

**DAILY
CURRENT
AFFAIRS
ANALYSIS**

 LAKSHYA ACADEMY®

29 AUGUST 2023

1 – About the Fujiwhara effect:

GS I

Topic → Geography related issues

- **Context:**
- Recent storms in California showed signs of the Fujiwhara effect.
- **The Fujiwhara effect is as follows:**
- It was first discovered in 1921 by a Japanese meteorologist named Sakuhei Fujiwhara.
- Two cyclone interactions lead to the Fujiwhara effect.
- When two storms (or cyclones, depending on where you live) revolving in the same direction are brought close together, a violent dance around their shared centre is set off.
- If one hurricane's intensity is greater than the other's, the smaller one will orbit the larger one and eventually crash with its vortex to be absorbed.
- When two storms of equal strengths pass one another, they may combine when they get close to a common core or they may just spin around one another before separating and proceeding in different directions.
- A megacyclone, which can wreak havoc along coasts, may occasionally form when two cyclones of equivalent strength merge.
- In 1964, it was first spotted over the western Pacific Ocean when typhoons Marie and Kathy collided.
- **Connection with climate change:**
- This unusual phenomenon is occurring more regularly since the globe is rapidly warming, which is warming the waters as a result.
- In the four years from 2013 to 2017, there were ten occurrences of the Fujiwhara Effect in the northwest Pacific Ocean.
- The severity of typhoons that hit Taiwan increased by 35% between 1977 and 2016.
- This happened as a result of the northwest Pacific's sea surface temperature rising by 0.4–0.7°C over these 40 years.
- **Source → *The Hindu***

2 – Details of Methanotrophs:

GS III

Topic → Environmental Conservation related issues

- **Context:**

- Methane-eating bacteria may aid in slowing the rate of global warming, according to a study.

- **Important details:**

- The energy industry (natural gas and petroleum systems), industry, agriculture, land use, and waste management all produce methane, a potent greenhouse gas.
- The agriculture sector is the primary source of methane emissions because of livestock manure and gastroenteric leaks.
- Since methane has a warming potential over the first 20 years that is more than 85 times greater than that of carbon dioxide, it is a particularly dangerous greenhouse gas.
- Atmospheric methane has been rapidly increasing since 2005 and has now reached record levels, causing at least 30% of current global warming.

- **Methanotrophs include:**

- Researchers have suggested that methane removal can occur naturally when a group of bacteria called methanotrophs convert methane to carbon dioxide and biomass.
- Methane is consumed by every bacterium in this group, which also uses some of the gas they capture from the air as a source of long-lasting protein for their own cells.
- According to study, one strain of bacteria in this group, *Methylobacterium burtonense* 5GB1C, can effectively remove methane even when it is present in very small proportions.
- If widely adopted, the method might help to reduce global warming.
- Any current emission reduction strategies that encourage bacterial activity in natural habitats may result in an excess production of nitrous oxide (N₂O), which has 10 times the global warming potential of methane.
- This technique, which relies on methanotrophic bacteria, emits no nitrous oxide.

- Recent simulations suggest that lowering methane emissions by 0.3 to 1 petagrams by 2050 might stop the planet from warming by 0.21 to 0.22C.
- **Where do these microorganisms thrive?**
- This kind of bacteria thrives in environments with high methane concentrations (between 5,000 and 10,000 parts per million (ppm)).
- Our atmosphere contains substantially less methane than other places; it barely makes up 1.9 ppm on average.
- Other locations, such as oil wells, rice fields, and landfills, however, emit levels that are about 500 ppm higher.
- **How the process works?**
- The strain probably has a low energy need and a larger methane attraction, more than five times higher than that of other bacteria, leading to a high methane consumption rate.
- Bacteria transform methane into CO₂, a far less powerful greenhouse gas.
- **Challenges:**
- The biggest barrier to deployment is the requirement to increase the methane treatment unit's size by a factor of 20.
- Access to financing for investments and public acceptance if it is successful will thereafter be the main challenges.
- The employment of methane-eating bacteria on a wide scale will require thousands of well-functioning reactors.
- *Source → The Hindu*

