Planetary nebula fun facts

In about 5 billion years, as the sun sets out of its outer layers, it will produce a beautiful layer of diffuse gas called planet nebula. About 10,000 of these short-lived glowing objects are estimated to exist in the Milky Way, although only about 1,500 have been discovered; Invisible remains hidden behind inters star dust. The Dumbbell Nebula (M27) was the first planet nebula discovered by Charles Messier in 1764. (Photo credit: European Southern Observatory) The term planet's nebula is a confusion. It was laid out by William Herschel, who also compiled an astronomical catalogue. Herschel recently discovered the planet Uranus, which is blue, and he thinks the new objects resemble gas giants. Saturn's Nebula. (Photo: NASA) The death of a Star At the end of its life, the sun will swell into a red giant, extending beyond Venus's orbit. When it burns through its fuel, it eventually collapses. The outer layers will be ejed in a gas shell that will last several tens of thousands of years before spreading into vast spaces. The small core, a newly formed white dwarf, will illuminate those layers in a dazzling screen, mostly green. [VIDEO: Earth consumed by red giant star] This process will be doubled in stars with eight times the mass of the sun. Massive stars, at the end of their evolution, explode into supernovae. The expanded gas shell form another type of nebula: the supernova remnant. The Crab Nebula (M1) is a good example. Other types of nebula include emission nebulas, which are clouds of ionized gas that release light of various colors; dark nebula, which are clouds of gas so dense that the background light is blocked; and the pre-planet nebula, which occurs when a star begins to shed its outer layers before becoming a planet nebula. Stingray Nebula. (Photo credit: Matt Bobrowsky (Orbital Sciences Corporation) and NASA) None of the planets associated with the first planet nebula were discovered as the Dumbbell Nebula, M27, by Charles Messier in 1764. He eventually added four to his catalogue of astronomical bodies. In 1790, Herschel found NGC 1514, a planet nebula with a bright central star. He realized that these new objects were made up of gas or dust, rather than clusters as thought at the time. Herschel identified 79 objects as planet nebulas, but only 20 of them actually were, while the other 13 objects he classified as other objects turned out to be these gas shells. In live colorsNew technology has captured some phenomenad images of planet nebula at extreme depths. In doing so, it has revealed the possible complexity at the end of the sun's life. In the event that scientists once thought the gas layers came out evenly, images from the Hubble Space Telescope revealed a range of possible possibilities the fate of our nearest star. Dumbbell Nebula (M27): The first planet nebula to be recorded, recorded, The nebula is located 1,200 light-years from the Earth's Ring Nebula. (Photo credit: AURA/STScI/NASA)) Ring Nebula (M57): The almost perfect ring-like shape makes the naming of M57 a brainless one. The diffuser shell of gases and dust spreads almost evenly after they are peeled off their parent star. NGC 1514: When William Herschel saw the bright star at the center of this planet's nebula, he realized that he was not looking at clusters but through gas and dust. As a result, he named the planet's nebula, because they share the color of the Uranus nebula.Saturn NGC 7009 was recently discovered: Located in the constellation Aquaryang, Saturn Nebula or NGC 7009, there is a bright central star surrounded by a patch of football-shaped gas and dust. Stingray Nebula (Hen-1357): The youngest known planet nebula, Hen-1357 is as large as 130 solar systems. SuWt2: A near binary star system creates a ring-like structure of dust and gas inside this planet's nebula. NGC 2818: This beautifully spreading planet nebula is located 10,400 light-years away in the southern constellation Pyxis, Compass.— Nola Taylor Redd, SPACE.com Related contribution: X-ray emission nebula/ optical synthetic image of Cat's Eye Nebula (NGC 6543) NGC 6326, a planet nebula with glowing outpouring dust lit by a binary central star[1] The planet's nebula, abbreviated PN or PNe number, is a type of emission nebula consisting of a glowing, enlarged crust of ionized gas ejing from red giant stars at the end of their life. [2] The term planet's nebulas are a confusion because they are not related to planets or planets. The term is derived from the planet-like circular shape of these nebula observed by astronomers through early telescopes. The first use may have occurred in the 1780s with the British astronomer William Herschel, who described these nebula as like planets; however, as early as January 