Everything four hydrogen atoms into one helium

Science, Astronomy

Everything known to humans was previously a simple cloud of dust and gas, before it began the complex process of star birth, taking millions of years (Caltech). The first step in star birth, consists of forming cold clouds of dust and gas, known as nebulas (Earth Science). These large nebulas begin to contract under the force of gravity as the temperature of their core rises greatly (Stars-Introduction). A nebulae found in the Milky Way is composed of ninety two percent hydrogen, seven percent helium, and one percent heavier elements (Earth Science). These nebulas undergo extreme density until their core reaches a hot enough temperature to begin nuclear fusion (Earth Science). This newly born star, enters it's Protostar stage and continues nuclear fusion until the core's temperature becomes ten million kelvins, 1.

8 x 108, or 17, 999, 540 degrees Fahrenheit to become a fully-fledged star (Earth Science). The birth of this star can dwell by itself as a single star, surrounded itself with hundreds to thousands of stars in star clusters, or orbit around a shared force of gravity with another star in binary stars (Astronomy & Space, Stellar). The mass of a star inevitably determines it's life story by dictating it's size, color, surface temperature, and lifespan (Introduction to star birth). The three main sizes of stars include, low mass stars, medium mass stars, and massive stars (Earth Science). Every star, regardless of mass begins its stellar stage as a main sequence star and remains so until its death (Earth Science). Main sequence stars fuse four hydrogen atoms into one helium atom, discovered by the physicist Hans Bethe (World of Scientific Discovery). This nuclear fusion happening in main sequence stars is essential to the star's balance (Earth Science).

The gas pressure produced from the hydrogen fusion is able to withstand the force of outward gravity trying to collapse the star (Earth Science). Depending on stellar mass, different stars remain main sequence stars for longer, yet generally stars spend ninety percent of their lives in this stage (Astronomy & Space, White). Stars with smaller masses are able to remain main sequence stars for hundred of billion of years due to how they face less gravitational pressure thus less gas pressure is necessary to attain balance (Earth Science). However, more massive stars face death much sooner as they exhaust their hydrogen fuel (Earth Science). For example, blue giants are one of the most massive stars in the cosmos, consequently only living ten million years before it encounters gravitational collapse (Earth Science).

Blue giants serve as an example as to how stars of larger mass have a luminosity thousands of times brighter than the sun, ultimately humiliating the suns illumination (NASA, Life). Low mass stars are the smallest classification of stars found in the universe famous for their almost interminable lifespans (Astronomy & Space, White). Low mass stars are considered to be less than half the suns size, putting in perspective that 1. 3 million earths fit into the sun (Caltech). Low mass stars are fairly cool as they never reach high enough temperatures to begin helium fusion into heavier elements (Earth Science). Thus, these stars continue hydrogen fusion for billions of years until they devour their hydrogen fuels and die from the gravitational forces no longer being resisted (Earth Science). These stars become white dwarfs, also known as degenerate stars as their core is unleashed from the star to then cool perpetually (NASA, White).

White dwarfs are extremely dense structures, thus “ although some white dwarfs are no larger than the earth, the mass of such a dwarf can equal fourteen times the sun” (Earth Science). This proves how a single white dwarf can be equivalent to the mass of eighteen million earths, as mention above that 1. 3 million earths fit into the sun (Earth Science). In addition, “ a spoonful of such matter would weigh several tons,” again signifying the extreme density present in white dwarfs (Earth Science).

This incredible density it made possible from the displacement of electrons now being pushed closer together as they no longer reside around the nucleus of atoms (Earth Science). This is also known as electron degenerate matter, explaining the electrons responsible for keeping the balance and preventing destructive collapse (Earth Science). During this collapsing into a white dwarf, stars often exceed a hundred thousand kelvins according to NASA, yet gradually become dimmer as they cool into black dwarfs (Astronomy & Space, White). Millions of these remnants of low mass stars are scattered throughout the cosmos including white dwarfs and black dwarfs, although impossible to observe (Astronomy & Space, White). Stars of all masses and ages permeate the galaxy, two famous examples being the Krab Nebula and of course, the most fundamental star to humans existence, the sun. It is due to Pierre Lapace’s theory that “ the sun was the central congealed portion of a larger clouds of gas that is surrounded by planets in in the outer rings”, that scientists are able to understand so much about the solar system (World of Scientific Discovery). That being said, the sun, extremely vital for human life, still remains in it’s early stages as a star.

This poses the question of how will our solar system be effected when the sun reaches it’s red giant stage?