Current Affairs 20th July 2025 by Right IAS

Supreme Court to Hear Presidential Reference on Governor/President Role in State Bills

A five-judge Constitution Bench of the Supreme Court will hear a Presidential Reference under Article 143 of the Indian Constitution. Main Questions in the Reference: On Time Limits: Can judicial orders impose time limits on the Governor or President when the Constitution doesn't specify any?

Can courts define the manner in which these constitutional authorities should act?

On Use of Article 142: Can Article 142 (used by courts to deliver complete justice) override constitutional provisions related to President/Governor powers?

Is it proper to use Article 142 to substitute the decision of the Governor or President?

On Deemed Assent: Can a State Bill become law without actual assent from the Governor or President?

Is the idea of "deemed assent" constitutional?

Can courts intervene or pass judgment on a Bill before it becomes law?

Why It's Important: The issue questions the balance of power between the executive and judiciary. It seeks clarity on what the Governor/President can and cannot do, and whether courts can direct their actions. The "deemed assent" concept introduced by the Court may limit executive powers and is being challenged as outside the constitutional framework.

What the Court Will Examine: Scope of Article 142: Can it alter or bypass powers given to the Governor/President?

Interpretation of Articles 200 & 201: What are the constitutional duties and rights of the Governor/President when a Bill is sent for assent? Justiciability: Can courts interfere before a Bill becomes law?

The Hindu

Matter and Antimatter Behave Differently

What was discovered?

Scientists observed for the first time that a baryon (a type of subatomic particle) and its antimatter version decay at different rates. This difference in decay is known as CP violation. It could help us understand why the universe has more matter than antimatter. What are matter and antimatter? Matter makes up everything we see: stars, planets, people. Antimatter is like a mirror image of matter but with opposite charges. According to science, the Big Bang should have created equal amounts of both.

Why is it a mystery?

If matter and antimatter were created equally, they should have destroyed each other. But today, we see only matter in the universe. Why this imbalance exists is still a big scientific puzzle. What is CP violation? CP stands for: C (Charge Conjugation): swapping a particle with its antiparticle. P (Parity): flipping space like a mirror image. If laws of physics treated matter and antimatter the same, CP would be conserved. CP violation means this symmetry is broken matter and antimatter behave differently

Has CP violation been seen before? Yes, but only in mesons (particles made of one quark and one antiquark). This is the first time it's been observed in baryons, which are made of three quarks. Baryons include protons and neutrons, the building blocks of the universe. Which particle was studied? The particle is the b0 baryon, made of up, down, and bottom quarks. Its antimatter version is the b0 bar (with corresponding antiquarks). Scientists studied how both decay into a proton, a kaon, and two pions.

Why should we care?

This discovery helps answer: "Why is there something instead of nothing?" Without CP violation, the universe may not exist as we know it. It's a key to understanding the origin and structure of everything around us.

New Technology to Measure Blood Sodium Non-Invasively

What's New? Scientists have created a new method to measure sodium levels in blood without taking blood samples. How It Works: The technique uses terahertz optoacoustic. It shines very high-frequency light (terahertz light) on the blood. Sodium ions in the blood respond by creating sound waves. These sound waves are picked up and used to measure sodium levels.

Key Features: ☑ Non-invasive – no needles or blood draws needed. ☑

Real-time gives results immediately. ☑ Accurate – tested successfully in living mice, and results matched traditional lab tests.

☑ Selective – it only responds to sodium, not confused by other things in the blood. Why is it Important? This could help doctors easily monitor patients with sodium imbalance (dysnatremia) a condition that can cause serious health problems if not managed properly.

The Hindu

Topic ⟶ All About Rare Diseases

What Are Rare Diseases? Definition: A rare disease is one that affects a small number of people compared to the general population. How rare? India: Less than 1 in 2,500 people. USA (NIH): Affects fewer than 200,000 people. Europe (EU): Affects fewer than 1 in 2,000 people. Total known rare diseases: Over 7,000–8,000 types known worldwide. Causes of Rare Diseases Genetic (inherited) ~80% of rare diseases.

E.g., Duchenne Muscular Dystrophy, Cystic Fibrosis, Thalassemia. Infectious agents e.g., some rare parasitic or bacterial infections. Autoimmune conditions where the body attacks itself. Environmental or unknown causes some remain undiagnosed.

