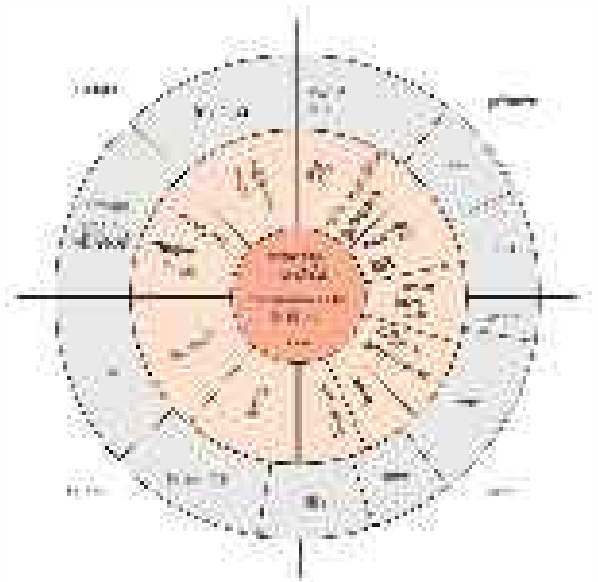


प्रकाश एवं कणों की गति

खगोल विज्ञान और गुरुत्वाकर्षण : आर्यभट्ट ने न्यूटन से सदियों पहले ग्रहों की गति और निहित गुरुत्वाकर्षण आकर्षण का वर्णन किया था। ब्रह्मगुप्त ने उस बल के बारे में भी लिखा था जिसके कारण वस्तुएँ पृथ्वी की ओर गिरती हैं (11,12)।

खगोल विज्ञान और गुरुत्वाकर्षण- ग्रहों की गति और निहित गुरुत्वाकर्षण और वह बल जो ग्रहों को प्रभावित करता है इससे वस्तुएं पृथ्वी की ओर गिरने लगती हैं।

ध्वनिकी और संगीत : नाट्यशास्त्र और सामवेद में ध्वनि तरंगों का अन्वेषण किया गया, हार्मोनिक्स और अनुनाद आधुनिक ध्वनिक भौतिकी के मूलभूत सिद्धांत(11)।



ध्वनिकी और संगीत : ध्वनि तरंगें, हार्मोनिक्स और अनुनाद आधारभूत आधुनिक ध्वनिक भौतिकी के सिद्धांत. आधुनिक ध्वनिक

दैनिक जीवन में व्यावहारिक विज्ञान

धातुकर्म- दिल्ली का लौह स्तंभ, जिसने 1,600 से अधिक वर्षों तक संक्षारण का प्रतिरोध किया है, मिश्रधातु और रासायनिक संरक्षण के बारे में प्राचीन भारत की समझ का उदाहरण है(6)।

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वास्तुकला - मंदिरों का निर्माण ज्यामिति, स्थैतिकी और कंपन नियंत्रण के सिद्धांतों का उपयोग करके किया गया था। संरचनाओं को खगोलीय अवलोकनों के अनुसार संरेखित किया गया था और ध्वनिकी और ऊर्जा प्रवाह को बढ़ाने के लिए डिजाइन किया गया था(5)।

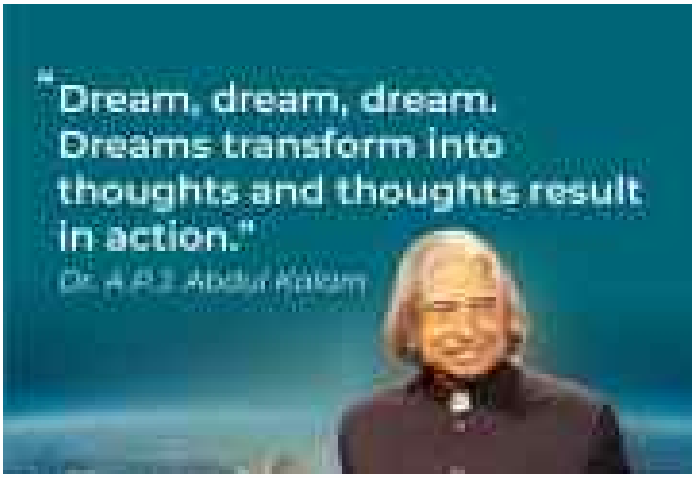
निष्कर्ष :

भारतीय ज्ञान प्रणाली में भौतिकी एक गहन एकीकृत विश्वदृष्टि को दर्शाती है जो दर्शन, अवलोकन और प्रयोग को सुसंगत बनाती है। जबकि कई प्राचीन दावों के लिए अधिक ऐतिहासिक और वैज्ञानिक जांच की आवश्यकता होती है, वे जांच की एक उल्लेखनीय भावना को प्रदर्शित करते हैं। कणाद, अगस्त्य और भारद्वाज जैसे ऋषि न केवल आध्यात्मिक व्यक्ति थे, बल्कि शुरुआती वैज्ञानिक भी थे जो गहन अवलोकन, तर्क और इंजीनियरिंग कल्पना के माध्यम से प्राकृतिक दुनिया के सिद्धांतों की खोज कर रहे थे।

इन प्राचीन ग्रंथों का खुले किन्तु आलोचनात्मक दृष्टिकोण से पुनरावलोकन और शोध करने से आधुनिक विज्ञान को विविध दृष्टिकोणों और विस्मृत ज्ञान से समृद्ध किया जा सकता है।

संदर्भ :

1. बद्रीश और प्रसाद, योगेश और चंद, कृष्ण, (2024)। भारतीय ज्ञान प्रणाली (आई.के.एस.) के तहत वैदिक पाठ के संदर्भ में एनईपी भौतिकी की समीक्षा। रिसर्च रिव्यू इंटरनेशनल जर्नल ऑफ मल्टीडिसिप्लिनरी। 9. 11-18. 10.31305/rrijm-2024.v09.n09.002।
2. मुण्डकोपनिषद् 3.2.1
3. हिरण्यगर्भ सूत्र ऑफ ऋग-वेदा.
4. भागवत गीता 11.5
5. ऋग्वेद 3.1.1
6. ऋग्वेद10.82.3
7. वैशेषिक सूत्र 1.1.14
8. यजुर्वेद 12.24
9. यजुर्वेद 12.25
10. ऋग्वेद 3.1.7
11. पृष्ठ संख्या 102, अध्याय 4, बल और गति, न्यूटोनियन भौतिकी बेंजामिन क्रोवेल
12. पृष्ठ संख्या 111, अनुभाग 5.1, न्यूटन का तीसरा नियम, न्यूटोनियन भौतिकी बेंजामिन क्रोवेल।



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Professor Madhavi Latha - Geotechnical Genius Behind India's Chenab Bridge

Meera Ramrakhiani
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and Former Professor and Head of Physics Department,
Rani Durgavati University, Jabalpur, Shakti Mahakoushal, Jabalpur

Introduction:

Prof. A. S. Madhavi Latha, also known as Gali Madhavi Latha, is among the technical minds behind the Chenab Rail Bridge — the world's tallest railway bridge — inaugurated by Prime Minister Shri Narendra Modi on Friday,7 June 2025. She is a highly respected expert in academic and researcher in the field of geotechnical engineering and a stellar example of Indian scientific and engineering leadership. Prof. Madhavi Latha is presently a professor in the Department of Civil Engineering and chair of the Centre for Sustainable Technologies at the Indian Institute of Science (I.I.Sc.), Bengaluru. She is an aspiration for young girls to adopt career in fields which are not common for women.

Early Life and Education: Dr. Madhavi Latha comes from middle-class family in a small village Yedugundlapadu, in Andhra Pradesh, where she was the first engineer ever. There is limited public information about Professor Latha's family. This lack of information suggests that she may keep her personal life private, focusing instead on her professional achievements. Professor Latha's educational qualifications are foundational to her success. She earned her Bachelor of Technology (B.Tech.) degree in Civil Engineering from Jawaharlal Nehru Technological University (JNTU), Kakinada Hyderabad, in 1992 graduating with first class and distinction, where she was mentored by Prof. A. Sreerama Rao, who taught soil mechanics and recognized her potential for research. She then pursued for her Master of Technology (M.Tech.) in Geotechnical Engineering at the National Institute of Technology (NIT) Warangal (1993-95), where she graduated as a Gold Medalist. During this period she realized her passion for scientific research, as noted in her profile on the I.I.Sc. Women in Science page. She completed her PhD in Geotechnical Engineering at the Indian Institute of Technology (IIT) Madras (1995-2000), under the supervision of Prof. K. Rajagopal, whom she credits for his deep understanding of concepts and significant influence on her academic development. Two persons, who helped her in shaping up the career, are Prof. A. Sreerama Rao, who taught the basics of soil mechanics and ground improvement during B. Tech. at JNTU Kakinada and Prof. K. Rajagopal, her Ph.D. supervisor at IIT Madras. While the love for this subject was initiated by the former, complete credit for familiarizing with the intensity of the subject, along with a deep-rooted understanding of concepts, goes to the latter. This educational trajectory equipped her with the technical expertise and research acumen that define her career.

