Daily News Juice

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1. Nobel Prize in Physics: Honoring AI Pioneers

AI Revolution

Artificial Intelligence (AI) tools are transforming daily life, enabling tasks like data analysis, image creation, and information retrieval. This year's Nobel Prize in Physics recognizes two scientists whose work laid the foundation for the AI advancements we see today—John Hopfield, a 91-year-old American, and Geoffrey Hinton, a 76-year-old British-Canadian. Their groundbreaking discoveries, primarily made in the 1980s, have now become key to machine learning with artificial neural networks.



Mimicking the Brain

Hopfield and Hinton's work involved developing algorithms that mimic the brain's functioning in tasks like learning and recognizing patterns. While early computers were designed for repetitive calculations, scientists soon sought to make machines perform more complex human-like tasks, such as learning and remembering. Hopfield's breakthrough came in the 1980s with the creation of artificial neural networks that resembled the human brain's nerve cells, allowing computers to 'remember' and 'learn.' His model could capture entire patterns in one go, crucial for technologies like face recognition.

Deep Learning Advances

Building on Hopfield's work, Hinton developed artificial neural networks capable of handling more complex tasks, such as understanding voices and images. He introduced a method called backpropagation, which allowed neural networks to learn from mistakes and improve. This led to the creation of deep neural networks, which are now central to speech recognition, translation, and self-driving cars.

In 2012, Hinton's deep networks made a major breakthrough at the ImageNet Visual Recognition Challenge, revolutionizing image recognition. His contributions have since earned him the prestigious Turing Prize.

Physics and AI

While Hinton's work is rooted in computer science, Hopfield's contributions stem from physics and biology. His neural network model was inspired by the mathematical principles of 'spin glass,' a special kind of physical system. This crossover between physics and AI marks the relevance of the Physics Nobel for their achievements.

In recognizing these pioneers, the Nobel Committee celebrates their foundational contributions to the AI revolution reshaping the modern world.

Relevance: GS Prelims & Mains Paper III; Science & Technology Source: Indian Express

2. Why Tomato Prices Have Soared to Rs 100/kg

Introduction

Tomato prices have surged across India, with rates reaching Rs 120-130 per kg in some areas. In response, the National Cooperative Consumers' Federation of India has begun selling tomatoes at a subsidized rate of Rs 65 per kg in Delhi. Even so, most consumers are paying between Rs 80-90 per kg. Here's why tomato prices are skyrocketing and how long this situation might last.



Reasons for the Price Hike

1. Low Sowing Levels: The primary reason for the price spike is reduced sowing. As of September 20, only 1.98 lakh hectares (lh) of kharif tomatoes had been sown, significantly lower than the target of 2.89 lh and even less than the 2.20 lh sown by the same time last year.

2. Crop Damage: Heavy rains at the end of September caused damage to crops that were ready for market, further reducing supply.

3. Shift to Other Crops: Due to extreme heat last year, many farmers shifted from tomato cultivation to more resilient crops like maize. Maize cultivation has increased from 84.56 lh last year to 88.50 lh this year, thanks to its ability to withstand heat and increased demand for ethanol production.

4. Disease and High Input Costs: Many tomato farmers faced bacterial and viral disease outbreaks in last year's kharif season. Since tomato farming is capital intensive, requiring Rs 1-2 lakh per acre, rising disease-related costs have made it less profitable, causing farmers to avoid planting tomatoes this season.

When Will Prices Fall?

Current wholesale prices of tomatoes in key markets like Pimpalgaon Baswant, Nashik, range around Rs 52-55 per kg. Prices are expected to stay high or even increase further. While fresh supplies from Nashik and Telangana are expected after Dussehra, this relief will be short-lived, as another supply shortage could push prices up again. A significant drop in prices is unlikely before the next major crop arrives in March.

Relevance: GS Prelims & Mains Paper III; Economics Source: Indian Express

3. DAE Inaugurates MACE, Asia's Largest and World's Highest Cherenkov Observatory in Ladakh

Introduction

On October 4, 2024, Dr. Ajit Kumar Mohanty, Secretary of the Department of Atomic Energy (DAE) and Chairman of the Atomic Energy Commission, inaugurated the Major Atmospheric Cherenkov Experiment (MACE) Observatory at Hanle, Ladakh. Standing at an altitude of 4,300 meters, MACE is not only the largest imaging Cherenkov telescope in Asia but also the highest in the world. This indigenous project, developed by the Bhabha Atomic Research Centre (BARC) with support from Indian industry, marks a significant milestone for India in the field of cosmic-ray research.



