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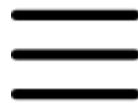
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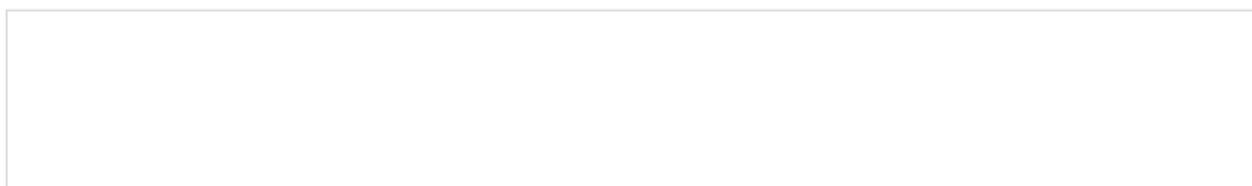
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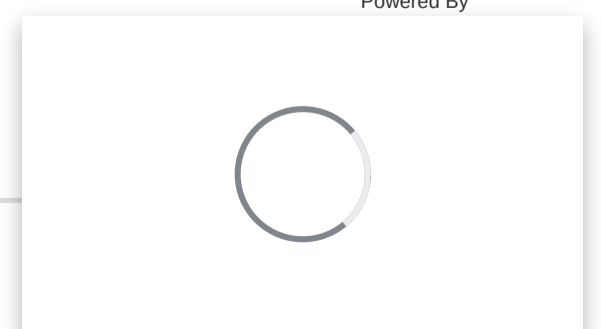
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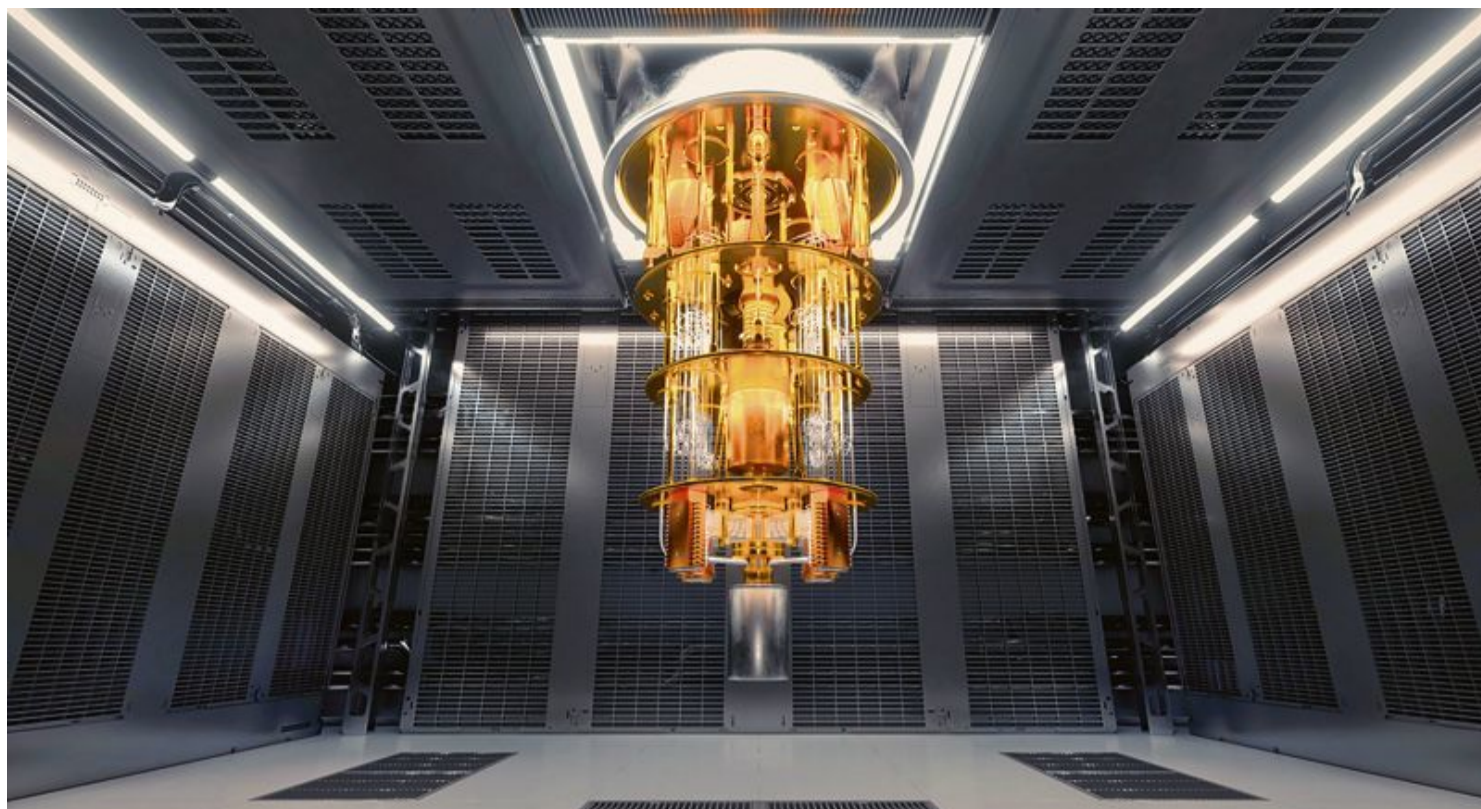
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Pivotal field: Quantum science and technology are set to significantly impact the UN's 2030 Sustainable Development Goals . istock