Career and Research :

Following her doctoral studies, Latha conducted postdoctoral research in Rock Engineering at the Indian Institute of Science from 2002 to 2003. She subsequently served as an assistant professor at I.I.T. Guwahati from 2003 to 2004. In 2004, she joined the Indian Institute of Science as assistant professor in the Department of Civil Engineering. She was promoted to the position of associate professor in 2009 and became professor in 2015 and since 2024 she is working as HAG professor in civil engineering department of I.I.Sc. Bengaluru. She values the research freedom and homely work culture at I.I.Sc. Over the years, she has supervised numerous graduate students and contributed to geotechnical engineering education and research in India. Her career at I.I.Sc., spanning over 20 years, has been marked by both achievements and challenges and she finds science fulfilling, interesting, and adventurous, despite the hardships.

Madhavi's academic journey is marked by significant contributions to geotechnical engineering, with research interests spanning soil and ground reinforcement, geosynthetics, earthquake geotechnical engineering, rock engineering, numerical modeling of jointed rock masses, stability analysis of rock slopes, and rock slope reinforcement. Her work has received global recognition, particularly her efforts in micro to macro soil-reinforcement interactions, supported by digital image analysis, which has been cited over 5,000 times on Google Scholar.

Madhavi's research interests center around fundamental aspects of soil and ground reinforcement. This has entailed studying basic friction characteristics between soils and reinforcement especially the frictional behavior at sand-geosynthetic interfaces, understanding the strength of improved ground and shear mechanisms at a micro level. Madhavi's recent work on this subject area is to use image-based techniques to understand the micro topographical surface changes in geosynthetics sheared by sands and relating them to stress-displacement response of sand-geosynthetic interfaces. Several topics explored in the area of soil reinforcement include strength and stiffness of geocell reinforced soils; model tests on geosynthetic reinforced foundation beds, retaining walls and slopes; cyclic load response of geosynthetic reinforced road aggregates; seismic response of rigid, wrap-faced, modular block faced and geocell retaining walls through shaking table studies.

Dr. Latha has received numerous prestigious awards and honors throughout her career such as Prof. S.K. Chatterjee Outstanding Researcher Award at IISc., Woman Achiever Award by Karnataka Book of Records, SERB POWER Fellowship, Best Woman Researcher in Geotechnical Engineering by the Indian Geotechnical Society in 2021, Featured in the Top 75 Women in STEAM (Science, Technology, Engineering, Arts, and Mathematics) in India in 2022.

Professor Latha holds the position of Chair for the Centre for Sustainable Technologies at I.I.Sc., reflecting her commitment to sustainable engineering practices. She has been a primary geotechnical consultant for major infrastructure projects, notably the world's highest railway bridge across the Chenab River in Jammu, India. Additionally, she served as Editor-in-Chief of the Indian Geotechnical Journal (published by Springer) from 2016 to 2022, and she currently serves as an Associate Editor for several prestigious journals, including the ASCE Journal of Materials in Civil Engineering, Geotextiles and Geomembranes, and the International Journal of Geosynthetics and Ground Engineering. Her contributions have earned her the distinction of being the first recipient of

the Best Woman Researcher in Geotechnical Engineering award from the Indian Geotechnical Society, highlighting her impact on the field.

Role in Developing World's Highest Chenab Bridge Project: A Telugu woman, Dr. Gali Madhavi Latha's tireless dedication and experience played a crucial role in overcoming the challenging geological and environmental conditions of the Chenab Bridge project to deliver one of the greatest civil engineering achievements in Indian history. Dr. Latha played an advisory role in the construction of the Chenab Rail Bridge, an infrastructure project located in the Himalayas. Her professional life exemplifies geotechnical engineering excellence, path-breaking research, and female engineer advocacy.

High in the rugged, unforgiving terrain of J and K's Reasi district, where the Chenab River slices through deep gorges and the Himalayas loom like silent giants, a marvel of human ambition now stretches its arms — the Chenab Rail Bridge, the tallest rail bridge in the world. But behind this audacious achievement lies not just engineering brilliance but a tale of resilience, vision, and courage — that of Prof A.S. Madhavi Latha, a geo-technology expert whose quiet determination and technical genius helped make the impossible possible. Her expertise in slope stability, soil-structure interaction, and geotechnical investigations made her a crucial advisor in several national infrastructure projects, including the Chenab Bridge. Her involvement in the Chenab Bridge project was particularly significant in terms of site assessment, foundation design, and slope stabilization - critical components in a bridge built in one of the world's most complex geological settings. She has been geotechnical advisor for the Chenab Bridge for 17 years. Given the region's complex geology, weather extremes, and inaccessibility, her team employed a "design-as-you-go" strategy, adapting to in-situ geological variations such as fractured rock formations and hidden cavities. Her contributions included the design and placement of rock anchors to enhance structural stability, enabling safe construction in highly variable rock mass conditions.

Prof. Madhavi Latha was never one to chase headlines, rather a reluctant trailblazer. She had already spent decades quietly pushing the boundaries of geotechnical engineering — the science of building stable structures on earth, rock, and uncertain terrain. But when the Indian Railways, under its ambitious Udhampur-Srinagar-Baramulla Rail Link (USBRL) project, envisioned a bridge soaring 359 meters above the Chenab River - taller than the Eiffel Tower - they knew this required more than conventional engineering. It needed courage, intellect, and unshakable faith in science. In 2005, Northern Indian Railways invited Dr. Madhavi Latha to join the expert panel along with the consultancy firm, AFCONS as a part of I.I.Sc. support team.

Dr Latha's role in this project was not easy. Her task was immense. The land near Chenab was treacherous - steep slopes, poor rock quality, and high seismic activity. But she wasn't just there to advice - she led the geotechnical investigation that would determine the strength, stability, and behavior of the foundation that would anchor the bridge. She had to face extreme weather, challenging terrain, and the harsh conditions of the mountainous region. Despite these, her dedication has led to significant contributions, including innovative reinforcing techniques for resilient geotechnical systems and extensive work on the seismic response of geosynthetic reinforced structures. Her team toiled for months in extreme conditions. Working with men and women of varied expertise, she inspired collaboration, trust, and

tenacity. Rock samples were extracted from hundreds of meters below. Wind and seismic simulations were run in labs and re-run when they didn't convince her. She wouldn't allow guesswork. Not when Indian soldiers and citizens would one day cross that bridge. The unstable layers and breaking rocks were a great challenge to build a bridge. She adopted 'design as you go' procedure along with the Afcons Company. She suggested rock anchor and ground stabilization to increase the strength of the rocks. The bridge is constructed at a height of about 360 meters and requires precision engineering to ensure its safety and durability. She not only dealt with the practical problems of the project but also been active in the process of real time design change.

Her passion for infrastructure development and her ability to thrive in such a tough environment has earned her great respect amongst her peers. Despite the hurdles, she has successfully managed the bridge's construction with dedication and skill. From 2004 to 2022, she frequently travelled between Bengaluru and Jammu & Kashmir, leaving her family. Prof. Latha has fearless mind. She would later recall in interviews. "People kept asking, what if the terrain collapses? What if there's a landslide? What if the winds tear the bridge down?" And she answered 'what if we succeed?' Recently she has published a paper entitled 'Design as you go: case study of Chenab Railway bridge'.As the work on the arch design progressed - a massive 476-meter span - Prof Latha ensured the foundation and slope stabilization matched the immense loads the structure would carry. It wasn't just rock and concrete. It was about ensuring decades of endurance through rain, snow, windstorms, and even potential earthquakes. Her work, though behind the scenes, became the bedrock of the project's integrity. The iconic steel arch that now defines the Chenab Bridge stands proud not just because of its metalwork, but because someone had read the ground, listened to the earth, and planned every bolt with precision, standing on Steel and Grit. Standing tall at 359 metres above the riverbed, the 1,315-metre-long bridge surpasses the Eiffel Tower by 35 metres and has an expected lifespan of 120 years. Built to 1withstand wind speeds of up to 260 kmph and seismic activity, this single-arch railway bridge is a testament to Indian engineering expertise. When the Chenab Bridge is finally completed and trains having started to run, the world applauded the achievement, but in the quiet corners of the story, the nation will remember that one of its finest daughters - Prof A.S. Madhavi Latha - helped turn a dream into steel. Madhavi Latha called the Chenab Railway Bridge a 'civil engineering marvel,' She proved that bridges aren't just built with iron - they are built with vision, conviction, and indomitable human spirit.

As a woman in a traditionally male-dominated field, Dr Madhavi Latha has faced her share of challenges but continues to break barriers. Her leadership and hard work have inspired many, especially women, to pursue careers in engineering. She advises aspiring women scientists to be available to opportunities, emphasizing the importance of courage for tough career decisions and choosing what they love over convenience, reflecting her own approach to her career. Her work culture and advice underscore her role as a mentor and role model in the scientific community. Even as she worked on the Chenab Bridge, Prof Latha never stopped being a teacher. Her students at I.I.Sc. remember how she would take overnight flights from Kashmir to make it to morning lectures. How she would bring real-world problems into the classroom and inspire young Indians - particularly the girls - to believe that engineering wasn't just about textbooks, but about shaping a nation's destiny.

