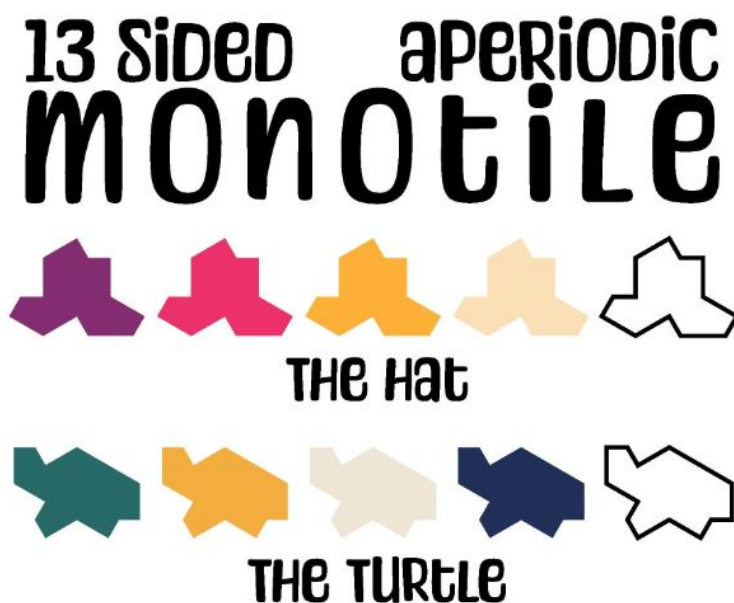


## Prelim Bits 04-04-2023 | UPSC Daily Current Affairs

### Einstein Tile

A group of four scientists have discovered an entirely new shape called 'the hat' which is an aperiodic monotile.

- **Tiling** - Several ways of tiling exists in nature and the real world like bathroom tiles or the hexagons of honeycomb.
- All of these are periodic and have a translation symmetry, i.e., the size, shape and angle remains the same, only the location changes.
- **Hat** - The 13-sided 'hat' discovered is also a shape that tiles plane, however, it does not possess translational symmetry.
- These types of shapes are called aperiodic tile sets.
- It is the first 'Einstein' tile to have been found.



- The 'Einstein' tile is an **aperiodic monotile**.
- 'Einstein' tile is a shape that can cover a plane without overlapping, leaving gaps, or repeating patterns.
- 'Einstein' is a play on German *ein stein* or 'one stone' and the tile has no connection with Albert Einstein.
- **Application** - Aperiodic tiling will help physicists and chemists understand the structure and behaviour of quasicrystals.
- To understand structures in which the atoms are ordered in a non-repetitive pattern.
- To open up new ideas for artwork.

*In the 1970s, Nobel prize-winning physicist Roger Penrose found a set of only*

*two tiles that could be arranged together in a non-repeating pattern ad infinitum. This is now known as Penrose tiling and has been used in artwork across the world.*

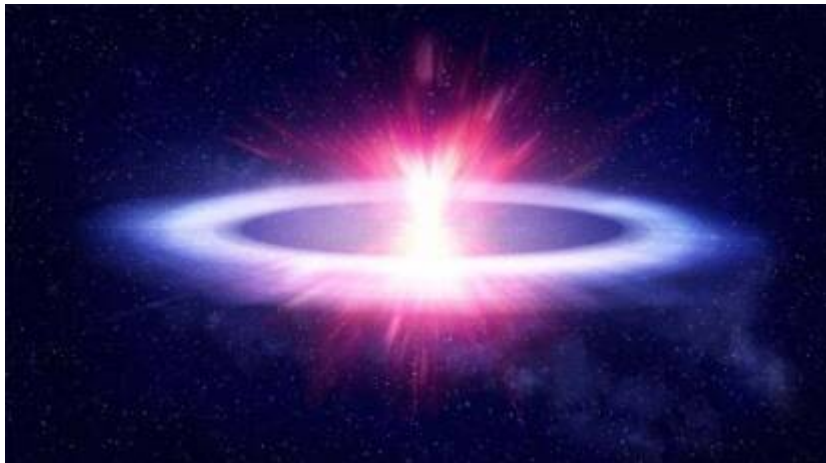
## References

1. [IE - Explaining geometry's 'Einstein problem'](#)
2. [The Hindu - New shape answers a 50-year-old geometry mystery](#)

## Fast Blue Optical Transient

*An explosion that happened over 180 million light-years away from us is aspherical and is shaped almost like a disc.*

- Stellar explosions in the Universe are almost always spherical in shape, as the stars themselves are spherical.
- An explosion that happened over 180 million light-years away from us is the flattest explosion ever seen in space.



- The explosion has been classified as a Fast Blue Optical Transient (FBOT).
- FBOT is an extremely rare class of explosion that is much less common than other kinds.
- They are too bright and they evolve too quickly, much different from other exploding stars.
- The first bright FBOT was discovered in 2018 in AT 2018cow and was nicknamed the cow.
- Including the latest discovered explosion, only a total of 5 FBOTs have been discovered so far.