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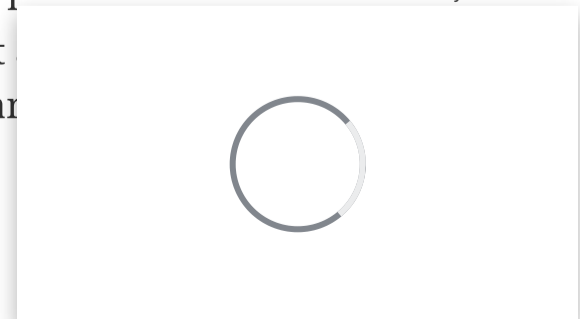
THE United Nations recently declared 2025 as the International Year of Quantum Science and Technology (IYQ 2025). This declaration followed a draft resolution moved by Ghana, co-sponsored by six other countries, and supported by more than 70 nations. Next year marks the centenary of the development of quantum mechanics, which explains the behaviour of matter and energy at atomic and subatomic levels. Quantum science and technology have enabled innovations like MRI (magnetic resonance imaging), lasers, solar cells and computer chips, fundamentally transforming physics and technology. The UN aims to acknowledge these contributions, raise awareness about their role in sustainable development and ensure equal access to quantum science education and its benefits. Numerous global events and initiatives are being planned at the regional, national and global levels throughout 2025.

The development of quantum science made extraordinary scientific advances possible, upturning centuries-old notions about nature. It revealed that particles can be treated as point-like or wave-like, depending on observation, and their behaviour is inherently probabilistic. Quantum theory, which was born in a theoretical field a century ago, is now a central theory governing our universe.

from the behaviour of subatomic particles to the distribution of galaxies in the universe. Quantum science shines and how solar panels capture its energy on earth. Understanding quantum mechanics is essential to uncover underground structures, map the sea floor and detect bodily changes beyond existing medical scanners. Quantum science has led to breakthroughs like integrated circuits, lasers, and quantum communication, which have revolutionised communication, medicine and lighting efficiency. Recent advances in quantum information processing and computing are critical for modelling complex systems and

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Quantum science and technology is set to become a pivotal field in this century, significantly impacting the UN's 2030 Sustainable Development Goals (SDGs) across energy, climate, environment, agriculture, health, food security and safety, clean drinking water and industrial development. Thus, quantum mechanics is a prime example of the practical impact that an abstract physical theory can have on human life. It can play a key role in advancing the UN's SDGs through improved medical imaging and diagnostics, vaccine and drug development, environmental monitoring and enhanced climate models. Additionally, quantum advancements contribute to developing new materials, energy-efficient technologies, economic growth and secure infrastructure, while promoting societal equity and accessibility through open access and gender equity in education and research.

Quantum theory has revolutionised physics, chemistry, biology, engineering, electronics and communications, leading to inventions like transistors, lasers, LEDs and MRI. While conventional computers use binary 'bits' (1 and 0), quantum computing uses qubits that exist in the superposition of states to process information and promises to transform electronics, clean energy and pharmaceuticals by enabling faster computations for cryptography, logistics optimisation and drug discovery. Additionally, quantum communication offers uniquely secure information transmission. Future quantum research can revolutionise computing, communications, materials, drugs and cybersecurity, crucial for global challenges like renewable energy, health and UN SDGs, accelerating progress toward a sustainable and equitable world.

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An important aspect of the IYQ 2025 is to motivate young people in developing nations as well as students from across the globe to become the next-generation torch-bearers in this field and use quantum science to make a positive impact on the lives of others. It also provides a golden opportunity for young students and inquisitive people of all ages to learn and understand this science, which can drive technological innovation, influence government policies, impact the global economy and enrich art and culture. The declaration provides a forum for educational institutions, research bodies, organisations and governments to promote quantum science and technology awareness.

Sensing the importance of this new technology, India launched the National Quantum Mission in April 2023, with a budget of around Rs 6,000 crore for eight years (2023-31). India has been the first country to have a dedicated quantum mission, which aims to advance research in quantum computing, quantum communication, sensing, metrology, materials, devices and quantum communication.

The mission aims to develop quantum computers with 50-1,000 physical qubits within eight years, establish quantum communication networks, and develop quantum sensors and devices. The mission also aims to establish quantum communications between ground stations spanning distances of up to 10,000 km. The mission also aims to develop quantum sensors and devices. The mission also aims to establish quantum communications between ground stations spanning distances of up to 10,000 km.

There is a lack of awareness about quantum science and technology in the northern part of the country.

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More efforts are needed, and the lawmakers, technical experts, people involved in science and technology, and universities across various states should take proactive steps in raising awareness about IQ 2025. Extension lectures, exhibitions, workshops and conferences should be organised in educational institutions to inspire young minds and raise awareness about this scientific field. Similar to initiatives in universities abroad, urgent steps should be taken to establish a quantum institute in this region by involving stakeholders and preparing a roadmap for IQ 2025 to ensure that the region benefits from quantum advancements.

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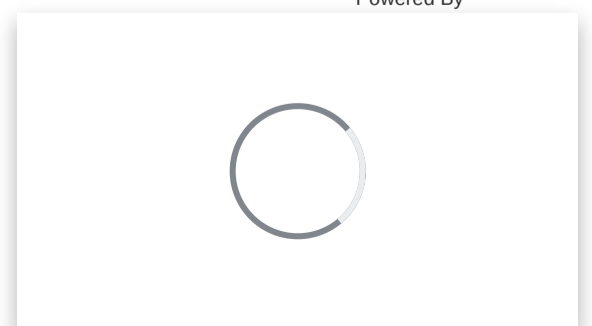
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