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Structuring Physics in New Times: The New Education Policy 2020

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Education is essential for achieving one's full potential, building a fair community, and promoting National advancement. India incorporated Sustainable Development Goal 4 (SDG4) of the 2030 Agenda in 2015. The goal is to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" by 2030, which is in line with the global objective for the development of the education sector. Physicists have worked to alter the way physics is taught for nearly as long as it has been taught in high school. Naturally, science was taught in schools in a dogmatic and deductive manner when it was first introduced. However, we must now acknowledge that science is our method of analysing natural phenomena. Therefore, teaching young people how to interpret for themselves is essential if they want to be proficient in science - the NEP's ultimate vision. It ought to form the habit of correctly interpreting phenomena, which is something that can only be learnt by scientific research. Teachers' perspectives and teaching methods are also crucial in creating a pool of educators who will positively impact the next generation. Teachers' education will gradually move to multidisciplinary colleges and universities by 2030, according to NEP, in acknowledgement of the necessity for training in both pedagogy and high-quality content. This article focuses on the novel approaches adopted in the journey of teaching and learning Physics.

Introduction

Significant changes in the process of teaching and learning, particularly in physics at the school and university levels in India, are brought about by the National Education Policy (NEP) 2020 [1]. These modifications aim to foster interdisciplinary learning, conceptual understanding, and the practical application of scientific knowledge and its technology transfer in real-world contexts. It encourages project-based learning, practical experimentation, and the incorporation of technology into science instruction. This method seeks to enhance the comprehension ability and interest towards physics. Instead of emphasising rote memorisation, NEP promotes competency-based examinations with emphasis on application and analysis. It is carved considering both students' and teachers' perspectives. For students, board exams are redesigned to assess critical thinking abilities and conceptual comprehension. Students can customise their educational pathways by including other subjects of their own interest, along with physics, like music, history, or economics, fostering a holistic educational experience[2,3]. They can accumulate credits for finished courses and keep them in a digital repository with the Academic Bank of Credits (ABC). High-quality physics courses and resources are accessible through platforms like SWAYAM, e-Pathshala and DIKSHA, allowing the learners to access lectures,

simulations, and tests in physics, as well as virtual labs to encourage experimentation even at remote locations[4] for self-paced study and ongoing professional development for students as well as teachers. When it comes to teachers, participation in ongoing professional development programs, which include 50 hours of training each year, is encouraged. These courses concentrate on using technology and contemporary teaching methods to teach physics [5].

Enhancing conceptual understanding and critical thinking in Physics, promoting interdisciplinary learning and the application of Physics in real-world contexts, offering educational pathways that are flexible enough to accommodate a range of student interests and career goals, and utilising technology to increase access to high-quality Physics education are the goals of the NEP 2020 reforms[6,7]. These modifications aim to enhance the relevance, engagement, and alignment of physics education with 21st-century skills. It also brings about changes in assessment tools and techniques. Quizzes, presentations, and practical work are used to continuously formatively test students' application, critical thinking, and analysis skills. This policy helps students and teachers compete with the world, which is now undergoing rapid changes in the knowledge landscape.

■ It's evolution

Mrs. Indira Gandhi's administration implemented the first education program in 1968. Later, in 1986, her son, Mr. Rajiv Gandhi, who was then prime minister, replaced this with the National Education Policy, followed by minor changes by Prime Minister P V Narasimha Rao in 1992. After almost 35 years, now, in 2020, the ruling administration came up with a new education program with significant reforms. Following cabinet approval, the policy's specifics were made public on June 29th and this policy would serve as a thorough framework to direct the nation's educational advancement.

■ The Vision

National Education Policy (NEP) aims to provide high-quality education to everyone, regardless of caste, creed, or means of subsistence and to create an education system with roots in Indian culture, thereby contributing to the transformation of Bharath into Vikasit Bharat. According to the Policy, our institutions' curricula and pedagogy should foster a profound respect for the Constitutional values and Fundamental Duties, a sense of national pride, and an understanding of one's roles and responsibilities in a changing global environment [8], which helps the students become truly global citizens.

■ Key features

NEP 2020 addressed a number of important issues, such as ensuring that all students receive a 100% Gross Enrolment Ratio (GER) by 2030, substituting the 10+2 curriculum structure with a "5+3+3+4" structure, and providing socially and economically disadvantaged groups (SEDG) with an edge. According to NEP, until at least grade 5, instruction should be offered in the regional language, mother tongue, or local language. This will help kids feel more comfortable learning new topics because they will be more at ease speaking their mother tongue or local language. In addition to developing a new curriculum for deaf pupils, Indian Sign Language (ISL) was standardised nationwide. The new policy suggests switching from a program-outcome-based assessment to a year-round assessment framework. This means cutting back on rote learning and curriculum content while adding conceptual learning, experimentation, and critical thinking [9,10].

■ Changes Proposed in Higher Education

In order to investigate how physics is taught and learnt, scholars in Physics Education Research

(PER) have chosen to employ scientific standards of evidence, have a background in physics, and have finished graduate-level physics research. PER scientists' study all about the students' understanding of physics, their reasoning and problem-solving skills, the participation and performance of students from under-represented groups, the preparation of physics teachers, and the measurement of physics comprehension [11]. They regularly develop research-based physics curricula and then subject them to rigorous, ongoing assessment. NEP, by taking these aspects into account, proposed many changes in higher education. With (i) a certificate after one year, (ii) a diploma after two years, (iii) a bachelor's degree after three years, and (iv) a bachelor's with research after four years, undergraduate degrees provide a variety of flexible exit alternatives. To bring degree programs into line with Western norms, MPhil (Master of Philosophy) courses will no longer be available. The policy's recommendation is to alter the way that universities, such as the IITs, handle learning diversity. The National Testing Agency will now administer admission exams for university enrolment across the country in addition to JEE Main and NEET. The proposed policy would increase the globalisation of Indian education [12,13]. India is now capable of hosting international university campuses. Both public and private institutions will have set tuition costs. It focuses on cutting-edge fields like astrophysics and quantum computing, Computational Physics and Photonics. This makes it easier for the students to keep up with the latest developments in physics research. Additionally, NEP incorporated research projects, internships, and on-the-job training programs into the postgraduate curriculum (chemistry, physics, etc.). Students are more likely to be exposed to the industrial setting where they hope to work in the future as a result. By relating theory to practice, they become familiar with the working environment of the real world and become prepared for a job. Assessment for NEP 2020 consists of both final exams and continuous internal review. Final-year projects or theses for students interested in research that place a strong emphasis on using physics to solve real-world problems. Every year, physics instructors must complete fifty hours of Continuous Professional Development (CPD)[14]. Pedagogical strategies like flipped classrooms, teaching in the use of digital tools (such as online labs and simulations), and, when necessary, bilingual instruction[15]. Continuous Internal Evaluation (CIE) is being adopted and is assessed as follows: Theory Assignments: 30%, Lab work and small projects: 30%, exams at the end of the semester (40%).

Conclusion

The way a policy is implemented determines how effective it is. Multiple efforts and activities will be needed for such execution, and they must be conducted by several bodies in a coordinated and methodical way. Therefore, in order to ensure that the policy is implemented in its spirit and intent, through coherence in planning and synergy across all these bodies involved in education, the policy should be implemented with certain timelines and a plan for review. The way Physics is taught in schools has drastically changed with the implementation of NEP 2020. Teachers are now well-trained to explain the basic concepts of Physics by vividly interpreting phenomena, making the students learn through hands-on sessions in their practical labs or through online animated videos that make the concepts crystal clear. Teachers' perspectives and teaching methods have changed mid and post-COVID, equipped with all the prerequisites of online teaching and learning after rigorous background work. Thus, NEP-led education is revolutionizing the education system through various reforms. Hope the current generation will become global leaders and lead many such reforms for a better future.

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Biophysics: The Physics of Life

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The invisible threads connecting physics and biology weave one of the most fascinating stories in modern science — the story of biophysics. This interdisciplinary field applies the principles and methods of physics to understand the structure and function of biological systems, from single molecules to complex organisms.

Origin of Biophysics

The roots of biophysics trace back to the 19th century, when scientists first began applying the tools of physics to study living organisms. Early physiologists like Hermann von Helmholtz measured nerve impulses and studied the conservation of energy in muscles, establishing that biological systems obey the same physical laws as inanimate matter.

By the early 20th century, pioneers such as A.V. Hill, Jacques Loeb, and J.D. Bernal used quantitative physics to explain biological phenomena — from diffusion and membrane transport to the structure of proteins. The discovery of DNA's double helix in 1953 by Watson and Crick, aided by X-ray diffraction data from Rosalind Franklin, marked a defining moment, positioning biophysics as a distinct scientific discipline.

