Breakthrough Prizes

Why in News?

The **2024 Breakthrough Prizes in the Life Sciences** category recognised groundbreaking research set to change the lives of those suffering from three **Rare Diseases:** Parkinson's disease**,** Cystic fibrosis and **Cancer.**

- Awards were also given in the categories of **Fundamental Physics** and **Mathematics.**

What are the 2024 Award-Winning Breakthroughs?

- **Life Sciences:**
    - **Cancer Treatment Advances:** Carl June and Michel Sadelain **genetically engineered T cells** with synthetic receptors to recognize individual cancer cells, achieving remarkable success against liquid cancers such as leukemia, lymphoma, and myeloma.
        - Some patients have experienced complete tumor eradication and long-term remission after treatment.
    - **Cystic Fibrosis Breakthroughs:** Sabine Hadida, Paul Negulescu, and Fredrick Van Goor invented the first effective medicines to treat the underlying cause of cystic fibrosis.
        - These medicines, including a triple combination medicine, enable a protein to function properly, significantly improving the quality and length of life for people with this disease.
    - **Parkinson's Disease Discoveries:** Thomas Gasser, Ellen Sidransky, and Andrew Singleton discovered the most common genetic causes of Parkinson's Disease.
        - These discoveries offer clues to the mechanisms that cause the disease, pointing to the role of the lysosome in neuronal damage.
- **Fundamental Physics:**
    - Winners John Cardy and Alexander Zamolodchikov have contributed **a lifetime of deep insights into quantum field theories,**
- **Mathematics:**
    - Awardee Simon Brendle has contributed a **series of remarkable leaps in differential geometry,** a field that uses the tools of calculus to study curves, surfaces and spaces.

What are the Breakthrough Prizes?

- **Establishment:**
    - Founded in **2012 by prominent Silicon Valley figures including Yuri Milner,** Mark Zuckerberg, Priscilla Chan (from Facebook), and Sergey Brin (from Google).
- **Recognition of Scientific Excellence:**
    - The prizes aim to honor **outstanding individuals who have made transformative contributions** in fundamental sciences, specifically in fields like life sciences, mathematics, and fundamental physics.
- **Categories:**
    - The Breakthrough Prizes are awarded in distinct categories, including **life sciences (biology, genetics, medicine), fundamental physics, and mathematics.**

- **Financial Reward:**
  - Recipients of the Breakthrough Prizes are awarded a substantial monetary prize. Each recipient receives USD 3 million, surpassing the monetary value associated with Nobel Prizes, which offer USD 1 million per category.
- **Oscars of Science:**
  - Often dubbed as the **"Oscars of Science,"** these awards hold significant prestige within the scientific community, shining a spotlight on groundbreaking discoveries and advancements.
- **Recognition Events:**
  - The awards are presented annually, acknowledging top scientists globally. The inaugural ceremony in 2012 was hosted by actor Morgan Freeman.
- **Support for Early-Career Researchers:**
  - Additionally, there are other prizes associated with the Breakthrough Prizes, such as the New Horizons in Physics and Mathematics and the Maryam Mirzakhani New Frontiers Prize, dedicated to recognizing the work of promising early-career researchers.

What are Rare Diseases?

- **About:**
  - A rare disease is **a health condition of low prevalence that affects a small number of people** compared with other prevalent diseases in the general population.
  - There is **no universally accepted definition of rare diseases** and the definitions usually vary across different countries.
- **Prevalence:**
  - There are about **7,000 known rare diseases,** affecting around 8% of the world's population" and "75% of rare disease patients are children.
  - **India** has close to **50-100 million people affected by rare diseases or disorders.**
- **Examples:**
  - **Lysosomal Storage Disorders (LSD)**
  - **Cystic fibrosis**
  - **Haemophilia**
  - **Parkinson's Disease**

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