



100 years of S N Bose's Colossal Work

Distinguished scientists and scientific administrators recently gathered at the **S.N. Bose National Centre for Basic Sciences (SNBNCBS) in Kolkata** to celebrate the 100th anniversary of **Satyendra Nath Bose's** last of the **four revolutionary publications** that led to new **quantum mechanics** (the others being those of **Planck in 1900**, **Einstein in 1905**, and **Niels Bohr in 1913**), traced the evolution of quantum mechanics through the years.

- SNBNCBS, an Autonomous Research Institute established under the **Department of Science and Technology (DST)**, in 1986 to honour the life and work of **S. N. Bose**.
 - S N Bose's pioneering work on **quantum statistics** has paved the way for the development of **modern quantum technologies** including **Bose-Einstein condensation**, **quantum superconductivity**, and **quantum information theory**.
 - Half the fundamental particles in the **Universe are named after him - BOSON**.
- The conference highlighted that **23 countries have set up National Quantum Missions** and India has a substantial contribution to make at an international level, especially in the field of quantum algorithms.

NATIONAL QUANTUM MISSION

Aims to put India among the top six leading nations involved in the R&D in quantum technologies

Presently, R&D works in quantum technologies are underway in the US, Canada, France, Finland, China and Austria

- **Duration:** 2023-24 to 2030-31
- **Nodal Ministry:** Ministry of Science & Technology
- **Highlights of the Mission:**
 - Four Thematic Hubs (T-Hubs) in different domains across the country
 - Wide-scale applications ranging from healthcare and diagnostics, defence, energy and data security
- Strengthening of indigenously building quantum-based computer
- Help develop magnetometers with high sensitivity in atomic systems and atomic clocks
- Support design and synthesis of quantum materials

A huge boost to National priorities like digital India, Make in India, Skill India, Stand-up India, Start-up India, Self-reliant India and SDGs

Quantum Technology

Works by using the principles of quantum mechanics (the physics of sub-atomic particles), including quantum entanglement and quantum superposition

Quantum Superposition

- The ability of a quantum system to be in multiple states simultaneously
- While digital computers store data as bits (the ones and zeros of binary), quantum computers use qubits that exist as one, zero or both at the same time
- This superposition state creates a practically infinite range of possibilities, allowing for fast simultaneous and parallel calculations

Quantum Entanglement

- It means the two members of a pair (Qubits) exist in a single quantum state
- If you change the properties of one of them, the other changes instantly
- This can be used to create a secure encryption key in quantum cryptography
- If an eavesdropper tries to intercept the transmission, the entangled state of the particles will be disturbed, making the attempt detectable

QUANTUM TECHNOLOGY

- Quantum Key Distribution
- Quantum Networks
- Quantum Simulators
- Post-Quantum Cryptography
- Quantum Sensors Particle Generators Atomic Clocks
- Quantum Cloud Computing
- Quantum Memories Quantum Repeaters Quantum Chips
- Quantum Software
- Quantum Computing Quantum Annealers
- Quantum Materials

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