With advances in molecular biology, computing, and imaging, the field expanded rapidly through the late 20th century. Today, biophysics bridges atomic physics, chemistry, and biology, illuminating everything from neural signaling to molecular motors and the physics of ecosystems. In essence, biophysics was born when curiosity about life's mysteries met the precision of physics — creating a field that continues to unravel the physical principles behind living systems.

Biophysics in Everyday Life

Biophysics isn't confined to laboratories — it quietly operates all around us, shaping the way we move, breathe, see, and even think. Every heartbeat, muscle contraction, and nerve impulse follows the laws of physics. Understanding this connection helps us appreciate how life itself is a masterpiece of physical principles in motion.

1. Breathing and Gas Exchange

When we breathe, air flows through our lungs due to pressure differences — a principle explained by physics. The exchange of oxygen and carbon dioxide follows diffusion laws, and the elasticity of lung tissues can be studied through biomechanics. Biophysics helps doctors understand how oxygen reaches our cells and how breathing patterns affect health.

2. Vision and Light

The process of seeing is pure physics in action. The lens of the eye focuses light onto the retina, where photoreceptor molecules convert photons into electrical signals — a phenomenon known as phototransduction. The study of optics and signal transduction in vision is a classic example of biophysics.

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3. Movement and Muscles

When you lift a bag or go for a walk, thousands of molecular motors inside your muscles — such as myosin and actin — convert chemical energy (ATP) into mechanical motion. Biophysics explains how these nanoscales machines generate force, maintain balance, and coordinate complex body movements.

4. Hearing and Sound Waves

Sound waves enter our ears, causing the eardrum and inner ear hairs to vibrate. These mechanical vibrations are transformed into electrical signals by mechanotransduction, a biophysical process that enables us to detect even the faintest whisper or a musical note.

5. The Physics of Touch and Temperature

Our sense of touch relies on pressure-sensitive ion channels that respond to mechanical stimuli. Similarly, thermoreceptor proteins in our skin detect changes in temperature. Both are governed by the physics of molecular motion and electrical signaling.

6. Biophysics in Medicine

Medical technologies such as MRI (Magnetic Resonance Imaging), CT scans, ultrasound, and X-ray imaging allow us to visualize organs and tissues non-invasively and are direct applications of physics to biology.

7. Plants and Photosynthesis

Even plants use biophysics! In photosynthesis, light energy is converted into chemical energy through quantum mechanical processes in chlorophyll molecules. Understanding this process helps scientists design solar cells and bio-inspired energy systems.

8. Everyday Technology Inspired by Biophysics

Biophysics also inspires biomimetic designs — technologies modeled after nature. Examples include gecko-inspired adhesives, artificial limbs, and robotic wings designed using the physics of bird flight.

Understanding Life Through Physics

Biophysics seeks answers to fundamental questions — *How do proteins fold into precise shapes? How does energy flow in cells? What physical forces drive nerve impulses or muscle movement?* Using the language of physics, scientists decode the mechanics of life itself.

At its core, biophysics explores how energy, force, motion, and matter interact within living systems. The same physical laws that govern atoms and galaxies also govern DNA replication, enzyme reactions, and photosynthesis.

Techniques that Unveil the Invisible

Modern biophysics is powered by advanced tools and technologies:

- X-ray crystallography reveals the atomic structure of proteins and nucleic acids.
- NMR spectroscopy provides insights into molecular dynamics.
- Cryo-electron microscopy (Cryo-EM) visualizes biological molecules in near-native states.
- Fluorescence microscopy and confocal imaging track live-cell processes.
- Atomic Force Microscopy (AFM) measures nanoscale forces on cell surfaces.
- Computational modeling and molecular dynamics simulations predict biomolecular behavior.

These methods have revolutionized our understanding of DNA structure, protein interactions, cell signaling, and neural communication.

Applications of Biophysics

Biophysics bridges the gap between physics and biology, helping us understand how life works at molecular, cellular, and organism levels. It applies physical principles and mathematical models to biological systems, leading to innovations in healthcare, agriculture, environment, and technology.

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1. Medical Imaging and Diagnostics

One of the most visible applications of biophysics is in medical imaging. Techniques such as X-ray crystallography, MRI (Magnetic Resonance Imaging), CT (Computed Tomography), PET scans, and ultrasound are rooted in biophysical principles. They allow doctors to visualize organs, tissues, and even molecular structures without surgery, revolutionizing diagnosis and treatment.

2. Structural Biology and Drug Design

Tools like X-ray diffraction, NMR spectroscopy, and Cryo-electron microscopy help study the molecular structures. Understanding the 3D structure of proteins and enzymes helps scientists design effective drugs and vaccines — an essential step in modern medicine and biotechnology.

3. Neuroscience and Brain Research

Biophysics helps decode how electrical signals travel through neurons, how brain cells communicate, and how sensory systems function. Technologies such as EEG and fMRI are used to study brain activity, which aids in the diagnosis and treatment of neurological disorders like epilepsy and Parkinson's disease.

4. Cardiovascular and Muscular Physiology

The pumping of the heart and contraction of muscles are governed by mechanical and electrical biophysical processes. Biomechanics help researchers develop artificial hearts. Bioelectrics aids in developing pacemakers and prosthetic devices that mimic natural body functions.

5. Bioenergetics and Photosynthesis

Biophysics explains how living organisms convert energy — from the ATP cycle in humans to photosynthesis in plants. Insights from these processes inspire renewable energy technologies and bio-inspired solar cells.

6. Environmental and Agricultural Applications

Biophysical models are used to understand ecosystem interactions, plant growth, and climate impacts on biodiversity. In agriculture, plant biophysics aids in developing stress-resistant crops and improving soil–water–plant relationships for sustainable farming.

7. Nanobiotechnology and Biosensors

At the nanoscale, biophysics merges with technology to create biosensors, lab-on-chip devices, and nanocarriers for targeted drug delivery. These innovations are transforming diagnostics and personalized medicine.

8. Radiation Biology

Biophysics explores how ionizing radiation interacts with biological matter, leading to advancements in radiation therapy for cancer and protection from harmful exposures.

9. Computational Biophysics

With the help of simulations and modelling, biophysics predicts the behaviour of complex biological systems. It supports protein folding studies, drug interaction modelling, and genomic analysis — accelerating discoveries in modern biology.

The Bridge Between Life and Physics

By merging physics with biology, biophysics not only explains how life works but also inspires new technologies that enhance it. It reminds us that nature's complexity arises from simple physical laws — harmonized beautifully in the rhythm of life itself.

From decoding the structure of DNA to designing cutting-edge medical technologies, biophysics touches nearly every aspect of human life. It continues to expand our understanding of how physics governs the living world, paving the way for innovation in health, energy, and sustainability.

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Confluence of Ancient Wisdom of Vimāna Śāstra and Contemporary Physics & Aeronautics

■ [1]Mrunal M. Yawalkar, [2]Bhavna D Deshpande
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Humans always had a fantasy to fly in air like a bird. Whenever there is reference of airplane flying successfully in air, Wright brothers - Orville and Wilbur are always remembered with great admiration. Their heavier than air, Wright Flyer completed the first controlled flight of 12 seconds. This invention of airplane by Wright brothers is considered to be a milestone in human development that laid the foundation of modern aerospace engineering. While the Wright brothers pioneered heavier-than-air flight in the 20th century, ancient Indian texts reveal much earlier and sophisticated aerial vehicles.

Aerial transportation is referenced in numerous ancient Indian literary works that describe aerial chariots or vimanas or flying machines. The earliest mention of vimanas appears in Rigveda, which includes references to

- Vidyut Ratha a vehicle that operates on electromagnétic power Rigveda 3.14.1

आ होता मन्द्रो विदथान्यस्थात्सत्यो यज्वा कवितमः स् वेधाः ।

विद्युद्रथः सहसस्पुत्रे अग्नि शोचिष्केशः पृथिव्यांपाजोअश्रेत् ॥

- Trichakra Ratha, a threee-wheeled vehicle designed to operate in the air, Rigveda 4.36.1

अनश्वो जाती अनभीशुरुक्थ्योइ रथस्त्रिचक्रः परि वर्तते रजः ।

महत्तदो देवस्य प्रवाचन धामृभवः पृथिवीं यच्च पुष्यथ ॥

and also to jalayan, kaara-kaara-kaara, Tritala-Tritala-Tritala and Vayu Ratha.

Pushpak Vimana, also known as the flowery chariot is mentioned in the Hindu epic Ramayana originally built by Vishwakarma for Brahma and later gifted to Kubera, but was stolen by his half-brother, the demon-king Ravana. This powerful large, luxurious and self-propelled vimana was used by Rama to return to Ayodhya with his allies on defeating Ravana in war.

