ONLY NEWS PAPER PUBLISHED IN INDIA FOR SCIENTIFIC COMMUNITIES

NESA NEWSLETTER

NATIONAL ENVIRONMENTAL SCIENCE ACADEMY

Vol. 29 Issue-02 (MONTHLY) **February 2026**

From the Editor's

Dear Readers,

In the February issue of our Newsletter, we received several popular articles from diverse fields. All the authors deserve great appreciation for sharing articles in huge numbers. Please continue sending articles to our Publication team and share published newsletter with your friends also.

I would like to thank the Editorial team including Print, Designer and Publication committee for their efforts throughout the edition.

Your suggestions are always welcomed for improvement.

Dr. R. S. Tomar
Editor-in-Chief

REPORT OF NATIONAL CONFERENCE ON ENVIRONMENTAL STEWARDSHIP FOR SUSTAINABLE AGRICULTURE AND CLIMATE CHANGE MITIGATION 2026

JOINTLY ORGANIZED BY:

NATIONAL ENVIRONMENTAL SCIENCE ACADEMY (NESA), NEW DELHI & ICAR-RESEARCH COMPLEX FOR EASTERN REGION, PATNA, BIHAR

A three-day National Conference on Environmental Stewardship for Sustainable Agriculture and Climate Change Mitigation (ESSACCM-2026) being organized from January 22–24, 2026; inaugurated today on January 22 at ICAR-Research Complex for Eastern Region, Patna. This programme is organized in collaboration with the National Environmental Science Academy, New Delhi, and ICAR-ATARI, Patna. Hon'ble Vice-Chancellor, Bihar Animal Sciences University, Patna, Dr Inderjeet Singh inaugurated the conference as Chief Guest, while Dr Anjani Kumar, Director, ICAR-ATARI, and Dr. Bikas Das, Director, ICAR-NRCL, attended as Guests of Honor. The inaugural session commenced with a welcome address delivered by Dr. Abhay Kumar, Principal Scientist, and Co Convenor, ICAR-RCER, Patna.

In his inaugural address, Dr Inderjeet Singh cautioned that human activities like indiscriminate use of chemicals &

antibiotics and environmental neglect for short-term gains have severely disrupted environmental and ecological balance. He suggested practical pathways to mitigate environmental degradation through the rejuvenation of natural farming, integrated farming systems, promotion of nitrogen-fixing crops, and strategies to enhance phosphorus-solubilizing microorganisms.

Dr Anup Das, Director, ICAR-RCER, Patna in his address as the chairman of the Conference underlined that environmental stewardship is no longer an option but a necessity. He stated that the pursuit of quality food production must not compromise environmental integrity, biodiversity, or farmers' welfare. Highlighting the national vision of Viksit Bharat @2047, he emphasized the urgent need to proactively address environmental concerns in agricultural development. He informed that ICAR-RCER, Patna is addressing food, nutritional and environmental security through multidisciplinary and integrated approaches like resilient varieties, IFS, Conservation Agriculture, natural farming, smart water management, agroforestry among many others.

The keynote address by Dr. Arun Kumar, Senior Research Scientist, Mahaveer Cancer Sansthan, Patna in his excellent and eye opening presentation highlighted the

serious concern of heavy metal contamination in Bihar and its health implications.

Addressing the gathering, Dr. Anjani Kumar elaborated on the challenges faced by farmers in sustaining productivity under changing climatic conditions and stressed the need for appropriate policy interventions. Dr. Bikas Das expressed concern over the declining soil organic carbon and emphasized that agricultural development must be assessed from an environmental sustainability perspective.

Dr Shakeel Ahmed Khan, General Secretary, NESA, New Delhi and Convenor of ESSACCM highlighted the role of the Academy in promoting environmental awareness and safety among the public and commended ICAR-RCER, Patna, for taking the initiative to organize a National-level conference on this critical theme.

The opening day also featured a special technical session on "Socio-economic upliftment of socially and economically weaker sections farmers" with participation of about 50 farmers and representatives from Dhanuka agro tech, Jain Irrigation, and Sri Millet foundation. Experts discussed areas of entrepreneurship development, Millets farming and product development, use of PPP model for enhancing farmers' income and linking farmers with agro-industry. The session was followed by field visits of farmers to experimental farms.

Four technical sessions spanning 95 oral presentations and 20 poster presentations alongwith 20 keynote and lead lectures Technical sessions on Climate Change and Sustainability and Green Technologies against Pollution, were also organized.

