From the Editor's Desk...

The Editorial Board is happy to present this issue of the **RRCAT Newsletter (Vol. 39, Issue 1, 2026)**, which chronicles the diverse scientific, technological and institutional activities carried out at the Centre during the period **July–December 2025**. More than a compilation of technical reports, this Newsletter reflects the collective endeavour of scientists, engineers, technical staff and support personnel who continue to push the frontiers of accelerator science, laser technology, materials science and advanced engineering in pursuit of scientific excellence and technological self-reliance.

The articles featured in this issue demonstrate the remarkable breadth of research activities pursued at the Centre. The round-the-clock operation of the Indus-1 and Indus-2 synchrotron radiation facilities, together with advances in beamline instrumentation, accelerator magnets, precision power supplies, detector electronics, X-ray optics and indigenous data acquisition systems, underscore the Centre's sustained commitment towards providing world-class national research facilities while continuously enhancing their capabilities through indigenous technological innovations.

The achievements of the Proton Accelerator Group in superconducting RF technology, ultra-high vacuum systems, cryogenics, RF engineering and accelerator physics are very noteworthy. The development of superconducting cavities, qualification facilities for superconducting magnets, digital low-level RF systems and sophisticated computational tools represents significant progress towards realizing next-generation accelerator facilities based on indigenous technologies. These developments not only strengthen our scientific capabilities but also contribute to India's growing competence in strategically important accelerator technologies.

The Laser Group continues to expand the horizons of laser science and photonics through significant advances in high-power laser optics, ultrafast phenomena, high harmonic generation, laser-driven ion acceleration, fibre laser technologies and radiation detector development. The successful demonstration of a 20 MeV proton beam using laser-driven ion acceleration at the PW Laser Facility marks yet another important milestone that places RRCAT among the select institutions worldwide actively pursuing frontier research in high-energy-density science.

The multidisciplinary nature of research at RRCAT is vividly reflected in the contributions from the Materials Science and Advanced Technology Group. Developments ranging from additive manufacturing for aerospace applications and advanced ceramic materials to triboelectric energy harvesters, multimodal biomedical imaging systems and Raman spectroscopy-based food quality assessment illustrate how fundamental research is being translated into technologies with broad societal and industrial relevance. The successful operation of the Infrared Free Electron Laser in the user mode further reinforces the Centre's growing role as a national user facility serving researchers from diverse scientific disciplines.

The enabling contributions made by the Technology Development and Support Group through the strengthening of information technology infrastructure, development of specialized fabrication technologies and establishment of advanced accelerator subsystem development facilities are very significant.

This issue also includes two insightful theme articles highlighting the growing importance of Infrared Free Electron Laser user facilities and Laser-Induced Breakdown Spectroscopy as a powerful analytical tool. Together, they provide readers with an appreciation of emerging research opportunities and evolving technological applications in these exciting fields.

The rich publication output during the period is a testimony to the scientific productivity of the Centre, while the sections on events and institutional activities capture another equally important dimension of RRCAT. Activities related to safety and environmental management, the DAE–Fermilab quality interaction meeting, indigenous development of high-RRR niobium sheets, the Rashtriya Karmayogi programme, Hindi implementation, Women's Welfare Committee initiatives, Staff Club activities, awards and honours, and the induction of new colleagues collectively portray a vibrant institution that nurtures both scientific excellence and human values.

As RRCAT continues to contribute to several high technology national programs, effective dissemination of our scientific accomplishments becomes increasingly important. The RRCAT Newsletter serves a valuable outreach platform, documenting institutional progress, preserving scientific milestones and communicating our achievements to academia, industry, and policymakers.

The Editorial Board remains committed to continually enhancing the quality and reach of this publication. We warmly invite our colleagues to contribute technical articles that reflect the dynamic research environment of RRCAT. Through wider participation, the Newsletter can evolve into an even more vibrant and comprehensive chronicle of the Centre's scientific journey.

I sincerely acknowledge the valuable support extended by the members of the Editorial Board in bringing out this issue in a professional and timely manner. I also express our deep gratitude to the Director, RRCAT for his constant encouragement, guidance and unwavering support, which continue to inspire the Editorial Board in its endeavour to showcase the scientific and technological achievements of RRCAT to the wider community.

With warm regards,
June 17, 2026

Sunil Verma
Chairman, Editorial Board
(On behalf of the RRCAT Newsletter Editorial Board)