- त्वमध्यारोह, सामात्यो राक्षसेन्द्र विभीषण । ततस्तत्पुष्पक दिव्यं सुग्रीवः सह सेनया ॥

- Sachitra Valmiki Ramayana. Yuddha kanda 125-24

- यस्य तत् पुष्पकम नाम विमानम कामगम् शुभम् । वीर्याद् आवर्जितम भद्रे येन यामि विहायसम्॥

-Aranya Kand, 48-6

Shalva king had used a mysterious high-tech aerial vehicle constructed by Maya Daanav to terrify the Vrishnis and attack dwarka of Lord Krishna

- तथेति गिरिशादिष्टो मयाः पुरपुरञ्जयः पुरं निर्माय शाल्वाय प्रादात्सौभमयस्मयम×॥

-Shrimad Bhagavatam 10.76.7

Many instances on the use of different vimanas are found in Mahabharata, one being the Indra's aerial chariot used by Arjuna to travel to heaven along with Matali (Chapter 42 –Vana Parva). Laghu Dharu Vimana and Alaghu Dharu Vimanain the shape of huge bird-maha

vihanga and shape of a temple respectively are described in Yantravidhanam in Bhojadeva's Samarangana Sutradhara.

Among these texts, Yantra Sarvasva by legendary Hindu sage Maharshi Bharadwaj grabs pronounced attention for its detailed description of advanced aircraft/ vimana with various types of propulsions and many other defensive and offensive weapon systems. Brihad Vimāna Śāstra, a part from this Sanskrit text presents a comprehensive account of the technologically advanced aircrafts /spacecrafts like Rukma, Sundar, Shakuna and Tripura etc. that traversed the skies and interstellar spaces thousand years ago. The aerodynamic shape of Rukma Vimana is well represented by NASA's Space X Dragon and the modern space shuttle with rocket boosters by Sundara Vimana.

Vimāna Śāstra reveals a much earlier and sophisticated designs, construction, propulsion and maneuvering techniques of aerial machines called vimanas. The text encompasses descriptions of flying crafts that used principles similar to those of contemporary physics, like dynamic aerodynamic control, and vimana propulsion using heat, electric and solar energy. References to the specific lohas (metals and alloys), their synthesis and yantras (mechanical contrivances), that go in the construction of these artificial or Kaliyuga aeroplanes, instructions for pilots are awe inspiring. The text discusses various root metals and their exact proportion for creating alloys with desired characteristics.

According to Kriyaasara, Ooshmapa or the heat-resisting metal Raja loha, termed as the king of metals is best suited for manufacture of Rukma and Shakuna Vimana. The treatise 'Lohatantra' guides to mix the beejloha or root metals - Sunadaasya, Ranjika and Dvyanika in the proportion of 6:3:7 with 1/3 part borax, place the mixture in antarmukha or inward-mouthed crucible and melt it in Koorma vyaasatika furnace to produce Rajaloha or Rajaamlaatrit. The as synthesized material further subjected to colouring process involving particular organic and inorganic compounds yields golden coloured Rajaloha. Another special Vimana, Tripura Vimana which can travel on land, water and sky by alteration of its structure using motive power from solar rays has to be prepared only by Trinetra Loha. Shaakataayana explains Trinetra Loha as a metal shining like peacock feather, unburnable, unbreakable, weightless, impregnated by water, fire, air and heat and undestructible .

This highly advanced understanding of material science, nanotechnology, plant biology, chemistry, mechanics, energy transformation, and environmental physics this ancient manuscript alludes to is still being investigated for its possible insights into early aeronautics.

Aerospace advancements hinge on engineering materials with good physical, mechanical and functional properties with reasonable production cost. Material scientists are always trying to develop innovative solutions in the form of materials with high specific strength and stiffness, compatible with service environment that show good temperature capability, light weight and durable, formability and weldability, good corrosion protection, cost effective etc .

However, many are unaware of the profound scientific legacy we possess, spanning diverse branches of knowledge and this leaves us at a disadvantage in the modern world. Acknowledging and highlighting our

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historical achievements in various scientific disciplines will empower us to move forward with confidence and innovation towards a more enlightened future. Embracing the enormous knowledge existing in our Bharatiya texts written thousands of years ago and maintain the scientific accuracy and trust in these Bharatiya technological advancements, it's imperative to recreate and validate the theory and techniques and prove that our ancient knowledge is at par/advanced than the recent ones.

Conclusion

Research focused on deciphering the advanced scientific and interdisciplinary knowledge embedded in Maharshi Bharadwaj Vimāna Śāstra the Indian Knowledge System offers insights into Indian Knowledge System, particularly in aeronautics, engineering, and advanced materials, which could inspire modern aerospace innovations. Additionally, it will deepen understanding of India's rich cultural heritage and scientific thought, blending ancient wisdom with contemporary physics and engineering technology.

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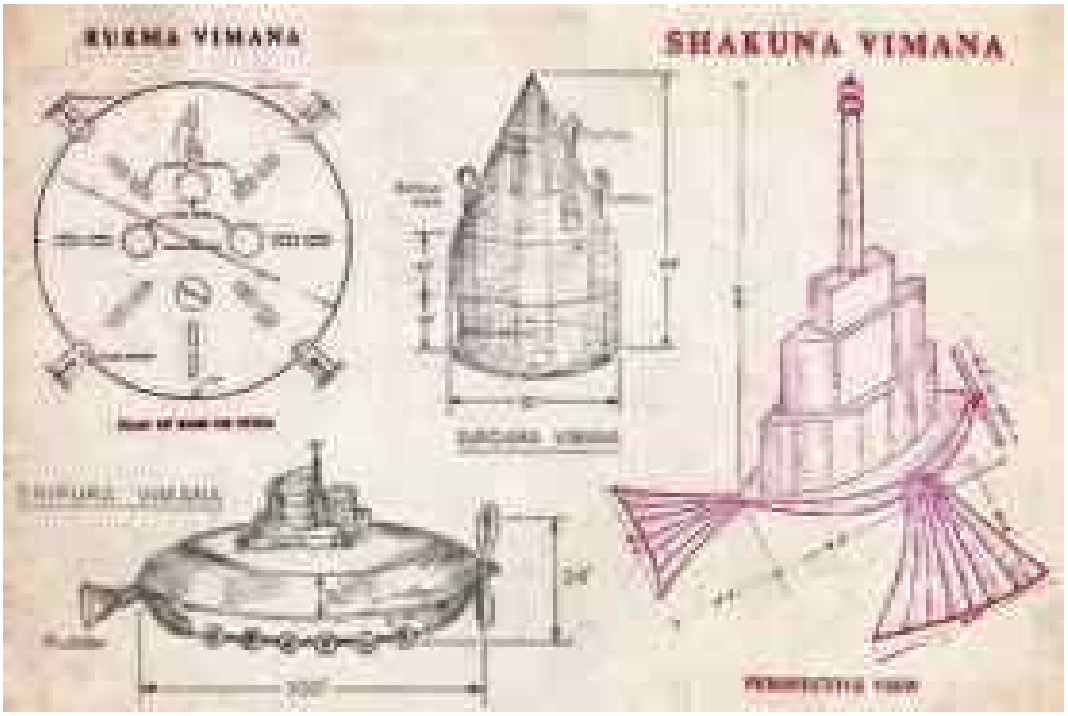

Ancient Vimanas And Vaimanika

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MICROPLASTIC POLLUTION- A PHYSICAL SCIENCE PERSPECTIVE ON A GROWING ENVIRONMENTAL CRISIS

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INTRODUCTION

The escalating problem of microplastic pollution represents one of the most pressing environmental challenges of the 21st century. Human populations have increasingly treated the oceans as dumping grounds, leading to the widespread contamination of shorelines and freshwater bodies across the globe [1]. Due to its remarkable durability and resistance to degradation, plastic waste has emerged as one of the most persistent pollutants in the environment. It readily adsorbs hydrophobic, persistent organic contaminants, thereby increasing morbidity and mortality among aquatic organisms.

Among the various forms of plastic debris, microplastics—minute plastic fragments less than 5 mm in size—pose a particularly severe threat. These particles have infiltrated nearly every part of the biosphere, from the deepest ocean trenches to snow-covered mountain peaks, and even into human drinking water and bloodstreams. Microplastics contain numerous chemical additives incorporated during manufacturing, many of which can leach into ecosystems and interact with other persistent, bioaccumulative, and toxic (PBT) substances [2].

From a physical science perspective, understanding the production, degradation, transport, and interaction mechanisms of microplastics is essential to addressing this growing crisis. This article examines the origins, physicochemical behavior, environmental impacts, and potential mitigation strategies for microplastic pollution, offering a comprehensive view of this multifaceted problem.

Figure 1- Microplastics pollution

MICROPLASTICS

Since their invention in the 20th century, synthetic organic polymers, also referred to as plastics, have become a ubiquitous part of everyday life and are used extensively in products ranging from clothing and sponges to

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bottles and gloves. As an aid in improving the performance of such materials, there are some chemical additives that are added during production—such as the butyltins, which stabilize polyvinyl chloride (PVC) polymers. Based on their size, constitution, and shape, plastic matter can be classified in several ways. Precisely, particles with a diameter of 1 μm to 5 mm are known as microplastics (MPs). MPs form a heterogeneous collection of pollutants from a variety of products, made from various sorts of polymers and additives, and having diverse shapes, colors, and chemical properties [3].

Types of MPs:

- **Primary MP's-** Final products of industrial activities used in cosmetics.

