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*Ask the right questions, and nature will open the door to her secrets
- Dr. C.V. Raman, The Nobel Prize in Physics 1930*

IISc Developed a Novel Technique to Encapsulate Liquid Droplets Used for Various Applications

Scientists at the Indian Institute of Science (IISc) developed a novel technique to encapsulate liquid droplets used for various applications, including single crystal growth and cell culture. The technique exploits the capillary effect – the rise of a liquid through a narrow space – to coat droplets in a composite shell containing oil-loving and hydrophobic particles. It offers the ability to tune the shell thickness over a wide range, allowing the encapsulation of droplets of different size. The researchers used coated droplets to grow single crystals successfully. They could also use the coated droplets for biological applications such as 3D cell culture and growing yeast cells in the lab with improved success rates.

AstroSat, India's first Multi-Wavelength Space-based Observatory Detected Bright Sub-Second X-ray Bursts

AstroSat, India's first multi-wavelength space-based observatory, detected bright sub-second X-ray bursts from a new and unique neutron star with ultrahigh magnetic field (magnetar), which could help understand the intriguing extreme astrophysical conditions of magnetars. Magnetars are neutron stars having an ultrahigh magnetic field that are much stronger than the terrestrial magnetic field. Further magnetars display strong temporal variability, typically including a slow rotation, a rapid spin-down, bright but short bursts going on up to months-long outbursts.

Qualcomm Technologies, Inc, in Collaboration with ISRO Developed Chipset Platforms that Support NavIC L1 Signals

Qualcomm Technologies, Inc, in collaboration with the Indian Space Research Organisation (ISRO), developed and tested select chipset platforms that support NavIC L1 signals. The initiative would help accelerate the adoption of NavIC and enhance the geo-location capabilities of mobile, automotive and the Internet of Things (IoT) solutions in the region. The L1 signals would be a critical next step by enabling better performance of location-based services in the consumer segment. NavIC L1 signal design contains indigenous spreading code, modulation scheme, and other signal structure elements. The design and development strengthens Government of India's initiative of Atmanirbhar Bharat.

CCCR, IITM Indigenously Developed a State-of-the-Art Earth System Model (ESM)

Scientists at the Centre for Climate Change Research (CCCR), Indian Institute of Tropical Meteorology (IITM) under the Ministry of Earth Sciences indigenously developed a state-of-the-art Earth System Model (ESM) known as the IITM-ESM. This is the first Earth System Model from India and the climate change assessment carried out using IITM-ESM, was used in the latest Sixth Assessment Report prepared by the Intergovernmental Panel on Climate Change (IPCC). The National Climate Change Assessment report documenting the regional climate change projections, has been released to benefit students, researchers, and policymakers.

Special Update: MoES Established a Dedicated AI and ML Virtual Center

Tasked with developing and testing various Artificial Intelligence (AI) and Machine Learning (ML) techniques and capacity building activities by conducting workshops and conferences, Ministry of Earth Sciences (MoES) has established a dedicated AI and ML virtual center. A computing environment and virtual workspace for training and deploying AI models has been established on Graphical processor-based server in India Meteorological Department (IMD). Achievements and outcomes of AI and ML in the Research and Development (R & D) of weather prediction:

- Improved the short-range precipitation forecast
- Developed high-resolution (300m) urban gridded meteorological data sets for temperature and precipitation
- Developed very high-resolution precipitation data sets for verification purposes
- Deep Learning approach is being explored for precipitation nowcasting using data from Doppler Weather Radars (DWRs)