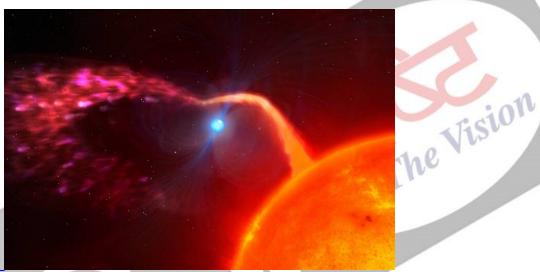


Fastest Spinning White Dwarf: J0240+1952

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 <u>binary star system</u>; under the <u>influence of the magnetic propeller</u> 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:

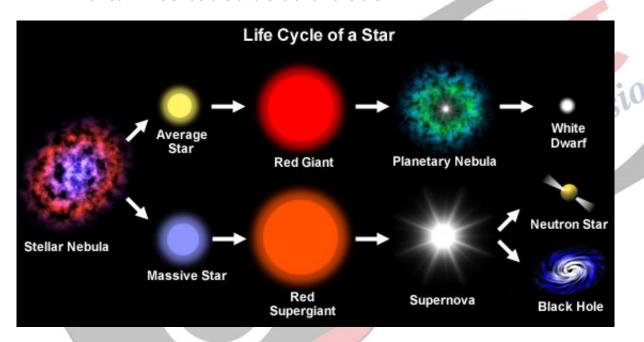
- White dwarfs are stars that have burned up all of the hydrogen they once used as nuclear fuel.
 - Such stars have very high density.
 - A typical white dwarf is half the size of our Sun and has a surface **gravity 100,000 times that of Earth**.
- Stars like our sun fuse hydrogen in their cores into helium through <u>nuclear fusion</u> 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 <u>Chandrasekhar</u> <u>Limit</u>.
- 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

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