

GOVERNMENT OF INDIA  
DEPARTMENT OF ATOMIC ENERGY  
**RAJYA SABHA**  
**UNSTARRED QUESTION NO. 3844**  
ANSWERED ON 06.04.2023

**Major findings of research Institutes under DAE**

3844 Smt. Sangeeta Yadav:

Will the PRIME MINISTER be pleased to state:

- (a) whether the Department of Atomic Energy (DAE) contributes significantly to the country's scientific prowess, if so, details thereof;
- (b) major non-strategic research findings in the field of science and mathematical research by different Institutes/bodies under DAE during the last five years;
- (c) number of peer-reviewed journal articles published in internationally acclaimed journals by faculty members and research scholars of research institutes under DAE during the last five years, the details thereof;
- (d) the number of women scientists in these research institutions, institute-wise; and
- (e) whether allocated budget has been sufficient to carry out research activities?

**ANSWER**

THE MINISTER OF STATE FOR PERSONNEL, PUBLIC GRIEVANCES & PENSIONS  
AND PRIME MINISTER'S OFFICE (Dr. JITENDRA SINGH):

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- (a) Yes Sir.

Department of Atomic Energy (DAE) and its R&D units have multi-disciplinary Nuclear Research Centres with excellent infrastructure for advanced Research and Development with expertise covering the entire spectrum of Nuclear Science, Engineering and related areas. A large amount of work involves design, development and deployment of various advanced technologies, operation and maintenance of nuclear facilities resulting in tangible benefits for common man and the nation. The areas of Research and development include Physical sciences, Chemical sciences, Bio- sciences, Agriculture, Food Preservation, Water Desalination and Water Purification, Nuclear Reactor Technologies, Reprocessing and Waste Management, etc.

Major scientific contributions done by Institutes under DAE cover three stage Nuclear Power Programme, research activities related to Medical Cyclotrons, super conducting magnet development, Advanced National Facility for Unstable Rare Isotope Beams (ANURIB), indigenous development of nuclear fusion technologies, Particle Accelerator related technologies, R&D activities in the area of laser, food agriculture and solid waste management, water desalination/purification spin-off technologies and Nuclear Medicine covering radioactive isotopes for non-invasive diagnosis of several human diseases etc.

- (b) Some of the non-strategic research findings by Institutions under DAE involve eco-friendly and biodegradable hydrogel developed and deployed in arid regions to achieve water absorption up to 550 times of its own weight, Gamma Irradiation based Food Preservation Technology, Sewage Sludge Hygienisation Technology for converting sewage sludge into organic manure, Hybrid granular Sequencing Batch Reactor (HgSBR) technology for waste water treatment, Cargo Scanner based on dual energy LINAC by BARC; Online Nuclear Emergency Response System (ONERS), Portable High Volume Air Sampler, Gamma Chamber Facility for irradiation of seeds and plants for research work, development of sensors for carbon, hydrogen etc.,  $^{89}\text{Sr}$ - a bone cancer palliative, Autonomous Gamma Dose Logger, Ultra Sensitive Flexi Range Pulsating Sensor based Conductivity Meter by IGCAR; Tokamak Fusion Devices, Societal and Industrial applications of Plasma covering waste disposal, medical and health applications, space, defence, industrial tools, nano-powders, agriculture, green hydrogen etc. by IPR and High precision study of the Hoyle state in  $^{12}\text{C}$ , High resolution gamma ray spectroscopy studies on different nuclei, Giant dipole resonance studies at low temperature, understanding of entanglement generation upon coupling tow chaotic systems, exploring the behavior of hot and dense nuclear matter under strong magnetic fields etc. by VECC.

As far as Mathematical research is concerned, Institute of Mathematical Sciences (IMSc) scientists were the earliest to forecast accurate trends for the spread of COVID-19 in India starting in February 2020 and the first to show quantitatively the effect of the national lockdown. Institute scientists also have been instrumental in creating an extremely detailed simulator for state-level

forecasting of epidemic trends that can assist authorities in planning for future pandemics.

Harish-Chandra Research Institute, Prayagraj has done the study of set-theoretic solutions of the quantum Yang Baxter equations using group theory and done work on the representation theory of infinite dimensional Lie algebras. The Institute has also worked on the local smoothing estimate for general Fourier integral operators with specific phase functions and has done study on tensor weight structures on derived categories of Noetherian schemes, representation of integers as monochromatic sums of squares of primes with an estimate and the growth of trace of powers of algebraic integers with a characterization for a non-zero algebraic integer to be a root of unity.

(c) Number of peer-reviewed journal articles published in internationally acclaimed journals in past five years are 33434. All these published articles are related to Nuclear and allied sciences and with reference to mandate of DAE.

(d) The number of women scientists in these research institutions, institute-wise are as below:-

<b>Institution</b>	<b>BARC</b>	<b>IGCAR</b>	<b>VECC</b>	<b>RRCAT</b>	<b>IPR</b>	<b>HRI</b>	<b>IMSc</b>
<b>No.</b>	722	156	19	64	60	32	9

(e) Yes Sir.

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