## References

1. [IE - Astronomers discover flattest explosion ever seen in space](#)
2. [Science Alert - Extremely flat explosion dubbed 'the Cow'](#)

## **Chondrostereum purpureum**

*The first case of a plant fungus called Chondrostereum purpureum infecting human beings has been reported from Kolkata.*

- *Chondrostereum purpureum* is a [plant fungus](#) that causes silver leaf disease in plants, particularly those in the rose family.
- **Silver leaf disease** infects their leaves and branches, the fungus can be fatal for the plant if not quickly treated.
- However, there were no reported instances of this fungus infecting human beings from any part of the world.
- **Fungal Disease** - Fungal diseases aren't exactly uncommon in humans, of the millions of known fungal species, only a few cause infections in humans.
- Ringworm, athlete's foot, and thrush commonly are found in damp areas of our skin, much to our irritation.
- This is the first instance of a plant fungus causing disease in a human.
- This may be the start of a new phenomenon when plant fungus is adapting to invade human cells.
- **Process** - The plant fungus is infecting human cells by evading the process of '[phagocytosis](#)' which means 'cell eating'.
- The process happens when a cell uses its plasma membrane to engulf a large particle, giving rise to an internal compartment called the '[phagosome](#)'.
- Organisms clean and defend themselves by this process.
- **Reason** - Rising temperature due to global warming is one of the major reasons for this new threat to human beings.
- Most fungi thrive in the range of 12°C to 30°C and many species are thermotolerant.
- Those fungal species that are able to grow at 35–37 °C can become a human pathogen or commensal flora.
- **Threat** - Human beings with a compromised immune system are most vulnerable to fungal infection.
- Fungal infections are expected to pose a greater threat to humans in future due to rising temperatures, caused by climate change.

## **References**

1. [Down To Earth - Global first plant fungus to infect humans](#)
2. [Science Alert - Plant fungus infects human in first reported case of its kind](#)

## **Central Bureau of Investigation**

*The Prime Minister inaugurates diamond jubilee (60 years) celebrations of Central Bureau of Investigation in New Delhi.*

- A Special Police Establishment (SPE) was constituted in 1941 in the British India to enquire into allegations of bribery and corruption which later evolved into Central Bureau of Investigation (CBI).
- CBI was established by a [resolution](#) of the Ministry of Home Affairs, Government of India dated 1st April 1963.

- CBI is the premier investigating police agency in India.
- CBI has grown into a multidisciplinary investigation agency over a period of time and has 3 divisions for investigation of crime
  1. Anti-Corruption Division
  2. Economic Offences Division
  3. Special Crimes Division
- It is also the nodal police agency in India, which coordinates investigation on behalf of Interpol Member countries.
- CBI functions under Dept. of Personnel, Ministry of Personnel, Pension & Public Grievances.
- The superintendence of CBI related only to investigation of offences under the Prevention of Corruption Act, 1988 lies with the Central Vigilance Commission (CVC).
- It derives its power to investigate from the Delhi Special Police Establishment Act, 1946.
- CBI can conduct investigation in a state only with the consent of the concerned state government.
- There are 2 kinds of consent of States - case-specific consent and general consent.
- However, the Supreme Court and High Courts can order CBI to investigate such a crime anywhere in the country without the consent of the State.

## References

1. [PIB - PM to inaugurate Diamond Jubilee Celebrations of CBI](#)
2. [Live Mint - PM to inaugurate CBI's diamond jubilee celebrations](#)
3. [Central Bureau of Investigation](#)

## International Conference on Human-Wildlife Conflict and Coexistence

*The International Conference on Human-Wildlife Conflict and Coexistence was held in Oxford, the United Kingdom for three days.*

- The global conference aims to address the human-wildlife conflicts across the world by facilitating collaboration between sectors and disciplines.
- **Organiser** - The International Union for Conservation of Nature (IUCN), the Food and Agriculture Organization (FAO), the UN Development Programme and others.
- **Participants** - The conference has brought together hundreds of representatives from 70 countries to discuss solutions for human-wildlife conflict.
- The conference will provide a platform to understand human-wildlife conflict through various viewpoints, learn from each other, and build new links and collaborations.
- Effective management of human-wildlife interactions to minimise for coexistence across countries will be the fulcrum of the discussions.
- **IUCN Guidelines** - The IUCN SSC Guidelines on Human-Wildlife Conflict and Coexistence was also published at the event.
- The new guidelines provide a clear steer for managing complex situations, and strategies for achieving coexistence with wildlife.

*Effective management of human-wildlife conflict was prescribed in Target 4 of*

*the Kunming-Montreal Global Biodiversity Framework agreed at the UN Biodiversity Conference in December 2022.*

## **References**

1. [Down To Earth - How can humans & animals exist more peacefully?](#)
2. [International Conference on Human-Wildlife Conflict and Coexistence](#)