  Primary microplastics are intentionally made plastic particles of a microscopic size. They are produced deliberately for certain purposes, like exfoliating ingredients in cosmetics (e.g., shower gels, microbeads in lotion) or as industrial abrasives. Yet, controversy surrounds some of the sources such as synthetic fibers and tire wear because other scientists have included them in the category of primary microplastics since they are artificial and microscopic. In order to clarify such discrepancies, it is argued that the definition of primary microplastics should not only highlight their microscopic nature but also forcefully stress the artificial and deliberate manufacturing process [4].

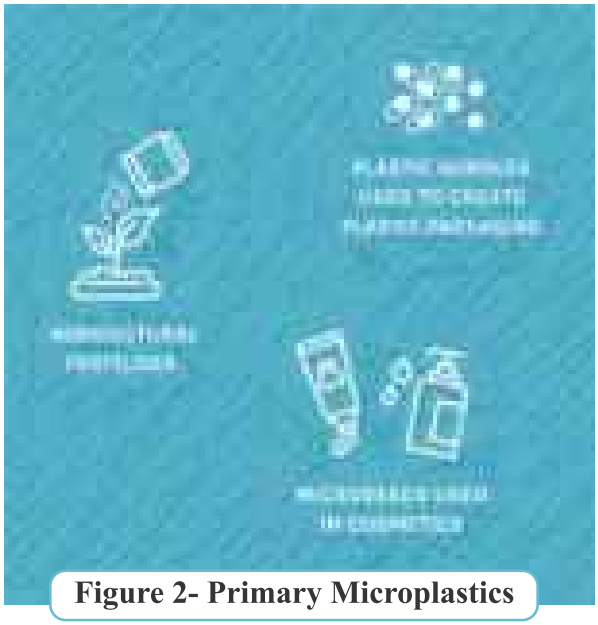

Figure 2- Primary Microplastics

- **Secondary MPs-** Products of Plastic Litter degradation.

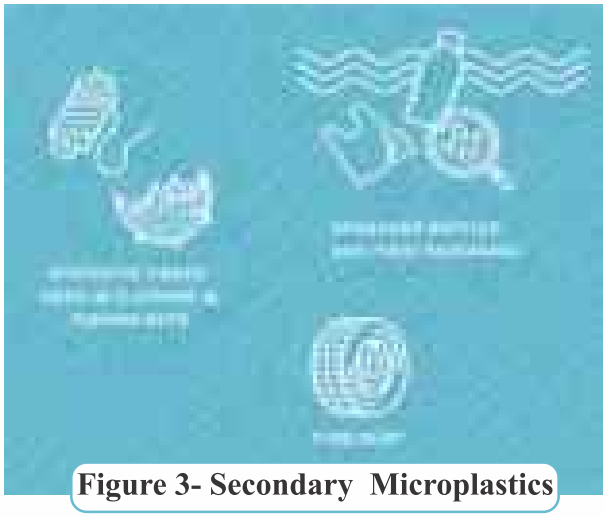

Figure 3- Secondary Microplastics

Secondary microplastics, however, are developed from the fragmentation of large pieces of plastic trash to small particles by way of physical, chemical, or biological degradation. They are not directly created but occur inadvertently due to natural weathering or mechanical abrasion. Typical examples include fibers shed off from washing synthetic fibers, tire particles created by road wear and fragments created by plastic mulch films or artificial turf. Although some of the largest sources of microplastic pollution, these are not always correctly classified because definitions are not clear. By highlighting their

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unintentional nature, secondary microplastics can be easily separated. It is essential to clarify them to create targeted anti- pollution strategies, where bans on manufacture can prevent primary microplastics, but for secondary microplastics, more general action against usage and disposal of bulk plastic products is required [4].

EFFECT ON ENVIRONMENT AND HUMAN HEALTH

Plastic waste amounts to a total of 4.8 to 12 million tons annually entering the oceans from 192 coastal nations, seriously endangering marine life. 269,000 tons of plastic are estimated to be floating on the surface of the ocean, without calculating microplastics suspended in water or deposited on ocean floors and beaches. Microplastics have been detected everywhere in the world, from shores to distant areas such as the deep sea and polar ice, with a concentration of up to 38,234 particles per cubic meter. Large levels of contamination have been detected in mid-latitude oceans, particularly the North Pacific and North Atlantic regions, with the subtropical zone of the North Pacific exhibiting an exponential rise over the last 40 years [5].

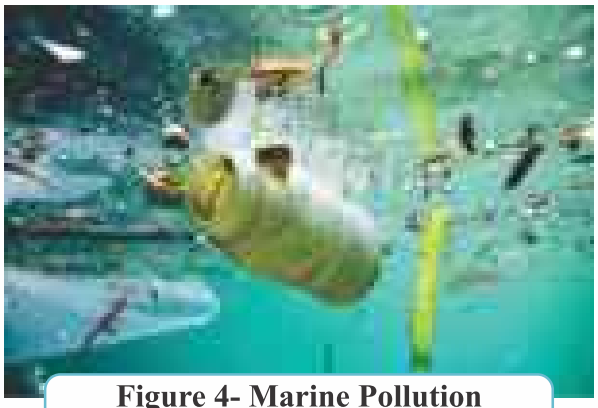

Figure 4- Marine Pollution

Marine microplastics originate from household products containing microbeads, domestic and industrial wastewater, and the breakdown of larger plastic waste. Natural forces such as tides and currents further spread this pollution. These microplastics disrupt marine life by blocking sunlight needed for photosynthesis and persisting in the ocean for centuries. Marine organisms often ingest plastics or become entangled in debris, leading to injury, disease, or death. Additionally, microplastics can release toxins and carry pollutants, intensifying ecological harm. Beyond environmental damage, this pollution also degrades coastal aesthetics and harms industries like fishing and tourism [5].

Figure 5- Threat to human health from Microplastics

Exposure to microplastics has become widespread, as the pollutants are now universal in the environment. Humans are exposed to microplastics through the ingestion of contaminated food, inhalation of airborne particles, and skin contact with products, clothing, or household dust that contain them. Microplastics pose a growing threat to human health by contaminating the air, food, and water we rely on daily.

1 Exposure Routes (Ingestion & Inhalation)

Recent research suggests ingestion as the major route of exposure for humans to microplastics. On average, people ingest about 39,000 to 52,000 microplastic particles per year via polluted food and drinks such as seafood, bottled water, salt, and dust in the air that falls on meals. Inhalation is also a major contributor with ambient air carrying synthetic fibers and tiny plastic particles. Urban rooftop fallout studies have yielded deposition rates of 29 to 280 particles per square meter per day, leading to an estimated tens of thousands of microplastic particles being inhaled annually [6].

2 Particle Translocation and Tissue Accumulation

Microplastics of a size smaller than 10 µm are able to translocate through epithelial barriers into systemic circulation. In laboratory and animal model experiments, they have been found to accumulate in organs, for e.g., particles smaller than 200 nm pass barriers and enter the bloodstream and tissues. One important finding: microplastics have been found in human blood and carotid artery plaques (buildup of fatty acids), indicating vascular isolation with potential cardiovascular consequences [6].

3 Cellular and Molecular Toxicity

At the cellular level, micro- and nano-plastics are shown to induce Inflammation and oxidative stress, Genotoxicity and Cytotoxicity. In vitro studies using polystyrene nanoparticles reveal activation of pro-inflammatory responses and oxidative stress pathways. Such cellular disruptions may underpin downstream health effects, though human data is still emerging.

4 Organ-System Impacts

Preclinical and early human evidence suggests that several organ systems are targeted: Respiratory: Inflammation of the lungs due to inhaled particles. Inhaled airborne polypropylene fibers from masks also occur with nodules in lung scans.

Cardiovascular: Identification in carotid plaques—also proposes roles in atherosclerosis and in thrombotic events.

Endocrine/Reproductive: The Existence of plastic additives (e.g., BPA, phthalates) can interfere with hormones, including effects on the hypothalamic-pituitary-gonadal axis.

Metabolic: Disruption of the gut-liver axis has been associated with insulin resistance and lipid metabolism alteration.

Neuro developmental: Nano-plastics permeate biological barriers in animal models, and they could interfere with brain tissues; however, human data confirming this is not available.

5 Bio accumulation & Food Chain Transfer

Fish and shellfish absorb microplastics, adding to food intake. In the United Kingdom, consumption of shellfish translates to around 123 particles per individual annually, increasing to 4,620 in nations where people consume much shellfish. Microplastics in soil also find their way into the food chain—through earthworms to chickens to humans [6].

