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Opinion Article

Exploring the Universe through Stars in Galaxy

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DESCRIPTION

The most familiar astronomical object is a star, which is the basic component of a galaxy. Therefore, an important region of research in astronomy is the birth, life, and death of stars. Stars are distributed across most galaxies, having formed within clouds of dust. The most famous example of a dust cloud is the Orion Nebula. Turbulence deep within these clouds produces lumps so massive that the gas and dust start to collapse due to their own gravitational pull. As the cloud lowers, the substance in its center starts to heat up. A protostar is the heated core at the center of the failing cloud that will eventually burst into a star. According to three-dimensional computer simulations of star formation, the majority of stars in the Milky Way are paired or in clusters of multiple stars because spinning clouds of collapsing gas and dust may divide into two or three blobs.

It takes roughly 50 million years from the start of the collapse to a star the size of our sun. For almost ten billion years, our sun will continue to exist in its mature state. Far below the stars, hydrogen undergoes nuclear fusion to create helium, which powers the stars. The pressure necessary to prevent the star from collapsing under its own weight and the energy necessary for it to shine are both produced by the loss of energy from the central regions of the star. Main-sequence stars can be categorized based on their luminosities and colors, which vary greatly. Red dwarfs, the tiniest stars, shine weakly at temperatures between 3000 and 4000 degrees Celsius. They may have as little as 10% the mass of the Sun yet just 0.01% of its energy is released. With tens of billions of years to live, red dwarfs are the most common stars in the cosmos even with their modest size. Equally, the most massive stars, referred to as hypergiants, may have surface temperatures exceeding 30,000 K and be 100 times more massive than the Sun.

Hypergiants survive a few million years, yet they release hundreds of thousands of times as much energy as the sun.

These kinds of extreme stars are assumed to have been established in the early Universe, but they are incredibly rare today; there are only a few hypergiants in the Milky Way galaxy. Though all stars, with the exception of the most massive, have billion-year lives, stars generally have shorter lives the larger they are. When all of the hydrogen in a star's core has been fused, nuclear processes come to an end. The core starts to collapse in on itself and gets much hotter when it loses the energy needed to keep it going. Hydrogen fusion proceeds in a shell surrounding the core because there is still hydrogen available outside of it.

The star becomes a red giant as its hot core expands and pushes its outer layers outward, causing them to grow and cool. The bulk of the star's material is expelled into space, but its core collapses to form a black hole or neutron star. Stars that are less massive than the sun do not explode; instead, their cores shrink into tiny, hot stars known as white dwarfs, while the outside material drifts away. During their main sequence, stars smaller than the sun does not burn with any color other than red. These red dwarves are not easily located.

These stars, though, might be the most established ones because they can burn for trillions of years. The above list contains the seven main phases of a star's life cycle. Big or small, young or ancient, stars are among the most wonderful and charming objects in the entire universe. Keep in mind that this is how the stars were made and how they will eventually die when you look up at them. When the core temperature reaches the threshold for fusion to start, the stage of development known as the main sequence phase occurs. In the process, helium atoms are created from hydrogen protons. A main-sequence star's core releases a tremendous amount of energy as it undergoes this reaction, which is exothermic, meaning it generates more heat than it needs.

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