Giant Star’s engulfing

Prelims: *Current events of national and international importance| Science and Technology*

Why in News?

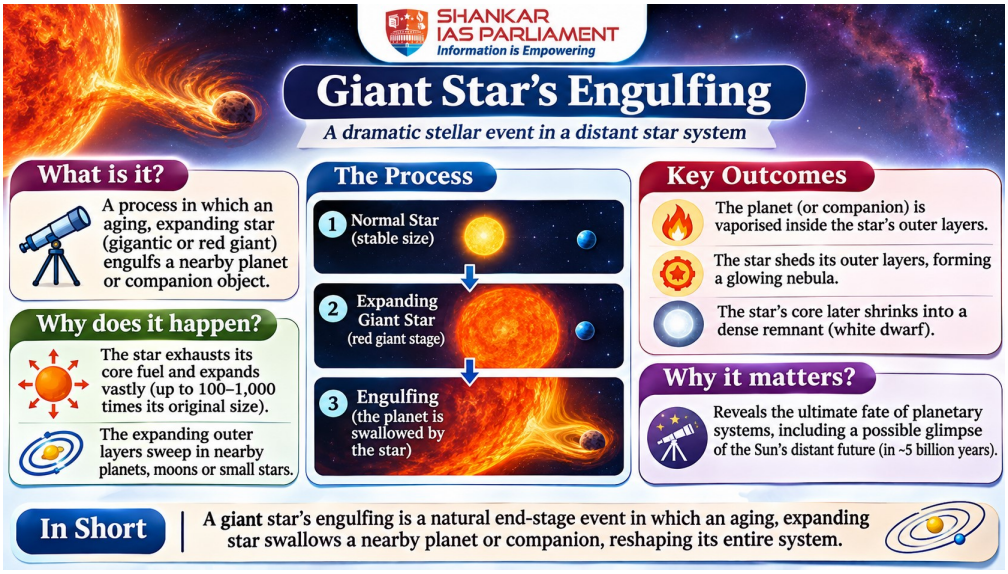
Astronomers have directly observed a giant star engulfing its smaller companion for the first time in a binary system designated AT 2025abao (nicknamed "Bao") in the Andromeda galaxy, about 2.5 million light-years away.

How the Engulfment Unfolded?

- **The Stars-** The primary star was a puffy supergiant roughly 7 times the mass of the Sun, 350 times wider, and 18,000 times brighter.
- Its companion star was about 0.7 times the mass of the Sun.
- **Slow Inward Spiral (from ~2018)-** The smaller star entered the giant's loosely bound outer layers and began spiraling inward due to orbital drag and friction, causing gradual brightening and dust production.
- **Major Eruption (October 2025)-** A powerful outburst spiked the system's brightness to roughly a million times that of the Sun and expelled about 0.1 to 0.2 solar masses of material.
- **Webb Follow-Up (December 2025) -** NASA's James Webb Space Telescope observed the system 47 days after the peak eruption, helping researchers reconstruct the interaction and aftermath.

Why It Matters?

- Unlike previously observed mergers of compact stars, puffy supergiants can either merge into a single "rejuvenated" star or eject their outer envelope to leave behind a tight binary.
- Tracking **AT 2025abao** gives astrophysicists direct data on how common-envelope interactions shape close binary systems and stellar lifespans.



Reference

[Science Daily| Giant Star's engulfing]

SHANKAR IAS PARLIAMENT
Information is Empowering