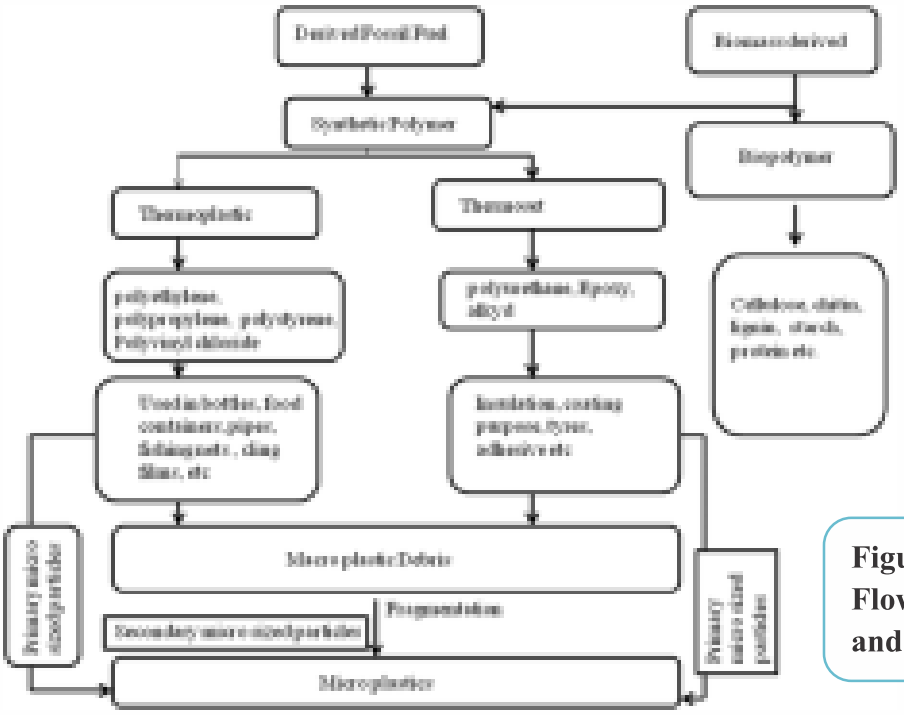

Figure 6- Flowchart on Primary and Secondary MP's

6 Evidence Gaps & Risk Assessment

Despite signs of biological accumulation and toxicity, quantitative health risk assessments remain incomplete. Human epidemiological data are scarce, and mechanisms linking exposure to disease outcomes need further study. Key information lacking includes particle dose-response thresholds and real-world concentration effects [6].

SOLUTIONS TO MICROPLASTIC POLLUTION

Microplastic pollution has emerged as a pressing issue, posing risks to both environmental sustainability and public health. These particles, which originate from the breakdown of larger plastics or are manufactured intentionally, are now found in oceans, soil, air, and even within the human body. The need for integrated strategies that not only tackle existing pollution but also prevent future accumulation is crucial. A comprehensive solution requires intervention at multiple levels—from production and consumption patterns to waste treatment and public policy.

The best means of decreasing microplastic exposure is by decreasing plastic use and production, particularly single-use plastics. This can be done by stricter plastic manufacturing regulations, prohibitions on particular plastic products, and incentives to

Figure 7- Reduce Plastic Pollution

businesses to create alternative materials. Inviting industries to use sustainable design principles—such as creating longer-lasting products that are easier to recycle or biodegrade safely—can also minimize plastic waste in the first place. Though biodegradable and bio-based plastics are touted as alternatives, they too need keen examination to guarantee that when they break down, they do not leave toxic residues [7].

Recycling is an important part of plastic waste management, but existing systems tend to fall short. To construct a more circular economy, it is necessary to enhance recycling infrastructure, market recovered materials, and make manufacturers responsible for the end-of-life of products through extended producer responsibility (EPR) programs. Not only will these actions decrease pollution, but they will also cut back on the demand for new plastic manufacture. Government policies need to promote the establishment of effective, low-cost collection and recycling systems, especially in the developing world where plastic pollution is the worst [7].

On top of prevention, remediation, and cleanup, action is needed to deal with the amount of microplastic pollution currently present. Mechanical cleanup options like beach cleanups and river filtration systems are helpful, but small in scale. New technologies, such as magnetic or biologically based filters that can catch tiny slivers of plastic, are already in research stages and may be viable for mass-scale use. Biological approaches, including the use of microorganisms that can degrade specific plastics, are also being researched, although their safety to the environment and efficacy in the long term need more investigation [7].

The complete scope of microplastic threats to human health continues to present a scientific challenge. Though studies indicate that breathing or ingesting microplastics can trigger inflammation, hormonal imbalances, and possible organ damage, more human data are required. More rigorous research, such as long-term epidemiology studies, is needed to clarify how exposure to microplastics is associated with disease or developmental disorders. Standardized testing procedures are also required to quantify the levels of microplastics present in food, water, and air, and in human tissues and body fluids [7].

Policy and regulation play an important part in determining how societies react to microplastic pollution. Global cooperation is necessary, and the development of legally binding worldwide agreements regarding plastic application and trash disposal may facilitate the uniformization of efforts across borders. National policies should have well-defined norms to control microplastics in merchandise products and have industries properly dispose of their waste. Governments also need to work with the private sector, researchers, and non-governmental organizations to put science-based and practical solutions into action.

Public engagement is equally important. Public education campaigns that teach people about sources and dangers of microplastics can result in changes in behavior, e.g., the use of reusable objects instead of disposable plastics or the washing of synthetic garments fewer times. Public buy-in to environmental action can be facilitated both by supporting data collection through citizen science efforts, e.g., monitoring or clean-up initiatives in the local context, and by participating in these activities themselves.

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Innovation, too, is a key to the puzzle. Ongoing research and development for more secure materials, new and better recycling technologies, and emerging technologies in filtration are needed for sustainable advancement. Mobilizing investment in green technology and encouraging the cross- pollination of scientists, engineers, and policymakers can speed the development of successful solutions. All of these innovations must be evaluated as a whole to make sure that they don't create new environmental problems when they are solving previous ones.

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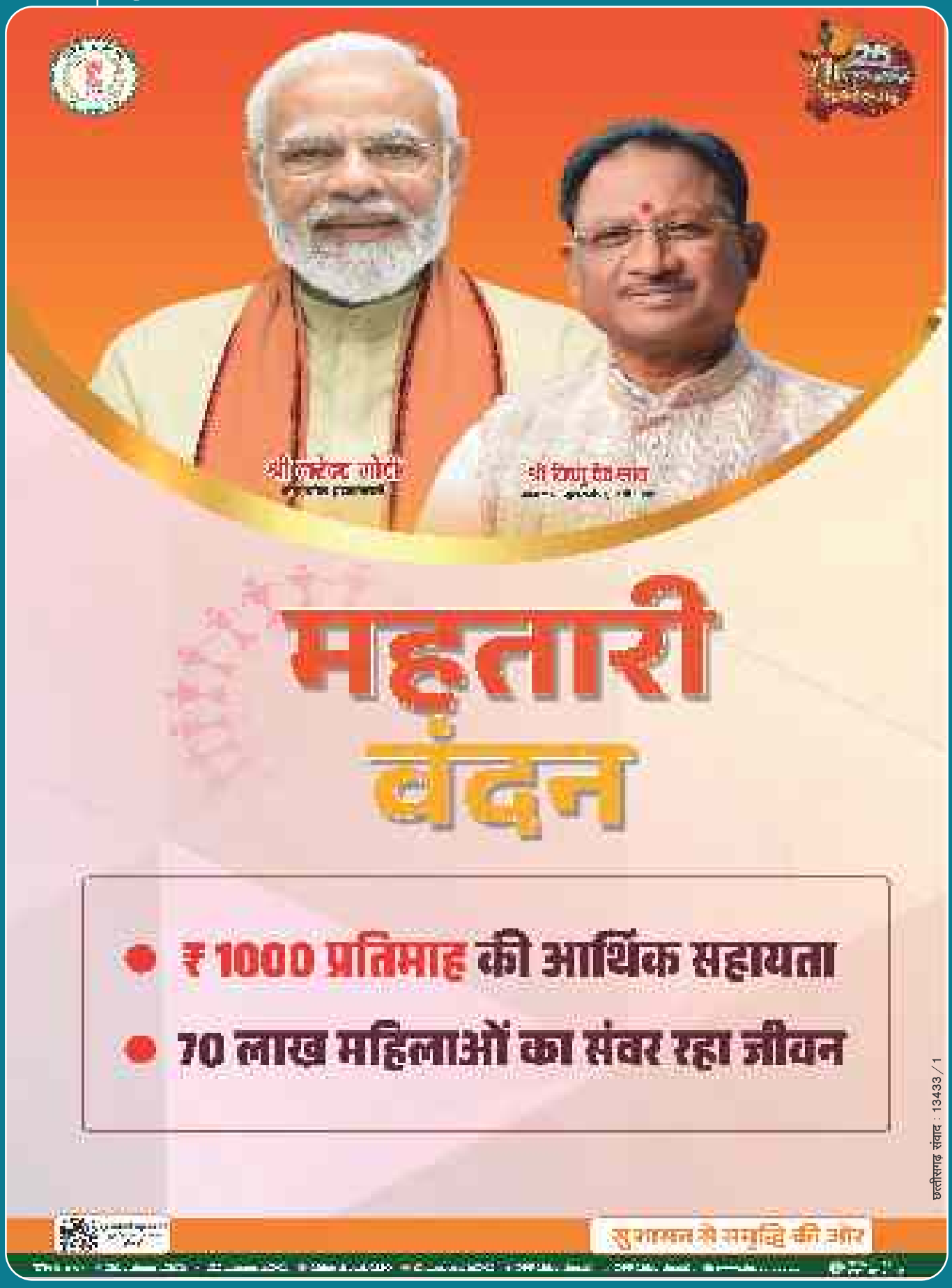

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SHAKTI
(A NATIONAL MOVEMENT FOR WOMEN)

SHAKTI

A National Movement for Women, was established in Kochi (Kerala) in the year 2003, by the inspiration of Vijnana Bharati, a Swadeshi Science Movement, the motto of which is 'Science and Technology for Social Harmony'. SHAKTI was formed with the vision to unite the women of India for social, intellectual, cultural and economic development of women in particular and Bharat in general. SHAKTI works for women with Science and Technology as a tool. SHAKTI works on the sacred concept of 'Ardhanareeshwara', acknowledging the complementary role of men and women in the progress and development of our Nation.

