2025 – The Year of Quantum

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The Year 2025 celebrated as “Year of Quantum” was proclaimed by the United Nations General Assembly in June 2024 to boost global awareness and collaboration in this field, marking 100 years since quantum mechanics' foundations. UNESCO acted as the lead agency in close collaboration with the American Physical Society. It was agreed to cooperate on Quantum R&D, building of its eco-system, governance and standards as well as international partnerships.

Major international cooperation in quantum technologies involves global initiatives like the UN-backed International Year of Quantum Science and Technology (IYQ 2025), large regional efforts like the EU's Quantum Flagship and National Quantum Missions (e.g., India's NQM), and specific partnerships (US, Canada, Japan, UK, CERN) focused on sharing R&D, developing standards, building ecosystems, and addressing workforce/supply chain challenges for quantum computing, communication, sensing, and simulation. While ongoing program of European Union with €1B+ helped to unite its member states in quantum leadership, funding projects in computing, sensing, communications, and simulation, including international cooperation via InCoQFlag; another major European agency European Centre for Nuclear Research (CERN) introduced Quantum Technology Initiative (CERN QTI) involving23 member states to develop quantum systems for physics research, computing, and detectors, linking with other global efforts like the Open Quantum Initiative.

As the year progressed, several breakthroughs were made in Quantum research, including acceleration in quantum computing (like better error correction with Google's Willow chip), Nobel-recognized work in macroscopic quantum tunneling, enhanced quantum sensing, and global initiatives by the UN and UNESCO to boost quantum literacy, equity, and workforce development, marking a century since quantum mechanics began and bridging quantum theory with practical, large-scale applications.

Highlights of some of the major achievements in this field include:

- Quantum Computing:

    1. Error Correction: Significant strides in managing errors, a major hurdle, highlighted by Google's Willow chip demonstrating reduced error rates for complex calculations.
    2. Superconducting Qubits: Progress in building fault-tolerant quantum computers, building on foundational discoveries recognized by the 2025 Nobel Prize for macroscopic quantum tunneling.
- Nobel Prize in Physics (2025): Awarded for demonstrating that quantum tunneling and energy quantization occur in larger, engineerable systems, connecting quantum mechanics to real-world devices like superconducting qubits.
- Quantum Sensing & Clocks: Advancements in creating more accurate atomic clocks and sensors, enhancing precision in navigation (GPS) and commerce.

UNESCO's Role: UNESCO launched a number of initiatives on empowering women in quantum, supporting the Global South, and promoting quantum literacy through arts. Several initiatives have led to higher investment (around US$ 60 billion) resulting in creation of new jobs and an improved economy.

In India, NITI Aayog's Frontier Tech Hub today released a Roadmap on Transforming India into a leading Quantum-Powered Economy.It represents the opportunity to redefine our place in the world — to lead in a frontier domain from the outset, rather than catching up after others have set the rules. Quantum is not just another sector of innovation; it is the foundation upon which the next era of artificial intelligence, biotechnology, advanced materials, and secure digital infrastructure will be built. Global competition in quantum is intensifying, and leadership will depend on the ability to develop exportable solutions, shape technical standards, and build secure value chains. This roadmap underscores the need to expand our research infrastructure, streamline innovation-to-market pathways, and cultivate talent at scale.

India also introduced high precision and compact diodes marking a significant leap in the nation's capability for all emerging quantum technologies. It paves the path towards quantum encrypted communication and computing.The high-performance, precision-engineered laser is designed for quantum research, higher education, and advanced scientific applications.The simplicity of operation covering a wide range of wavelengths from ultraviolet to near infrared makes these lasers a true enabler of quantum technologies. In particular, the laser will open the door to the financial and banking industry to provide quantum safe transactions, protecting sensitive client information and critical business data.

In essence, 2025 marks a transition from foundational quantum discovery (celebrating 100 years) to tangible applications, driven by major research breakthroughs and global efforts to democratize this powerful new era of technology.