NESA awards were bestowed upon distinguished scientists from different parts of the country during the event. Innovative farmer awards were given to recognize their contributions. The conference souvenir and abstract book was released by dignitaries. The opening day of the conference witnessed participation of nearly 200 scientists, experts, academicians including farmers from across the country who shared their insights and experiences.

The valedictory function of the conference was graced by Sh. Bharat Jyoti, Chairman, Bihar State Biodiversity Board, Patna, as the Chief Guest. In his address, he highly appreciated the efforts of ICAR–Research Complex for Eastern Region, Patna for successfully organizing such a relevant conference. Emphasizing the critical role of biodiversity, he highlighted its importance across different thematic areas discussed during the conference. He also lauded the platform provided for exchange of innovative ideas and underlined the significance of agroecology as a key pathway towards sustainable development.

The Guest of Honour, Dr. S.S. Rahore, Head, Division of Agronomy, IARI, New Delhi, in his address stressed the need for integrating ecological principles into modern agricultural practices to ensure long-term productivity and environmental sustainability.

Earlier, during the valedictory session, Dr. P.C. Chandran, Principal Scientist presented a comprehensive report of the conference, highlighting the major deliberations, technical sessions, and key outcomes of the three-day event.

The NESA Award Ceremony–2026 was also held on this occasion, during which various prestigious awards including the NESA Scientist Award, NESA Environmentalist Award, Women Excellence Award, NESA Young Scientist Award and NESA Junior Scientist Award were conferred upon eminent scientists and experts for their outstanding presentations. In addition, prizes for best oral and poster presentations were distributed to encourage young researchers and scholars.

The programme was moderated by Dr. Manisha Tamta, while coordination was carried out by Dr. Rachana Dubey, Scientist, and Dr. Saurabh Kumar, Scientist.

Glimpses of
NATIONAL CONFERENCE ON ENVIRONMENTAL STEWARDSHIP FOR SUSTAINABLE AGRICULTURE AND CLIMATE CHANGE MITIGATION 2026
ICAR-Research Complex for Eastern Region, Patna, Bihar














Glimpses of
NATIONAL CONFERENCE ON ENVIRONMENTAL STEWARDSHIP FOR SUSTAINABLE AGRICULTURE AND CLIMATE CHANGE MITIGATION 2026
ICAR-Research Complex for Eastern Region, Patna, Bihar

ANTIBIOTIC RESIDUES IN SOIL AND PLANT ENVIRONMENT

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INTRODUCTION

The widespread application of antibiotics in medical treatment, livestock production, and agriculture has led to their continuous introduction into environmental systems. A significant portion of these compounds is not completely metabolised and is released into the surroundings through human and animal waste. As a result, antibiotic residues enter soil through sources such as treated wastewater, sewage sludge, livestock manure, and pharmaceutical industrial discharge. Once present in soil, these biologically active substances can persist for long durations and influence soil quality, microbial diversity, and plant health.

PATHWAYS OF ANTIBIOTIC ENTRY INTO SOIL

Antibiotics such as tetracycline reach agricultural soils through several pathways, including municipal wastewater, hospital effluents, domestic sewage, and runoff from agricultural fields. The use of biosolids and manure as fertilisers further contributes to their accumulation. Livestock treated with veterinary antibiotics excrete unmetabolized residues, which eventually contaminate the soil ecosystem. After entering the soil, these compounds may undergo processes such as adsorption to soil particles, leaching, partial degradation, or accumulation, depending on environmental conditions and soil composition.

EFFECTS ON SOIL MICROBIAL COMMUNITIES

Soil microorganisms play a critical role in maintaining nutrient cycles and organic matter breakdown. The presence of antibiotic residues can interfere with these essential biological processes. For example, tetracycline can inhibit beneficial microbial populations involved in nitrogen fixation and nutrient mineralisation. This disturbance reduces nutrient availability and slows decomposition, ultimately affecting soil fertility. Moreover, the presence of antibiotics promotes the selection of resistant microbial strains, posing ecological risks and potentially reducing long-term soil productivity.

Reduced microbial activity also indirectly affects soil fauna by limiting their nutrient sources. Consequently, essential processes such as denitrification and nutrient recycling become less efficient, which can negatively influence plant nutrient uptake.

