UV-Bright Stars Spotted in Globular Structure NGC 2808

Why in News

Recently, astronomers have spotted rare hot **Ultra Violet (UV)-bright stars** in the **massive intriguing globular cluster** in the **Milky Way Galaxy** called **NGC 2808.**

- **India's first multi-wavelength space satellite AstroSat** helped astronomers in this.

Key Points

- **Data:**
    - Scientists combined data of **Ultraviolet Imaging Telescope (on board AstroSat)** with observations made using other space missions such as the **Hubble Space Telescope** and the **Gaia telescope** along with **ground-based optical observations.**
        - **Hubble Space Telescope:** The HST or Hubble **(NASA)** is a space telescope that was launched into **Low Earth orbit** in 1990 and remains in operation. It is one of the **largest and most versatile space telescopes** till date.
        - **Gaia** is a space observatory of the **European Space Agency,** launched in **2013 and expected to operate until 2022.** The spacecraft is designed for astrometry: measuring the positions, distances and motions of stars with unprecedented precision.
- **Findings:**
    - About **34 UV-bright stars** were found to be members of the globular cluster (NGC 2808). One of the UV-bright stars was found to be about **3000 times brighter** than the Sun with a surface temperature of about **1,00,000 K.**
    - **Hot UV-bright stars** have been distinguished from the **relatively cooler red giant and main-sequence stars.**
    - Most of the stars were found to have evolved from a solar stage called the **horizontal branch stars** with hardly any outer envelope. Thus, they were bound to skip the last major phase of life called the **asymptotic giant phase (it is one of the last major phases in the life of stars)** and directly become dead remnants or white dwarfs.
        - The **horizontal branch** (HB) is a stage of stellar evolution that immediately follows the **red giant branch** in stars.
- **Significance:**
    - **Properties of Stars:** The findings will help in determining properties of these stars such as their surface temperatures, luminosities and radii.
    - **Evolution of Stars:** These present **excellent laboratories** where astronomers can understand **how stars evolve through various phases** between their birth and death.
        - **Death of star:** It is not clear how these stars end their lives as not many of them are detected in these fast-evolving phases, making their study crucial.
    - **UV radiations:** UV-bright stars are speculated to be the reason for the ultraviolet radiation

coming from old stellar systems.

- **About NGC 2808:**
    - NGC 2808 is a **globular cluster in the constellation Carina.** The cluster belongs to the **Milky Way,** and is one of our home galaxy's **most massive clusters,** millions of stars. It is estimated to be 12.5-billion years old.
    - It is said to have at least **five generations of stars.**

Stellar Evolution

- **Nebula:**
    - A nebula is a cloud of gas (mostly hydrogen and helium) and dust in space.
    - Nebulae are the birthplaces of stars.
- **Main Sequence Stars:**
    - Main sequence stars are stars that are fusing hydrogen atoms to form helium atoms in their cores.
    - Most of the stars in the universe i.e. about 90% of them are main sequence stars. The **sun** is a main sequence star.
    - Towards the end of its life, a star like the Sun **swells up into a red giant,** before losing its **outer layers** as a **planetary nebula and finally shrinking to become a white dwarf.**
- **Red Dwarf:**
    - The **faintest (less than 1/1000th the brightness of the Sun) main sequence stars** are called the red dwarfs.
    - **Proxima Centauri,** the nearest star to the Sun, is a red dwarf.
- **Red Giant:**
    - Red giants have diameters between 10 and 100 times that of the Sun.
    - They are very bright, although their surface temperature is lower than that of the Sun.
    - A red giant is formed during the **later stages of the evolution as it runs out of hydrogen fuel at its centre.**
    - A very large red giant is often called **Red Supergiant.**
- **Planetary Nebula:**
    - Planetary nebula is an outer layer of gas and dust that are lost **when the star changes from a red giant to a white dwarf.**
- **White Dwarf:**
    - A white dwarf is a **very small, hot star, the last stage in the life cycle of a star.**
    - White dwarfs are the remains of normal stars, whose nuclear energy supplies **have been used up.**
    - White dwarf consists of degenerate matter with a **very high density** due to gravitational effects.
- **Nova:**
    - Novae occur on the surface of a **white dwarf** in a binary system.
    - If the two stars of the system are sufficiently near to one another, material (hydrogen) can be pulled from the companion star’s surface onto the white dwarf.
    - When enough material builds up on the surface of the white dwarf, it triggers a nuclear fusion on a white dwarf which causes a sudden brightening of the star.
- **Supernova:**
    - A supernova is the **explosive death of a star** and often results in the star obtaining the brightness of **100 million suns for a short time.**
    - The extremely luminous burst of radiation expels much or all of a **star’s material at a great velocity,** driving a shock wave into the surrounding interstellar medium.
    - These shock waves trigger condensation which is a nebula paving the way for the birth of a

new star.