3 – All about the Clearspace-1:

GS III

Topic → Science and technology

- **Context:**
- A recent space junk impacted the Clearspace-1 circling cleanup target.
- **Important details:**

- The ClearSpace-1 mission is an effort to clear space of junk by the European Space Agency.
- **Aim:**
- Deorbiting a VESPA (Vega Secondary Payload Adapter) is the mission's objective.
- The adapter is a 2013 Vega launch leftover with a conical form that orbited a small number of satellites.
- In addition to paving the path for the cleanup of space debris, the mission aims to showcase technologies for rendezvous, capture, and deorbit for satellites that are close to the end of their useful lives.
- During destructive reentry, it will also be destroyed together with the captured satellites.
- The elimination of debris and reduced collision risk will make space travel safer for upcoming generations.
- *Source → The Hindu*

4 – Details of Chandrayaan-3 experiments and explorations:

GS III

Topic → Science and technology

- **Context:**
- After the lander has successfully landed, the 26-kg, six-wheel Chandrayaan-3 rover will begin its job of lunar exploration. It can move slowly up to 500 metres.
- **Regarding the Mission's tests:**
- **Rama:**
- The Radio Anatomy of Moon Bound Hypersensitive ionosphere and Atmosphere (RAMBHA) research will look at the electrons and ions close to the moon's surface.
- The Chandra Surface Thermophysical Experiment (ChaSTE) will look at the thermal properties of the lunar surface in the polar region.

- Chandrayaan-3, the spacecraft that has landed the closest to the lunar south pole, is located at a latitude of roughly 70 degrees south.
- **ILSA:**
 - The Instrument for Lunar Seismic Activity (ILSA), which will also gauge lunar earthquakes close to the landing site, will investigate the Moon's crust and mantle.
- **LASER retroreflector array:**
 - NASA has sent out the LASER Retroreflector Array (LRA), a passive experiment that acts as a target for lasers to make incredibly accurate measurements for prospective missions.
- **LIBS:**
 - The LASER Induced Breakdown Spectroscopy (LIBS) will be used to ascertain the chemical and mineral composition of the lunar surface.
- **APXS:**
 - The Alpha Particle X-ray Spectrometer (APXS) will be used to determine the composition of elements such as magnesium, aluminium, silicon, potassium, calcium, titanium, and iron in the lunar soil and rocks.
- **Earlier investigations that may be relevant to the current mission include:**
 - **Discovery of water:**
 - It is commonly known that deep craters in the southern polar region of the Moon are always black and are almost certainly home to water ice.
 - The most important result made by the equipment on board Chandrayaan-1 was the discovery of water and hydroxyl (OH) molecules in the Moon's thin atmosphere (exosphere) as well as on its surface.
 - India's Moon Impact Probe (MIP) looked at the quantity of water and hydroxyl molecules in the moon's atmosphere.
 - A separate payload known as mini-SAR helped in locating underlying water-ice deposits in the permanently shadowed regions inside the craters near the south pole.
 - These substances were found on the Moon's surface thanks to the NASA third payload, the Moon Mineralogy Mapper, or M3.
 - The first-ever mapping of water features on the Moon and the separation of the water and hydroxyl molecules were both made possible by Chandrayaan-2, which was designed to study the water on the Moon in greater detail.

- **Subterranean lava tunnels:**

- The landscape mapping camera and hyperspectral imager on board Chandrayaan-1 found a subsurface lava tube that may one day provide a safe environment for human habitation.
- It can protect users from dangerous radiation, tiny meteorite strikes, extremely high temperatures, and dust storms on the surface of the Moon.

- **The idea of a magma ocean:**

- The Moon may have been formed when an early Earth fragment broke off due to a collision.
- The energy of the collision is supposed to have caused melting on the Moon's surface.
- This is what the magma ocean theory proposes.
- The M3 payload of Chandrayaan-1 discovered a specific type of lighter-density crystals on the Moon's surface that could only exist if the Moon had formerly been liquid.