PLANT UPTAKE AND ACCUMULATION

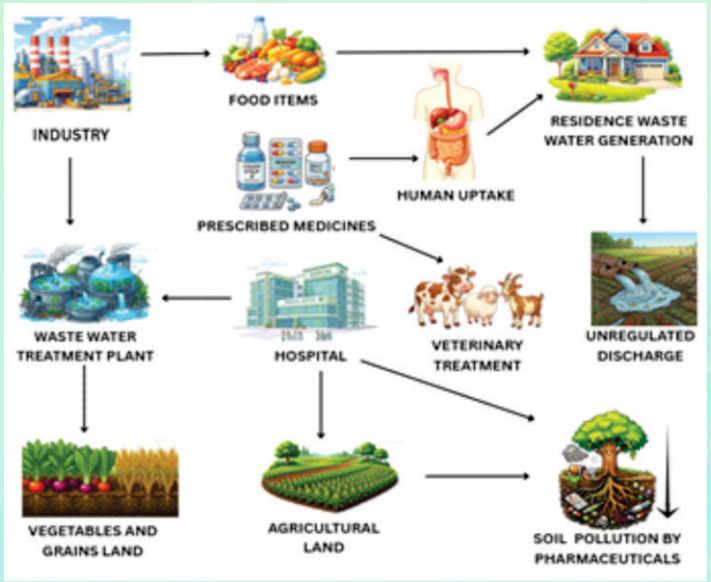
Plants cultivated in contaminated soils can absorb antibiotic residues primarily through their root systems. Once absorbed, these substances may accumulate in different plant tissues. Research indicates that tetracycline can be detected in edible crops such as lettuce and carrots when grown in contaminated conditions or irrigated with polluted water.

Typically, accumulation follows the sequence: Roots > Leaves > Stems, indicating higher concentration in underground plant parts.

Tetracyclines accumulate easily in soil because they degrade slowly in the environment. In soil solutions, their behaviour differs from that of sulphonamides, reaching concentrations up to 150 µg/kg of soil, which is twice that quoted for sulphonamides. Tetracyclines are highly sorbed in soil surface layers and do not travel deep into the soil profile or groundwater, unlike sulfonamides, which have been detected in groundwater. The production of manure aggregates with a high concentration of individual antibiotics on the soil surface is responsible for the higher amounts of antibiotics observed locally in the soil solution. The mobility of antibiotics in the soil depends on the soil type. For example, sulphachloropyridazine remains mobile in sandy soils, as opposed to loamy soils.

Fluoroquinolones, ciprofloxacin, and norfloxacin have been found in sludge at quantities ranging from 1.4 to 2.4 mg/kg of sludge dry matter. Fluoroquinolones proved to be stable in soils fertilised with sludges for around two years (at a concentration of about 0.3 mg/kg of soil). Antibiotics may also enter the soil, albeit in modest quantities, from the air deposition of the finest dust particles as carriers of these compounds.

This bioaccumulation raises concerns regarding food safety and long-term exposure through the food chain.



ENVIRONMENTAL AND AGRICULTURAL CONSEQUENCES

Long-term exposure to antibiotic residues can shift soil microbial populations toward resistant species while reducing beneficial organisms. Such changes may impair soil structure, decrease biodiversity, and weaken ecosystem stability. Over time, this imbalance can negatively affect crop yield and threaten sustainable agricultural productivity.

CONCLUSION

Antibiotic contamination of soil represents an emerging environmental challenge due to its persistence and ability to enter plant systems. Residues such as tetracycline disrupt microbial balance, interfere with nutrient cycling, and may influence plant growth. Understanding the movement and ecological effects of these compounds is essential for improving waste management practices and ensuring sustainable agricultural development while protecting soil health and food quality.

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FLOW CYTOMETRY AND CELL SORTING: ADVANCED TOOLS IN MODERN MICROBIAL AND CLINICAL RESEARCH