Cherenkov telescope

A Cherenkov telescope is a specialized type of astronomical instrument used to detect high-energy gamma rays from cosmic sources by observing Cherenkov radiation. It is primarily used in gammaray astronomy to study energetic phenomena such as supernovae, black holes, and gamma-ray bursts.

How It Works:

1. Cherenkov Radiation: When high-energy gamma rays from space interact with Earth's atmosphere, they produce cascades of secondary particles, such as electrons and positrons, which move faster than the speed of light in the atmosphere (though not faster than the speed of light in a vacuum). This creates a faint blue glow, called Cherenkov radiation.

2. Imaging Cherenkov Radiation: Cherenkov telescopes detect and image this brief flash of Cherenkov light, which lasts just a few billionths of a second. The light is captured by large mirrors and focused onto a camera, usually made of highly sensitive photomultiplier tubes or other optical sensors.

3. Data Analysis: By analyzing the shape, intensity, and timing of the Cherenkov radiation, scientists can infer the properties of the original gamma rays, such as their energy and the direction they came from in the sky.

Significance of the MACE Observatory

Dr. Mohanty emphasized that the MACE Observatory places India at the forefront of global cosmic-ray research. The telescope will study high-energy gamma rays, advancing our understanding of the universe's most energetic phenomena, such as supernovae and black holes. He also highlighted MACE's role in promoting the socio-economic development of Ladakh and inspiring future generations of Indian scientists and astronomers.

Collaborative Efforts and Community Engagement

Several dignitaries, including Shri Ajay Ramesh Sule, Additional Secretary of DAE, and Dr. Annapurni Subramaniam, Director of the Indian Institute of Astrophysics (IIA), spoke about the collaborative efforts that made the MACE project possible. Shri Sajjad Hussain Mufti, Chief Conservator of Forests, UT Ladakh, praised the project's alignment with the goals of the Hanle Dark Sky Reserve, encouraging community engagement and scientific tourism.

Technological Impact and International Collaboration

The MACE project aims to foster international collaboration and establish India's leadership in astrophysics and multi-messenger astronomy. It will complement global observatories in studying cosmic phenomena, strengthening India's contribution to space research. The inauguration event also featured the release of a special pictorial compilation documenting the journey of the MACE project and a film showcasing the technological advancements involved.

This observatory represents a monumental achievement for Indian astrophysics and is set to inspire generations of scientists while contributing to global research on the most energetic events in the universe.

Relevance: GS Prelims & Mains Paper III; Science & Technology Source: PIB

4. WHO declares that India has eliminated Trachoma as a public health problem in 2024

Introduction

World Health Organisation (WHO) has declared that the Government of India has eliminated Trachoma as a public health problem becoming the third country in the South-East Asia Region to achieve this milestone.

About Trachoma

Trachoma is a bacterial infection that affects the eyes. It is caused by the bacterium Chlamydia Trachomatis. Trachoma is contagious, spreading through contact with the eyes, eyelids, nose or throat secretions of infected people, if left untreated it causes irreversible blindness.

Stages of trachoma



Infection caused by Chlamydia bacterium causes inflammation and thickens the upper eyelid



Scarring of the eyelid pulls the eyelashes into the eye The section of the se

The eyelashes scratch the cornea and continue to infect and damage the eye, which can lead to blindness

WHO has termed Trachoma as a neglected tropical disease. WHO estimates suggest that 150 million people worldwide are affected by Trachoma and 6 million of them are blind or at risk of visually disabling complications. Trachoma found is in underprivileged communities living in environmental poor conditions.

Trachoma in India

Trachoma was amongst the leading cause of blindness in the country during 1950-60. The Government of India launched the National Trachoma Control Program in 1963 and later on Trachoma control efforts were integrated into India's National Program for Control of Blindness (NPCB).

In 1971, blindness due to Trachoma was 5% and today, owing to the various interventions under the National Programme for Control of Blindness & Visual Impairment (NPCBVI), it has come down to less than 1%. WHO SAFE strategy was implemented throughout the country wherein SAFE stands for adoption of surgery, antibiotics, facial hygiene, environmental cleanliness etc. As a result, in 2017, India was declared free from infective Trachoma. However, surveillance continued for trachoma cases in all the districts of India from 2019 onwards till 2024.

The National Trachomatous Trichiasis (TT only) Survey was also carried out in 200 endemic districts of the country under NPCBVI from 2021-24, which was a mandate set by WHO in order to declare that India has eliminated Trachoma as a public health problem.

All the reports were compiled in a specific dossier format by the NPCBVI team and were shared with the WHO country office for final scrutiny. Finally, after years of fighting against Trachoma, WHO declared that India has eliminated Trachoma as a public health problem.

Relevance: GS Prelims; Prelims Source: PIB