UPSC Daily Current Affairs| Prelimbits 11-07-2025

Supersolid and Quantum theatre

Prelims: Current events of national and international importance | Science and technology

Why in News?

A team of researchers from Italy, recently froze light into a 'supersolid' using 'quantum theatre.'

• **Supersolid** - A super solid is an *exotic phase of matter* in which particles are arranged in a crystalline structure but also move like a non-viscous fluid, exhibiting properties of both a solid and a superfluid.
• **First created in -** 2017 in a laboratory, but Physicists predicted the idea of a super solid in the 1960s.
• It combines the friction-free flow of a superfluid with the ordered structure of a crystalline solid.
• Usually, solids do not move on their own, but super solids ***change direction and density*** depending on their particles' interactions while maintaining an organised internal structure.
• **Properties of light -** Light always travels at *3 lakh km per second in a vacuum.*
• It cannot be trapped and solidified because the particles of light, photons, have no rest mass and do not interact strongly with each other.
• Light exists only as a particle or a wave.

- **Recent Findings –** It marks the first time scientists have managed to couple light with matter to create a supersolid.
- It used a quantum mechanical approach that relied on the properties of polaritons.
- These are hybrid particles that sometimes behave like light and sometimes like matter.
- They are created by coupling photons with packets of energy inside materials, like phonons (vibrational energy) or excitons (electron-hole pairs).
- The researchers used an aluminium gallium arsenide semiconductor platform as a waveguide, a channel through which waves can pass, fitted with a source of excitons and a laser.
- The waveguide had a microscopic structure with a periodic grating.
- The etched ridges influenced the polaritons' motion, trapping them in a regular pattern.
- The team used a pulsed laser to maintain a dense polariton condensate at a temperature of about –269ºC.
- **Quantum theatre -** This framework uses concepts from quantum mechanics to

analyse theatrical performances, exploring themes like identity, observation, and play.
- **Potential applications -** Through this experiment photonic supersolids become more accessible for experimentation.
- Helps in producing lossless optical energy transport and optical computing elements.

Reference

The Hindu| supersolid |quantum theatre

National Biobank

Prelims: Science and technology- Current events of National & International importance.

Why in News?

Recently Minister for Science and Technology inaugurated the National Biobank' and India's own Longitudinal Population Data study at CSIR-IGIB (Institute of Genomics and Integrative Biology).

- A National Biobank is a ***large-scale repository*** designed to collect, store, and manage biological samples (like blood, tissues, DNA) and associated health data (clinical, lifestyle, genomic).
- **Launched under -** The Phenome India Project.
- **Objectives-** The Biobank will serve as the backbone of a nationwide cohort study, collecting comprehensive genomic, lifestyle.
- **Collection of data** - A long-term, data-rich study tracking the health trajectories of individuals over several years.
- Involves the collection of clinical data from 10,000 individuals across India.
- **Tailored version** - The Indian version is tailored to capture the country's unique diversity, across geography, ethnicity, and socio-economic backgrounds.
- **Supports early treatment** - This initiative will aid early diagnosis, improve therapeutic targeting.
- **Treatment of complex diseases** - In the fight against complex diseases such as diabetes, cancer, cardiovascular ailments, and rare genetic disorders.
- **Individualised treatment** - Indian may receive individualised treatment tailored to their genetic makeup, lifestyle, and environment.
- **Disease Recognition** - It will help scientists uncover disease patterns, gene-environment interactions, and response to therapies within the Indian context.
- **Self-reliance** – A bold step toward India's self-reliance in healthcare data.
- **Prospect** – It has the potential to evolve into a global benchmark like the UK Biobank.

Phenome India project

• **Launched by** -The Council of Scientific and Industrial Research (CSIR).
• **Launched on** - December 7, 2023.
• **Objective** - To develop India-specific risk prediction models for cardio-metabolic diseases, including diabetes, liver diseases, and cardiac diseases.
• **Participants** - Around 10,000 individuals—primarily CSIR employees, pensioners, and their spouses.
• **Data collected** -Clinical questionnaires, lifestyle and dietary habits, anthropometric measurements, imaging and scanning data, and extensive biochemical and molecular data.