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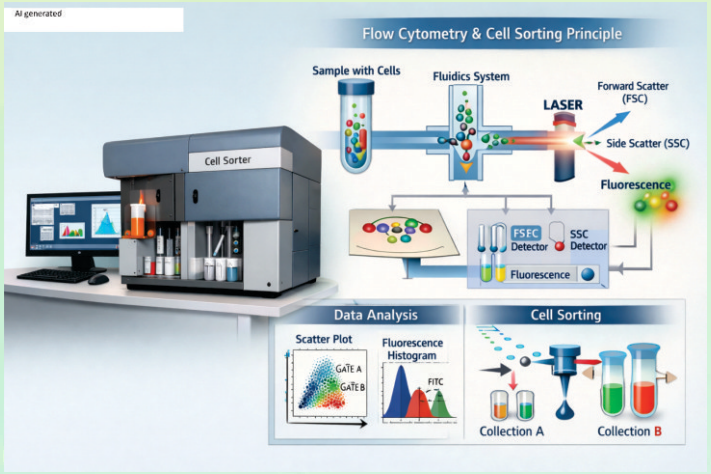
Flow cytometry is a powerful analytical technique that measures the physical and chemical characteristics of cells or particles as they pass individually through a laser beam. It has become essential in microbiology, immunology, hematology, environmental science, and clinical diagnostics because it enables rapid, high-throughput analysis of thousands of cells per second. When paired with cell-sorting capabilities, the method goes beyond analysis to precisely isolate particular cell populations for further research.

Light scattering and fluorescence emission form the foundation of flow cytometry. Detectors measure side scatter (SSC), which represents internal complexity or granularity, and forward scatter (FSC), which is correlated with cell size, when cells go through a concentrated laser beam. Signals that enable the identification of certain cellular components, such as surface antigens, nucleic acids, proteins, or metabolic indicators, are released by cells labeled with fluorescent dyes or fluorochrome-conjugated antibodies. Multiple features can be measured simultaneously within a single cell thanks to this multiparametric technique.



Flow cytometry offers a quick substitute for conventional culture-based techniques in microbiology. It is frequently used for biofilm research, monitoring antimicrobial susceptibility, counting bacteria and yeast, evaluating cell viability, and identifying viable but non-culturable (VBNC) cells. It improves prompt decision-making in clinical and industrial applications since it provides results in a matter of hours as opposed to days.

Fluorescence-Activated Cell Sorting (FACS), often known as a cell sorter, is an important development in this field. A sorter physically divides cells according to predetermined optical features, in contrast to traditional analyzers that merely measure and record data. This procedure involves electrically charging droplets containing individual cells

and deflecting them into collection tubes based on their scatter or fluorescence characteristics. This allows researchers to isolate extremely precise populations with remarkable purity, such as immune cell subsets, stem cells, antibiotic-resistant bacteria, or genetically engineered organisms.

Research and medicine can benefit greatly from cell sorting. Sorted immune cell populations can be employed in clinical settings for cell-based treatments, cancer diagnostics, and in-depth immunological investigations. Sorting enables the separation of uncommon microbial strains from mixed communities in microbiological research, facilitating investigations into microbial ecology, quorum sensing, and antibiotic resistance. Additionally, it makes downstream analyses like transcriptomics, proteomics, metabolomics, and genome sequencing easier.

Sorting technologies and flow cytometry are also very useful in environmental and food microbiology. Safety monitoring is improved by quickly measuring the microbial load in food and water samples. Sorting improves accuracy in quality control procedures by separating live cells from dead or stressed populations. These instruments guarantee strain viability, purity, and functional stability in the fermentation and probiotic sectors.

Multicolored fluorescence panels, fast sorters, microfluidics integration, and sophisticated artificial intelligence-based computational analysis are examples of recent advancements. Compact and portable solutions are becoming more widely available for resource-constrained environments and field diagnostics. These developments are in line with international initiatives for sustainable scientific improvement and precise diagnostics.

Despite their benefits, flow cytometry and cell sorting necessitate a large financial outlay, technical know-how, and meticulous procedure standardization. Small microbial cells can be difficult to identify, and appropriate training is necessary for data interpretation. Nevertheless, these restrictions are still being overcome by advancements in laser sensitivity, detector resolution, and automated analysis software.

In conclusion, when combined with cell sorting technology, flow cytometry offers a complete platform for single-cell resolution analysis and separation of certain cell types. Research and diagnosis across fields have been revolutionized by its speed, accuracy, and adaptability. The advancement of microbiological research, tailored medicine, environmental monitoring, and public health activities will be greatly aided by these technologies as long as innovation persists.

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Solar power significantly benefits the environment by providing a clean, renewable energy source that reduces greenhouse gas emissions, lowers air pollution (nitrogen oxides, sulfur dioxide), and cuts down on carbon footprints. It reduces dependence on fossil fuels, conserves water, minimizes land degradation, and promotes sustainability.

