Blue Straggler Stars

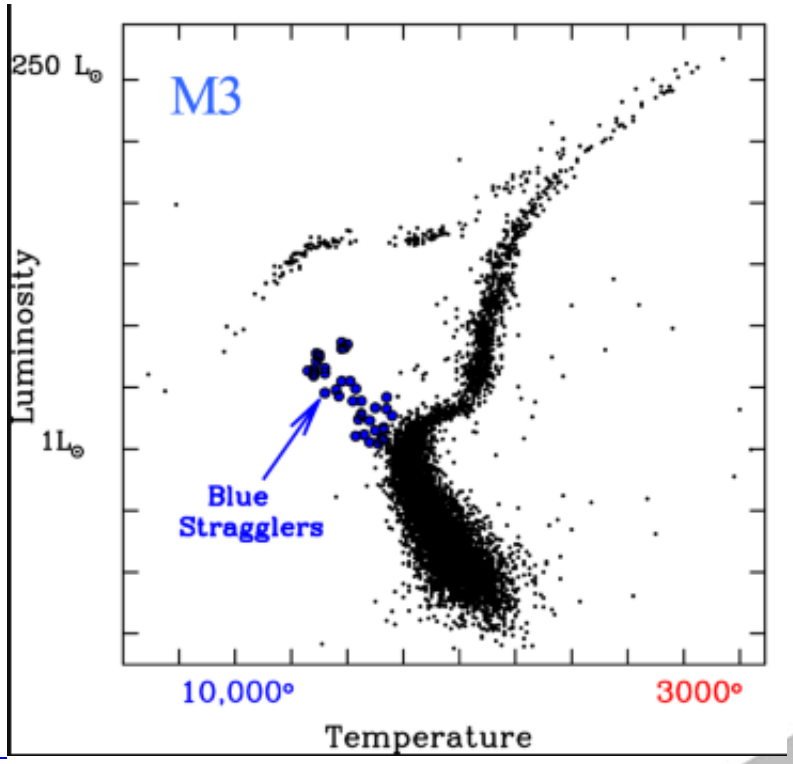
Why in News

Recently, in the **first-ever comprehensive analysis of blue stragglers,** Indian researchers have proposed a **hypothesis for evolution of blue straggler stars.**

- Blue stragglers is a class of stars on open or globular clusters that **stand out as they are bigger and bluer than the rest of the stars.**

Key Points

- **About Blue Straggler Stars:**
    - These are **unusually hot and bright stars found** in the cores of ancient star clusters known as **globulars.**
    - A clue to their origin is that they are only found in dense stellar systems, where distances between stars are extremely small (a fraction of a light year).
    - **Allan Sandage** (an astronomer with Carnegie Observatories in Pasadena, California) **discovered blue stragglers** in the **globular cluster M3** in 1952-53.
    - Most are located at least several thousand light-years away from the sun, and most are around 12 billion years old or more.
    - The **Milky Way's largest and brightest globular** is **Omega Centauri.**
- **Peculiarity about Blue Stragglers:**
    - Blue straggler stars **appear to violate standard theories of stellar evolution.**
        - A bunch of stars born at the same time from the same cloud form a star cluster. Star formation happens in interstellar molecular clouds: opaque clumps of very cold gas and dust.
        - Under standard stellar evolution, as time passes, **each star evolves differently depending on its mass,** in which **all stars born at the same time should lie on a clearly defined curve in the Hertzsprung-Russell diagram.**
        - Hertzsprung-Russell diagram **plots the temperature of stars against their luminosity** or the colour of stars against their absolute magnitude. It **shows a group of stars in various stages of their evolution.**
            - By far the **most prominent feature is the main sequence,** which runs from the upper left (hot, luminous stars) to the bottom right (cool, faint stars) of the diagram.
    - In **case of blue straggler,** they evolve and move off the main sequence creating a bend in their track, **known as the turnoff.**
        - Since blue stragglers often lie well off this curve, they **may undergo abnormal stellar evolution.**
        - They **appear to be lagging behind most of the other stars in the cluster in its evolution toward a cooler, reddish state.**



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- **About the Hypothesis:**
  - Indian researchers have found that:
    - Half of the blue stragglers are formed through mass transfer from a close binary companion star.
    - One third are likely formed through collisions of two stars.
    - Remains are formed through interactions of more than two stars.
  - For this Hypothesis, the researchers utilised the **Gaia telescope of the European Space Agency.**
  - For further study, Ultraviolet Imaging Telescope on **AstroSat**, India's first dedicated space observatory, as well as the **3.6 m Devasthal Optical Telescope in Nainital** will be used.
  - The study **will help improve understanding of these stellar systems** to uncover exciting results in studies of large stellar populations, including galaxies.

Source: PIB