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Lucy Mission - First Mission to Trojans

NASA will launch its first spacecraft Lucy on an Atlas V rocket to study Jupiter's Trojan asteroids to collect insights into the solar system's formation.

The mission is named as 'Lucy' after an ancient fossil that provided insights into the evolution of human species.

- **Mission** - To investigate the group of rocky bodies circling the Sun in two swarms, one preceding Jupiter in its orbital path and the other trailing behind Jupiter.
- After receiving boosts from Earth's gravity, Lucy will embark on a 12-year journey to 8 different asteroids.
 - Among the 8 asteroids, one asteroid is in the Main Belt between Mars and Jupiter and then 7 Trojan Asteroids.
- Lucy will offer new insights into the history of the solar system, including how all of the planets came to be and why they are aligned in their current configuration.
- **Working** - Lucy will fly by its targets within 400 kms of their surfaces.
- It will use its onboard instruments and large antenna to investigate their geology, including composition, mass, density and volume.
- It will be the first solar-powered to venture this far from the Sun, and will observe more asteroids than any other spacecraft before it.

Trojan Asteroids

- Trojan asteroids or Jupiter Trojans are group of asteroids (more than 7,000 in number) that share the planet Jupiter's orbit around the Sun.
- They are leftovers of the primordial material from which Jupiter and the other outer planets were formed.
- Despite the fact that they really are in a very small region of space, they're very physically different from one another.
- Trojans are a type of co-orbital object, where a star and a planet orbit around a common barycentre.

Government Shutdown

The US Congress is working to avoid a partial government shutdown as the new fiscal year is set to begin on October 1, 2021.

- A government shutdown happens when the Congress fails to fund the government, in which case the government
 - 1. Stops all non-essential services
 - 2. Continues the essential services like the armed forces, police etc.

- In the beginning of every fiscal year, the Congress passes 12 appropriation acts that provide the budget authority to obligate and expend funds from the US Treasury for specific purposes for that year.
- Without these acts, federal agencies cannot withdraw money from the US Treasury as stated in Article 1 of the US Constitution.
- When an agreement is not reached within the ending of a fiscal year, federal agencies may face a gap in funding.
- In such a case, the government may pass a stopgap funding bill. If not enacted, the government may have to shut down.
- **Effects** - Government shutdowns may lead to furloughing of federal government employees, reduction in some government activities since the government stops all non-essential services.
- A full government shutdown may affect the services including social security, medicare, national parks, air travel and health services, and also it may affect the various sectors of the economy.

Blue Dot Network

- In 2019, the Blue Dot Network (BDN) was announced as a joint initiative of the US, Japan and Australia to certify infrastructure projects that meet international quality standards.
- It brings together governments, the private sector and civil society to promote principles of global sustainable infrastructure development.
 - It will help attract private capital to infrastructure projects in developing and emerging economies.
- It is seen as a direct counter to China's Belt and Road Initiative (BRI).
- BDN certification will serve as a globally recognized symbol of market-driven, Paris Agreement-aligned, and financially, socially, and environmentally sustainable infrastructure projects.
- But, unlike the BRI, the BDN would not offer public funds or loans for the project.

Failure of Artemisinin-based Anti-malarial Drugs

There is increasing evidence for the failure of artemisinin-based therapy for Plasmodium falciparum malaria either alone or with partner drugs.

- In most malaria-endemic countries including India, Artemisinin-based antimalarial drugs are the first-line choice for malaria treatment especially against *P. falciparum*.
- In India, after the failure of chloroquine to treat *P. falciparum* malaria, artemisinin-based combination therapy was initially introduced in 2008.
- In 2010, artesunate plus sulfadoxine-pyrimethamine (AS+SP) was introduced.
- In 2013, the combination partner was replaced by artemether-lumefantrine (AL) for the 7 North Eastern States.
- Currently, several combinations of artemisinin derivatives are registered in India.
- In 2019, a report indicated the presence of 2 mutations in *P. falciparum* cases treated with artemisinin that linked to its presence of resistance.
- Again in 2021, artemisinin-based combination therapy failure was reported where the partner drug SP showed 3 mutations with artemisinin wild type.
- This means the failure of artemisinin-based combination therapy may not be solely linked to artemisinin. There is a need to change the partner drug.
- Chloroquine is no longer used for the treatment of *falciparum* malaria in India. But it is still the effective choice to treat *P. vivax* malaria.
- Reports of the presence of chloroquine resistance mutations in some *vivax*-dominated areas

are a cause of concern and continued monitoring is needed.

- Now, Molecular Malaria Surveillance has to be carried out to find out the drug-resistant variants so that corrective measures can be undertaken in time to avert any consequences.

Mumba Eels

A new species of swamp eel belonging to the genus Rakthamichthys that is endemic to India was discovered in a well in Mumbai.

- This blind eel was named Rakthamichthys mumba. It is a new species of Hypogean eel (Teleostei: Synbranchidae).
- It is a completely blind subterranean freshwater fish species.
- Unlike other species of its genus, the mumba lacks eyes, fins and scales, has jaws equal in forward extent, different gill aperture, crescentic-shaped cephalic.
- Its body is pinkish-red with numerous blood vessels all over.
- **Difference** - Rakthamichthys mumba differs from its congener from Western Ghats of India by the possession of jaws-projecting forward equally, absence of eyes and having more vertebrae.



Family Synbranchidae

- Members of this family are very peculiar, relict lineages of percomorphs, consisting of freshwater eel-like fishes of the tropics and subtropics.
- They are distributed across all countries except Antarctica.
- Presently, this family consists of 26 valid species and are unique among teleosts by lacking paired, median and caudal fins.

Source: PIB, The Hindu, The Indian Express, Down To Earth, NBC, Hindustan Times