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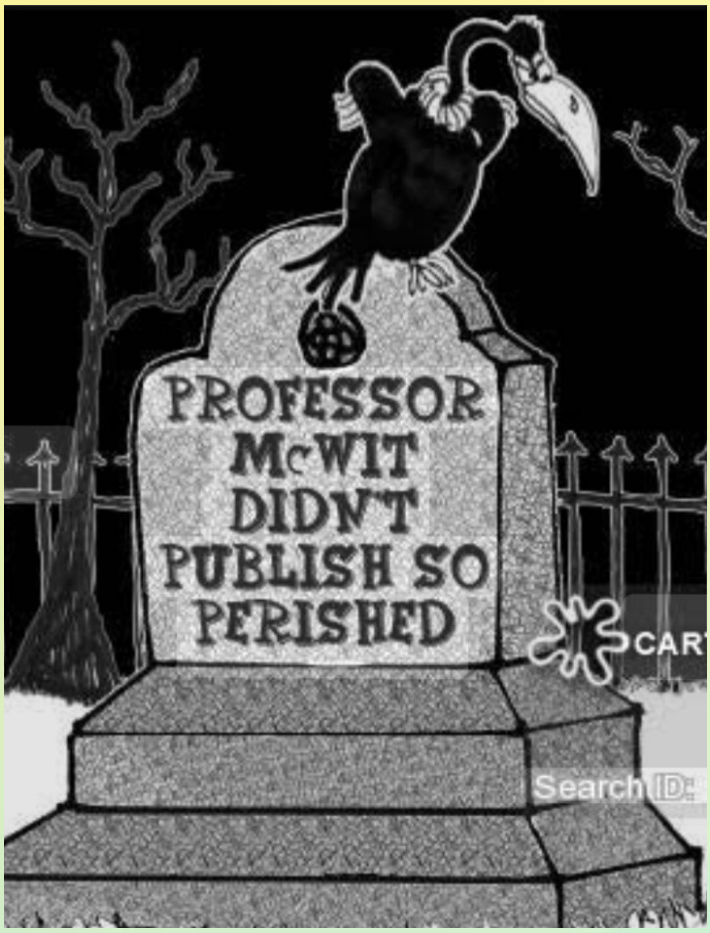
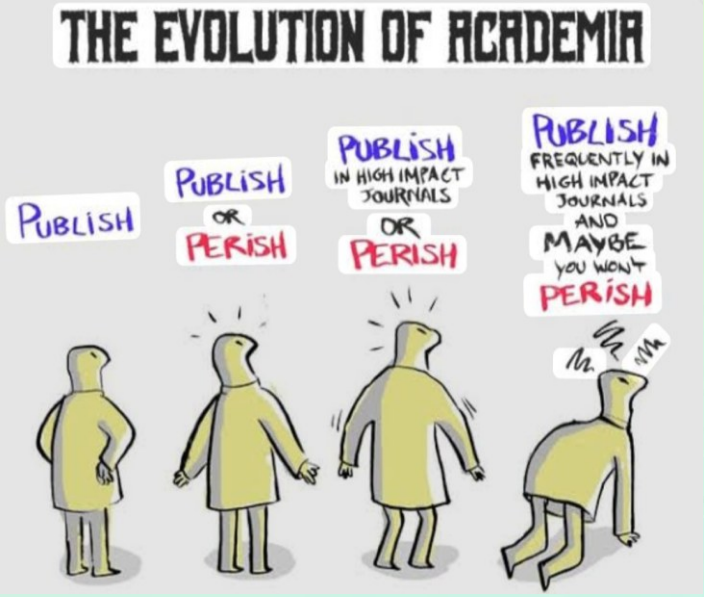


"Publish or Perish" is a well-known phrase in the culture of research and science communication. It reflects the idea that regular publication of scientific work is essential for a researcher's credibility, career survival, and the advancement of science. Science progresses when discoveries are shared with the scientific community and the public. Regular publications allow researchers to present new findings, share experimental methods and data, and enable other scientists to build upon their work. Without publication, valuable knowledge remains inaccessible and cannot contribute to scientific progress.
Frequent publication in peer-reviewed journals demonstrates that a researcher's work has been evaluated and validated by experts. This builds trust and reputation in the scientific community, shows the researcher is actively contributing to their field, and strengthens the credibility of science communication.

In academia and research institutions, publications are a key metric of performance. Hiring, promotions, tenure decisions, and grant approvals often depend on number of publications, quality of journals, and citations and impact of the work. Thus, scientists must publish regularly to maintain career progress.