VISION

To strengthen the Social, Cultural, Intellectual and Economic growth of women for constructive leadership in leading the Nation.

MISSION

Empowering and enriching women through Science and Technological interventions by associating with Scientific, Government and Non-Government Organisations, Academicians, Self Help Groups, Philanthropists and the Youth.

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NATIONAL PROGRAMS

Abhyas Varg
Rashtriya Abhyas Varg is an orientation Program conducted once in two years for the state executive team

Conferences
National Seminars and Workshops are conducted every two years to deliberate, debate, discuss and disseminate scientific progress and innovations

Samarpan Diwas (28th October)
On the occasion of Bhagini Nivedita's Birth Anniversary, various activities and programs are organized every year in schools during 13-28 October, in acknowledgement of her 'Service to Society' motto. Bhagini Nivedita's dedication, untiring efforts and active contribution in sowing the seeds of Indian Culture and Values and her resolute efforts in the field of Science and Technology specially in bringing out the research work of Jagdish Chandra Bose on global platform are commemorated.

Science Festival (11-28 February)
Coinciding with the Day for Women and Girls in Science (11 February) and National Science Day (28 February), science activities such as science fairs, showcasing innovations, competitions, deliberations, debates for the students and interactions with eminent Scientists as a motivation for girl students to pursue science as career, are conducted.

Shakti Sthapana Diwas (22 March)
Foundation Day of Shakti is celebrated as "Shakti Sthapana Diwas" on 22nd March every year by all the units of SHAKTI. On this occasion the special guests and the organisations working for women welfare are invited. The local unit activities and the National Shakti activities are showcased in the event. "Shakti Sthapana Diwas" is celebrated by Conferring 'SHAKTI Prerana Samman' to a woman scientist for her social contribution, and ‘Swa-SHAKTI Sahayog’ to a talented girl student who is interested in pursuing Science or innovations.

Prabodhini
PRABODHINI means Refined Sense, Self-Knowledge or Individual Consciousness to Collective Consciousness. The aim of Prabodhini is to strengthen the inner self in a scientific way for rational introspection. Discourses by prominent intellectuals are conducted regularly in this context.

Publication
'PRAMA' is an Annual National Magazine publishing on issues related to social and science advancements, from 2011 onwards.

CSIR-Indian Institute of Chemical Biology

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CSIR-Indian Institute of Chemical Biology (IICB), originally established as the Indian Institute of Medical Research in 1935, later became a part of the Council of Scientific & Industrial Research (CSIR). The institute was founded with the noble mission of eradicating cholera, culminating in the development of an oral cholera vaccine. The institute operates through six research divisions and is spread across two campuses, in Jadavpur and Salt Lake, in Kolkata, with excellent infrastructure for pioneering research and innovation.

Major Divisions and Thrust Areas:

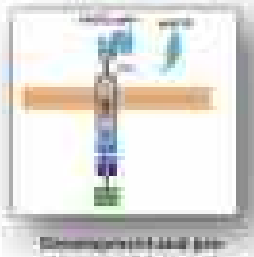
Ph.D. Programme being offered:

CSIR-Indian Institute of Chemical Biology, Kolkata offers Ph.D. Programme through AcSIR, Jadavpur University and Calcutta University in the following areas

- Cancer Biology & Therapeutics (Hematological & Solid Cancer)
- Drug Discovery & Development, API & KSM
- Immunology
- Metabolic Disorders (Cardiovascular Diseases, Diabetes, Lung Diseases)
- Neurodegenerative diseases and Neurogenesis
- Organic & Medicinal Chemistry
- Phytopharmaceuticals
- Transcriptional reprogramming in human diseases
- Viral and Parasitic Diseases (Leishmania, Malaria)

Generating Knowledge Globally

- Average Published Papers / Year = 100
- Hindex: 112
- Total citation: 1,05,217 (without self-citations)
- Average Impact Factor = 6.3



Bioengineered dual gene therapy validation of CAR-T constructs targeting ovarian cancer

Transforming Knowledge into Wealth (IP)

- Patent filed / Year = 6
- Patent Granted / Year = 4

Potential Technologies Developed Recently

- Novel Thermostable insulin formulation
- Potent TLR9 selective and TLR9 and 7 dual antagonists for Autoimmune diseases
- Novel amphotericin B liposomal formulation against Leishmania and fungi
- Novel Process for Manufacturing TRDP-recTRIOH
- Rapid Tests (Kit) for Diagnosis of Human and Canine Visceral Leishmaniasis (RTL) and Post Kala-azar Dermal Leishmaniasis (PKDL)
- An easy-to-use, point-of-care system for RNA-based detection of Dengue
- Diagnostic Kit for detection of Rheumatic Heart Disease
- Improved process for the manufacture of Tricaine and its salts
- Novel paromomycin liposomal formulation against Leishmania
- Tandem Metabolic Therapy for Management of Cancer
- Management of Prostate Hypersexuality disorders (Prostaxy®) being commercialized)
- Organelle Specific Fluorescent probes for live cell imaging

Rapid Diagnostic Kits for Leishmaniasis

Rapid Diagnostic Kits for RHD

Hemostatic Pad for faster blood clotting

Prostaxy®

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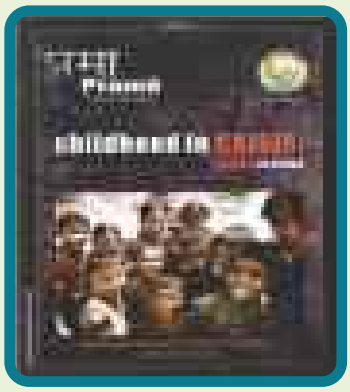
Phone: (033-24995779) (PAX No.), (033-24995791 (Director), Email: [redacted], Website: https://iicb.res.in

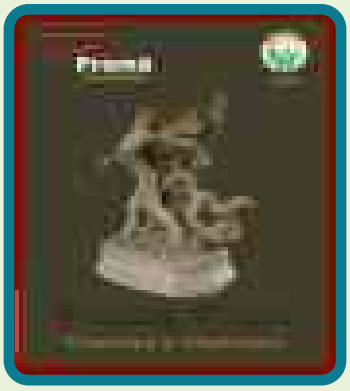
Journey of Prama

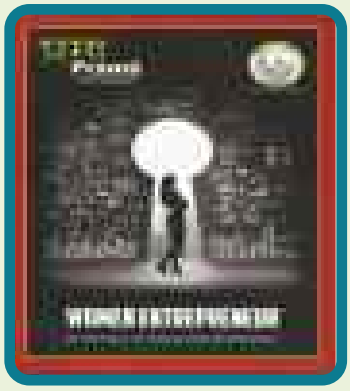

2012


2014-C


2018


2013


2015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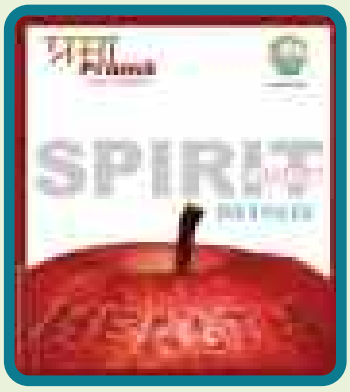
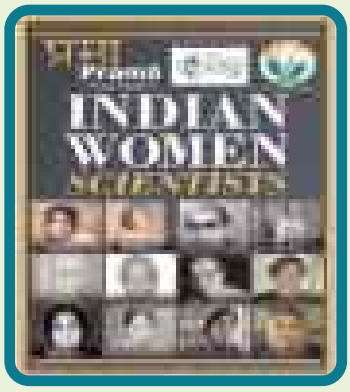


2014-A

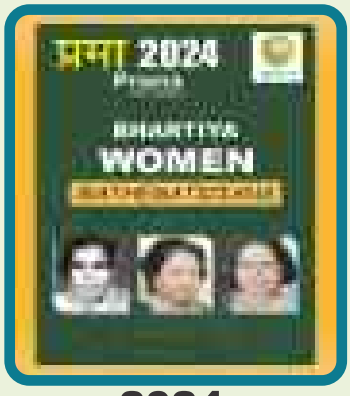

2016



2020


2014-B


2017



2024

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