Reference

PIB| National biobank

Oral Cancer

Prelims: Current events of National & International importance

Why in News?

Recently, it has been suggested that identifying oral cancer in Stages I and II can increase the 5-year survival rate to 80–90%, compared to significantly lower survival when diagnosed at an advanced stage.

- **Oral cancer** - Cancer that forms in ***tissues of the oral cavity*** (the mouth) or the oropharynx (the part of the throat at the back of the mouth).

Oral cancer in India

- **Annual cases** - Over 1,35,000 new cases reported annually, remains one of the most prevalent cancers in India.
- **Disease burden** - India accounts for nearly one-third of the global incidence of the disease, according to GLOBOCAN 2020 and the National Cancer Registry Programme.
- **Major contributing factors** - Use of smokeless tobacco, betel quid, and areca nut, especially in underserved communities.
- **Precancerous conditions -** Leucoplakia or oral submucous fibrosis.



- **Early diagnosis** - When diagnosed at an early stage, oral cancer is highly treatable, with five-year survival rates exceeding 80% for Stage I and II cases.
- **Use of Advanced tools** -VELscope and Oncodiagnoscope should be used to screen suspicious red or white patches in the oral cavity.
- **Regular surveillance-** High-risk patients who underwent biopsy should be placed under regular surveillance to monitor for any signs of malignant transformation.
- **Advanced treatment-** Each case is thoroughly evaluated and discussed by a tumour board.
- **Individualised diagnosis** - Treatment plans are individualised, following internationally recognised protocols.
- **3D printing** -It is incorporated in preoperative planning and reconstruction.
- This allows for the creation of accurate anatomical models, simulate surgeries, and fabricates patient-specific surgical guides and reconstruction plates.
- **Improvements** - These advances have improved surgical accuracy, reduced operating time, and contributed to better postoperative function and aesthetics.
- **Postoperative care** - Speech therapy, nutritional support, physical rehabilitation, and psychological counselling
- **Ongoing follow-up** - Ensures early detection of any recurrence or secondary conditions.
- **Trios of the treatment** - Early diagnosis, tailored treatment, and holistic rehabilitation.

Reference

The Hindu | Oral cancer diagnosis

Mukh Mantri Sehat Yojana

Prelims: Current events of national and international importance

Why in the news?

Recently, Punjab government launched the "Mukh Mantri Sehat Yojana".

- **About** – It is a flagship health insurance scheme to ***provide cashless treatment to all residents of Punjab.***
- **Aim -** To ensure universal health coverage and reduce out-of-pocket expenses for secondary and tertiary healthcare services.
- **Cashless Treatment** - Beneficiaries receive completely cashless treatment, including diagnosis, hospitalization, surgery, and medicines.
- **Eligibility Criteria** - All residents of Punjab, including farmers, labourers, and marginalized sections, are covered.
    - Beneficiaries are identified through State Resident Data Hub (SRDH) and NFSA databases.
- **Financial Coverage** - Each eligible family is entitled to ***Rs.10 lakh per year*** for hospitalization and treatment under the scheme.
- **Wide Network** - The scheme covers over 1,500 procedures across a wide network.
- **Empanelled Hospitals** - Both *public and private hospitals* meeting quality and infrastructure criteria are authorized to deliver services.
- **Digital Integration** - The entire scheme is IT-enabled with a centralized e-card system, online authorization, and real-time monitoring.
- **Special Focus** - Special attention is given to vulnerable groups, including pregnant women, children, senior citizens, and those with chronic illnesses.
- **Grievance Redressal** - A robust system is in place for addressing grievances and ensuring timely redressal through helplines and district-level officers.

Reference

Hindustan Times| Mukh Mantri Sehat Yojana

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