Published research invites peer discussion, criticism and review and replication of results. This dialogue improves the reliability of scientific knowledge and helps correct errors. Regular publications increase a scientist's visibility and influence. When research is widely published and cited, it can shape policies, influence future research directions, and improve public understanding of science.

Publishing research ensures transparency in methods, results, and conclusions. This accountability is fundamental for maintaining integrity in science communication. The phrase "Publish or Perish" highlights that regular publication is crucial because it spreads knowledge, builds credibility, supports career advancement, encourages scientific debate, increases research impact, and maintains transparency in science. Without continuous publication, both individual researchers and the broader scientific community risk losing relevance and progress.



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Chief Editor

Plant Tree **Save Environment**

NATIONAL SCIENCE DAY CELEBRATION & SIGNIFICANCE

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National Science Day is celebrated every year on 28 February to commemorate the discovery of the Raman Effect by the Indian physicist C. V. Raman in 1928. This groundbreaking discovery demonstrated how light changes its wavelength when it passes through a transparent medium, a phenomenon that significantly advanced the understanding of light scattering and molecular structure. In recognition of this discovery, Raman was awarded the Nobel Prize in Physics, making him the first Asian to receive a Nobel Prize in the field of science.

The celebration of National Science Day was officially initiated in 1986 by the National Council for Science and Technology Communication, a body under the Government of India, to promote scientific awareness and encourage people, especially students, to appreciate the role of science in everyday life. Since then, the day has been observed across schools, universities, research institutions, and scientific organizations throughout India.

National Science Day serves as a platform to highlight the contributions of Indian scientists and to inspire young minds to pursue careers in science and technology. Various activities such as science exhibitions, seminars, workshops, public lectures, quiz competitions, and innovation fairs are organized to engage students and the public. Each year, the celebration revolves around a specific theme that addresses current scientific challenges and encourages innovation for societal development.

The significance of National Science Day lies in its aim to foster a scientific temper, promote research and innovation, and emphasize the importance of science in national progress. By celebrating the achievements of scientists and encouraging curiosity and critical thinking, the day helps strengthen the scientific foundation of the country and motivates the next generation to contribute to scientific advancement.

The theme of National Science Day 2026 has been "Women in Science: Catalysing Viksit Bharat." This theme highlights the important role of women scientists and researchers in advancing science, technology, and innovation in India. It encourages greater participation of women and girls in STEM fields (Science, Technology, Engineering, and Mathematics) to help build a developed India (Viksit Bharat).

Key Focus of the 2026 Theme:

1. Promoting gender equality in science and research
2. Encouraging girls to pursue careers in STEM
3. Recognizing the contributions of women scientists
4. Strengthening innovation and research for a developed India by 2047

The celebration of National Science Day plays a significant role in promoting awareness and appreciation of science and technology across India. Observed annually on February 28, the day commemorates the discovery of the Raman Effect by the renowned Indian physicist C. V. Raman. Through various activities such as science exhibitions, seminars, workshops, public lectures, and student competitions organized by schools, universities, and scientific institutions, the celebration helps communicate scientific knowledge to a wider audience.

National Science Day encourages young students to develop curiosity, scientific thinking, and interest in research and innovation. It also highlights the achievements of Indian scientists and the progress of India in fields such as space research, medicine, engineering, and information technology. Institutions like Council of Scientific and Industrial Research and Indian Space Research Organisation actively participate in outreach programs that make science more accessible to the public.

By engaging students, educators, and the general public, the celebration strengthens scientific literacy and inspires the next generation of innovators. Overall, National Science Day serves as an important platform for spreading knowledge about Indian science and technology while fostering a culture of curiosity, innovation, and scientific temper in society.

Overall, National Science Day not only commemorates the historic discovery of the Raman Effect but also reinforces the vital role of science and technology in shaping a sustainable and progressive future for India.

Planting trees is essential for a healthier planet, as they clean the air by absorbing and pollutants while releasing oxygen. A single mature tree can provide oxygen for two people annually. They also cool cities, combat climate change, prevent soil erosion, and support biodiversity.

"Plant a tree and keep the flood at bay".

"Save the forests and change the climate".

"It is our collective and individual responsibility to protect and nurture the global family, to support its weaker members, and to preserve and tend to the environment in which we all live."

— Dalai Lama

Let's clear the air for Earth's future.

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