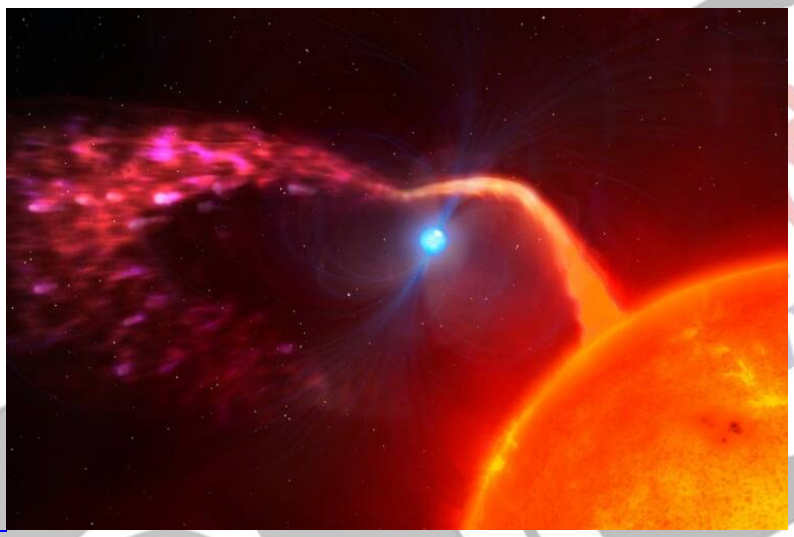
Fastest Spinning White Dwarf: J0240+1952

Why in News

Recently, a team of astronomers has confirmed the **fastest spinning white dwarf** (named J0240+1952) that completes a **full rotation once every 25 seconds**.

Key Points



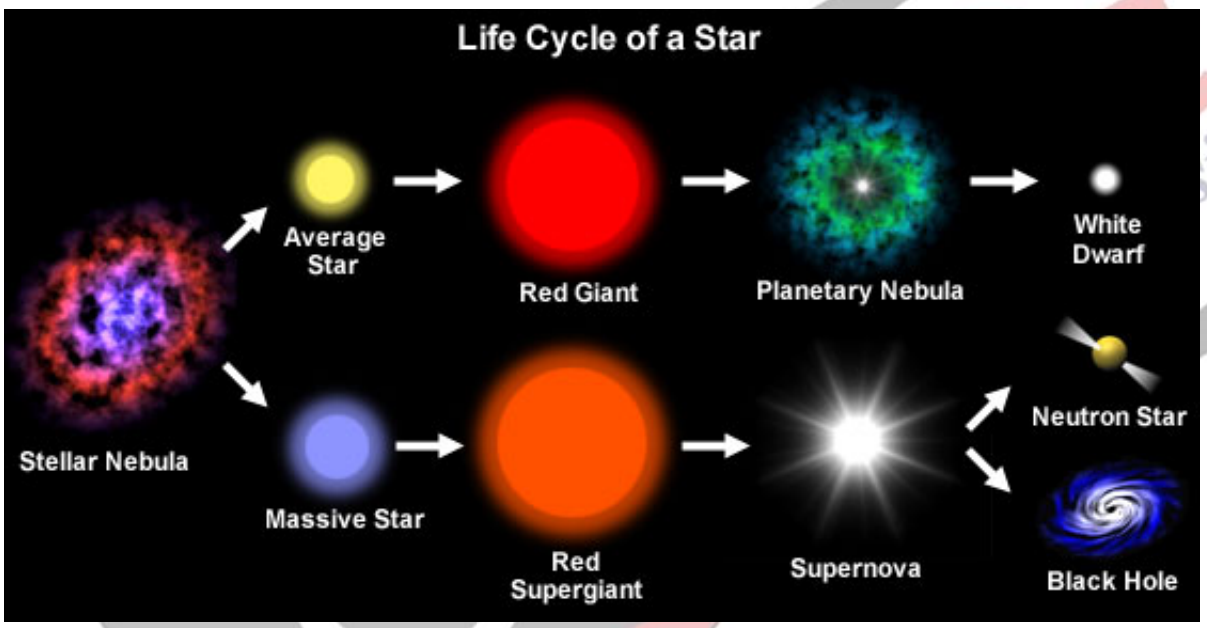
- **About:** //
  - It is part of a **binary star system**; under the **influence of the magnetic propeller system**, its immense gravity is pulling material from its larger companion star in the form of plasma.
  - Under the **magnetic propeller system, the white dwarf attracts plasma from the binary star system**. **However,** the magnetic field of white dwarf acts as a **protective barrier,** causing most of the falling plasma to be propelled away from the white dwarf.
- **White Dwarf:**
  - White dwarfs are **stars that have burned up all of the hydrogen** they once used as nuclear fuel.
    - Such stars have very high density.
    - A typical white dwarf is half the size of our Sun and has a surface **gravity 100,000 times that of Earth**.
  - Stars like our **sun fuse hydrogen in their cores into helium** through **nuclear fusion reactions**.
  - Fusion in a star's core produces **heat and outward pressure** (they bloat up as enormous red giants), but this pressure is kept in balance by the inward push of gravity generated by a star's mass.
  - When the hydrogen, used as fuel, vanishes and fusion slows, **gravity causes the star to**

collapse in on itself into white dwarfs.
    - **Black Dwarf:** Eventually—over tens or even hundreds of billions of years—a white dwarf cools until it becomes a black dwarf, which emits no energy. Because the universe's oldest stars are only 10 billion to 20 billion years old there are no known black dwarfs

        - It must be noted that not all white dwarfs cool and transform into black dwarfs.
    - Those white dwarfs which have enough mass reach a level called the **Chandrasekhar Limit**.
    - At this point the pressure at its center becomes so great that the star will detonate in a **thermonuclear** supernova.

Chandrasekhar Limit

- Chandrasekhar Limit is the **maximum mass theoretically possible** for a stable white dwarf star.
- A limit which mandates that **no white dwarf** (a collapsed, degenerate star) can be more massive than about **1.4 times the mass of the Sun**.
- Any degenerate object more massive must inevitably collapse into a neutron star or black hole.
- The limit is named after the **Nobel laureate Subrahmanyan Chandrasekhar,** who first proposed the idea in 1931.
- He was awarded the **Nobel Prize in Physics** in 1983 for his work on the physical processes involved in the structure and evolution of stars.



Source: IE