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Stellar Objects

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ABSTRACT

Stellar object is more of an approach towards the universe we live in. It is a lookout for those school students who are interested in the universe and space. Written by 17 years old it talks about stellar objects, their birth, their death etc.

Keywords: *Stellar Objects, Luminous Balls, Protostars, Hurtzsprung-Russel Diagram, Neutron Stars.*

1. INTRODUCTION

Stars are luminous balls of plasma that mainly consist of hydrogen and helium and are held by their own gravity and represent the most fundamental building blocks of galaxies. Consequently, the study of the birth, life, and death of stars is central to the field of astronomy. The history and evolution of the galaxy can be determined by knowing the age, distribution, and composition of the star. Also the manufacture and distribution of heavy elements such as carbon, nitrogen and oxygen and so this means that the oxygen we breathe or I should say that our survival is possible because of the sun i.e. their manufacture is the responsibility of the stars.

The question that arises is how are stars formed? The life of stars begins in clouds of gas and dust called nebulae, for example, the Orion nebula. Inside the nebula, the creation of evaporating gaseous globules takes place and the turbulence causes the globules and gas to collapse due to its own gravity. As the globules or the clouds collapses, the material reaches upto10 million degree Celsius at its core, hydrogen atoms begin to join together in nuclear reactions and a star is born known as a protostar. Not all of this material ends up as part of a star — the remaining dust can become planets, asteroids, or comets or may remain as dust. As they get smaller, the clouds spin faster because of the conservation of angular momentum—the same principle that causes a spinning skater to speed up when she pulls in her arms. The interaction between the young star's magnetic field and the surrounding gas causes episodic increases in brightness.

The reason stars don't collapse is that they use hydrogen for nuclear fusion to form helium deep inside them. Now due to this a large amount of energy is produced at the core and due to its overflow, the star is provided with the pressure necessary to keep the star from collapsing under its own weight, and the energy by which it shines.

According to the Hurtzsprung-Russel diagram which is a graph to plot the temperature of stars against their brightness. The temperature of the stars is indicated by its color. Now the smallest stars called red dwarves. Their sizes are larger than that of Jupiter but smaller than that of the sun and emit only 0.01% energy of the sun. our universe consists mainly of red dwarves with their life span being tens of billions of year. ++

Brown dwarves are a little bigger than Jupiter. They are cold but their formation was the same as that of the other stars but apparently, they were not big enough to start shining properly. They glow very faintly with the heat left over from their formation. Black dwarves are very small, cold, dead stars. They were either not big enough to start shining or they have burnt all their nuclear fuel and stopped glowing. Now the last stage of a medium-sized star is a white dwarf. They are smaller than red dwarves but they contain the same amount of matter as the sun.

Giant stars are hundred or more times larger and brighter than the sun but their lifetime is only a few million years. The entire Milky Way consists only a limited number of them. In general, the larger a star, the shorter its life. The last stage of a giant star is a red giant star that has swollen hundred times their size and so their outer gas layer cools and expands. These stars have burnt all of their hydrogens so burn helium, fusing helium atoms to make carbon. If the star is sufficiently massive, the collapsing core may become hot enough to support more exotic nuclear reactions that consume helium and produce a variety of heavier elements up to iron. However, such reactions offer only a temporary reprieve. Gradually, the star's internal nuclear fires become increasingly unstable - sometimes burning furiously, other times dying down. The red giants swell to become super giants. They are 500 times bigger than

the sun and have pressure enough to fuse carbon atom together to make iron and that is where all the iron comes from. Their magnitude varies from -5 to -10. This means that there is a limit to their brightness and eventually they collapse and explode.
What happens after the explosion?

- Average Stars Become White Dwarfs
- White Dwarfs May Become Novae or supernovae
- Supernovae Leave Behind Neutron Stars or Black Holes

Neutron stars are high-density stars and they are extremely small. They are dense because of the presence of a large amount of mass in unit volume. The gravitation at the surface is immense. If a neutron star forms in a multiple star system it can accrete gas by stripping it off any nearby companions. They also have a very powerful magnetic field, powerful enough to accelerate atomic matter around its magnetic poles producing powerful radiation. They look like massive searchlight beams when the star rotates. A neutron star is known as a pulsar when such a radiation is pointing towards the Earth, we observe it as regular pulses of radiation that occur whenever the magnetic pole sweeps past the line of sight.

Black Hole is a celestial body which is extremely dense. Dense enough that it can swallow the nearby object including light. Whatever goes inside a black hole is stretched to the length of infinity. Due to a large amount of gravity, it shrinks to an unimaginably small point called a singularity. So the matter spiraling into a black hole is torn apart and it glows brightly that it now is the brightest object in the entire universe called quasar. X-rays and Gamma rays are also emitted. When a star passes from a certain distance of a black hole, close enough that the black hole can swallow it, the star stretches and then gets compressed. It is like the star is pulling itself inwards. This destruction of a star by a black hole is called 'stellar tidal disruption'. A large amount of energy is released and a lot of light is produced, the brightening of the surrounding in an event is called a flare.

- From the Remains after the explosion of the star, New Stars Arise

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