- **A glowing Moon:**

- The Chandrayaan-1 mission's findings disproved popular belief and showed that the Moon's interior was dynamic and interacted with the exosphere.
- The landscape mapping camera found lava ponds, channels, and vents that are up to 100 million years old as well as evidence of current volcanic activity.
- This surface degassing theory was further corroborated by the carbon dioxide observations from the MIP.
- This proves lunar surface contact with the exosphere even when meteor strikes are not present.

- **Sunlight flares:**

- The Chandrayaan-2 orbiter's Solar X-Ray Monitor detected several solar microflares outside the active zone as well as the elemental abundance from the dim solar corona.
- The coronal heating mystery, or the puzzle of why the Sun's atmosphere (corona) is a million degrees hotter than its surface, which is just over 5,700 degrees Celsius, can be solved with the help of these measurements.

- **Mapping of minerals:**

- The CLASS X-ray fluorescence experiment has successfully scanned 95% of the lunar surface in X-rays for the first time.

- Over the course of the past 50 years, X-ray spectrometers have only examined less than 20% of the Moon's surface.
- These studies have shown that the minerals on the Moon contain significant amounts of oxygen in the form of oxides.
- In order to get fuel for subsequent missions, this can be done.
- *Source → The Hindu*

5 – About Bharat NCAP:

GS III

Topic → Environmental Conservation related issues

- **Context:**
- The Ministry of Road Transport and Highways introduced the Bharat New Car Assessment Programme (NCAP), an indigenous star-rating system for crash-tested cars that would assign each vehicle one to five stars according on how safe it is in an accident.
- **In relation to Bharat NCAP:**
- **What is it:**
- Vehicles that automakers voluntarily designate will have their crashworthiness evaluated as per the processes defined in the soon-to-be-published Automotive Industry Standard 197. This is done as part of the Bharat NCAP programme.
- **Applicability:**
- The programme is applicable to passenger cars with a maximum gross vehicle weight of 3,500 kg and a maximum of eight seats overall, not counting the driver's seat.
- The base model of a given variant will be the only one investigated.
- **Scale of grades:**
- **Cars are given a star rating between one and five after being evaluated on the following three factors:**
- adult occupant protection
- underage passengers' safety, and
- There are several in-car safety aid systems.

- **When is a choice not free?**
- **Despite the fact that Bharat NCAP is optional, some vehicles may still undergo crashworthiness testing, for instance:**
 - for a common variety's base variant, or
 - when the Ministry of Road Transport and Highways offers a model for testing or when the Ministry of Road Transport and Highways
 - for the safety of all parties.
- **Goal and purpose:**
 - Before they purchase a car, consumers are instructed as part of the programme, which increases demand for safer cars.
 - With only 1% of the world's automobiles, India accounts for 10% of all road crash fatalities globally with its 1.5 lakh yearly road fatalities.
 - According to a World Bank research, the yearly cost of traffic accidents to the Indian economy is between 5 and 7% of GDP.
- **The growth of the Bharat NCAP:**
 - The testing processes used by the Bharat NCAP are based on those used by the Global NCAP, an initiative of the U.K.-based NGO Towards Zero Foundation.
 - The United States, which has the oldest crash testing system in the world dating back to 1978, can collaborate with other countries' new automobile assessment programmes thanks to this platform.
- **Moving forward:**
- **Acquiring knowledge and skills:**
 - India will need to develop its crash testing capabilities and knowledge in order to implement the Bharat NCAP plan effectively. For example, India will need to develop a software system that is wired to the dummies placed inside of cars in order to evaluate the types and severity of injuries and calculate scores.
- **Observance of international standards:**

- In order to bring Bharat NCAP into accordance with international norms, India will also need to gradually enhance the testing requirements for it.
- Consider the U.S. A roll-over test, which is a component of NCAP, establishes how likely it is for a car to topple over when performing a risky manoeuvre.
- Japan's NCAP examines a variety of subjects, including the effectiveness of seat belt reminders for passengers, the performance of neck injury prevention in rear-end collisions, the evaluation of pedestrian safety devices, and more.
- *Source → The Hindu*



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