- A **neutron star** is the **collapsed core of a massive supergiant star.**

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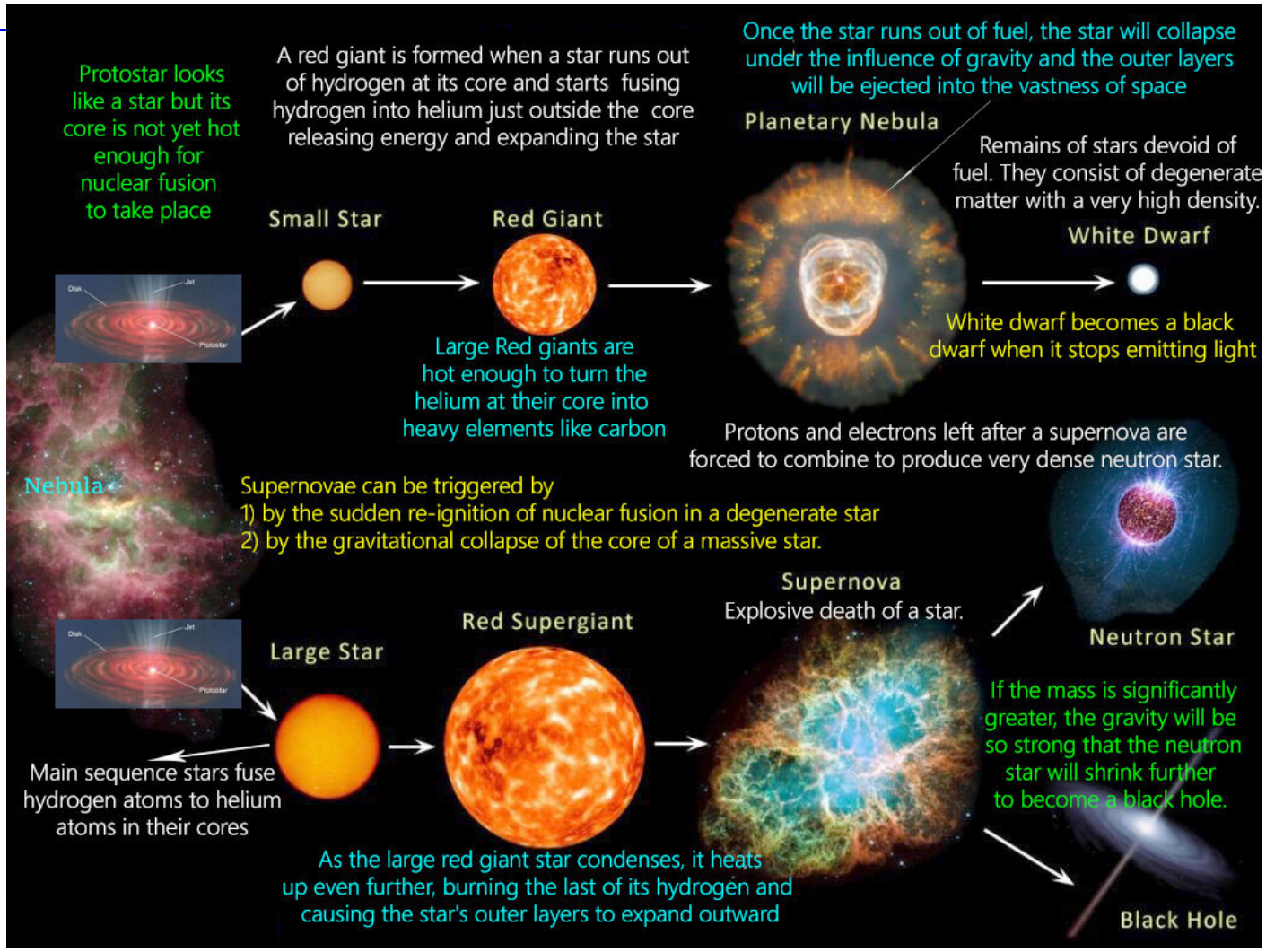

AstroSat

- It is a **multi-wavelength astronomy mission** on an IRS-class (Indian Remote Sensing-Class) satellite in a **650-km, near-equatorial orbit.**
- **Launch:** It was launched by the Indian launch vehicle **PSLV** from Satish Dhawan Space Centre, Sriharikota in 2015 by ISRO.
- It is the **first dedicated Indian astronomy mission aimed at studying celestial sources in X-ray, optical and UV spectral bands** simultaneously with its five unique X-ray and ultraviolet telescopes working in tandem.
- One of the unique features of AstroSat mission is that it enables the **simultaneous multi-wavelength observations** of various astronomical objects with a single satellite.
- The Ground Command and Control Centre for ASTROSAT is located at **ISRO Telemetry, Tracking and Command Network** (ISTRAC), **Bangalore, India.**
- This has put India in an exclusive club of countries which have multi wavelength space observatories.
- The minimum life of the AstroSat mission was expected to be **5 years.**

Source:PIB