Treatment Approaches Orphan Drugs – Special drugs developed for rare diseases. Often very expensive.

Gene therapy – New and evolving for genetic conditions. Symptomatic care To manage pain or slow progression. Supportive therapies – Physiotherapy, speech therapy, etc. Global & Indian Initiatives International Orphan Drug Act (USA, 1983): Promotes drug development. Rare Disease Day: Observed on last day of February every year. EURORDIS: European rare disease advocacy group.

India National Policy for Rare Diseases (2021): Focus on diagnosis, treatment, and awareness. Financial aid of up to ₹20 lakh for selects rare diseases. Three groups defined for diseases based on treatment availability. Centres of Excellence (COEs) set up at AIIMS and other institutes.

Famous Rare Diseases (Examples)

Disease	Feature
Huntington's Disease	Brain disorder; affects movement and thinking
Gaucher's Disease	Affects organs and bones due to fat buildup
Spinal Muscular Atrophy	Muscle wasting disorder
Pompe Disease	Muscle weakness due to glycogen buildup
Progeria	Rapid aging in children

The Hindu

BioEmu

What Are Proteins Like?

Proteins are not stiff or fixed structures. They bend, twist, and change shape which is essential for their functions in the body. For example: Enzymes open like clams to grab molecules. Signaling proteins change shape to control cell actions. Some proteins briefly show hidden pockets where drugs can attach.

The Problem with Old Methods Traditional AI tools like AlphaFold gives only one stable shape of a protein. But in reality, proteins have many different shapes like a moving picture. The best method until now was Molecular Dynamics (MD), which: Simulates proteins moving at an atomic level. Is very accurate but also very slow and expensive. Needs thousands of hours on supercomputers.

What is BioEmu?

BioEmu is a new AI system developed by: Microsoft Rice University (USA) Freie Universität (Germany) It uses deep learning to predict all the natural shapes a protein can take known as its equilibrium ensemble. What BioEmu Can Do Predicts large and small shape changes in proteins: Like opening and closing of enzymes. Switching proteins on or off. Revealing hidden drug binding pockets (e.g., in Ras protein linked to cancer). Got 83% accuracy in large movements and 70–81% in small ones. Predicts how mutations affect protein stability. Works for proteins with no fixed 3D structure too.

The Hindu

Low-cost reusable water filter

Overview Scientists from the Institute of Nano Science and Technology (INST), Mohali, along with IIT-Dharwad and IIT-Kharagpur, have developed an innovative, low-cost, and reusable water filter. This filter is designed to clean water polluted with harmful dyes released by industries. The Problem Industrial wastewater often contains toxic dyes like Congo Red and Methylene Blue.

These dyes pollute rivers and underground water, causing health issues such as stomach problems, skin diseases, and breathing difficulties. Existing cleaning methods (like ozone treatment or Fenton chemistry) work well but: Require chemicals and electricity Are

expensive and environmentally taxing

The New Solution Scientists developed a sustainable and affordable water filter using: PLA (polylactic acid) a biodegradable plastic used to make 3D-printed sponge-like sheets. Bismuth Ferrite (BFO) a special nanoparticle that acts as a catalyst. How It Works PLA sheets are first treated with a sodium hydroxide solution to make them absorb water. Then, the sheets are coated with BFO ink. BFO acts in two ways: Photocatalysis (with sunlight): Creates radicals that break dye molecules. Piezoelectric effect (with ultrasound): Generates electricity from vibrations to create radicals even in the dark. This combined process is called piezo-photocatalysis, allowing it to work day or night.

Performance In lab tests: Removed 99% of Congo Red Removed 74% of Methylene Blue in 90 minutes Worked effectively even on real wastewater from a textile factory. Durable – After five reuse cycles, only 3% drop in cleaning ability. Use of Artificial Intelligence Researchers used machine learning models (like Random Forest, XGBoost, and Neural Networks). AI was trained using: Thousands of experimental data points (dye levels, light intensity, ultrasound frequency, etc.) The AI accurately predicted how quickly the dyes would be removed under different conditions. Future Applications Scientists plan to scale up production of this filter. Aim to use it near sewage and treatment plants, especially where rivers and lakes are regularly polluted. Potential use in government programs like: Jal Nigam Namami Gange

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