1779, French astronomer Antoine Darquier de Pellepoix described in his observations of the Belt nebula, very dim but perfectly outlined; it is as big as Jupiter and resembles a fading planet. [4][5] Although the modern explanation is different, the old term is still used. All planet nebulas form at the end of the life of a star of intermediate mass, about 1-8 solar masses. It is expected that the Sun will form a planet nebula by the end of its life cycle. [6] They are a relatively short-lived phenomenon, lasting perhaps several tens of thousands of years, compared to significantly longer periods of star evolution. [7] Once all the red giant's atmosphere was dissipated, energetic ultraviolet radiation from the exposed hot-glow core, known as the planet's nebula nucleus (PNN), ionized material was ej ejed. [2] The ultraviolet light absorbed then insctres the fuzzy air shell the central star, making it appear like a brightly colored planet nebula. Planet nebula likely to play an important role in chemicals of the Milky Way by expelling elements into the inters star environment from the stars where those elements were created. Planetal nebulas are observed in more distant galaxies, which provide useful information about their chemical abundance. Starting in the 1990s, hubble Space Telescope images showed many planetary nebula with extremely complex and varied er attitudes. About one-fifth are sys, but most are not sy rye symmetry. The mechanisms that create various shapes and features are not well understood, but binary central stars, star winds, and fields can play a role. Observation of NGC 7293, Spiral Nebula. NGC 2392, Lion Nebula. The first planet nebula to be discovered (though not yet called so) was the Dumbbell Nebula in the constellation Vulpecula. It was observed by Charles Messier in 1764 and listed as M27 in his catalogue of ambiguous objects. [8] For early observers with a low-resolution telescope, M27 and later discovered planetary nebulas resembling giant planets such as Uranus. William Herschel, who discovered Uranus, may have set the term planetary nebula. [9] However, in early January 1779, French astronomer Antoine Darquier de Pellepoix described in his observations of the Belt nebula, a very dull, but perfectly outlined nebula; as big as Jupiter and looks like a fading planet. [4][5] Regardless of the true origin of the term, the planet's nebula label is ins dunged in the term used by astronomers to classify these types of nebula, and is still used by astronomers today. [11] The term The true nature of these objects is uncertain, and Herschel first thought that objects were stars surrounded by material condensing into planets rather than what is now known to be evidence of dead stars burning any orbiting planets. [12] In 1782 (238 years ago), William Herschel discovered this object now known as NGC 7009 (Saturn Nebula), for which he used the term planet nebula. [13] [suspicious - discussed] In 1785, Herschel wrote to Jerome Lalande: These are celestial bodies that we do not yet have clear ideas and are probably of a completely different kind from those we are familiar with in heaven. I found four visible in diameter between 15 and 30 seconds. These bodies seem to have a disk quite similar to a planet, that is, have equal brightness all over, round or slightly oval, and are also defined in outlines as disks of planets, of a light strong enough to be visible by a common telescope with only one leg , but they only have the appearance of a star of approximately ninth intensity. [14] Herschel assigned them to Class IV in his nebula catalogue, eventually listing them planet nebulas, most of which are actual galaxies. [15] The nature spectrum of the planet's nebula remained unknown until the first spectral produced in the mid-19th century. Using prisms to disperse their light, William Huggins was one of the earliest astronomers to study the optical spectrum of astronomical objects. [9] On August 29, 1864, Huggins was the first to analyze the spectrum of the planet's nebula when he observed the Cat's Eye Nebula. [8] His observations of stars have shown that their spectrum consists of a continuity of radiation with multiple dark lines overlapping. He discovered that many translucent objects such as the Andromeda Nebula (as it was later known) had quite similar spectrums. However, when Huggins looked at the Cat's Eye Nebula, he found a very different spectrum. Instead of a strong continuity with overlapping absorption lines, the Cat's Eye Nebula and other similar objects show some emission lines. [9] The brightest of these is at a wavelength of 500.7 nanometers, which does not correspond to a line of any known element. [16] At first, it was hypothesized that the line may have been caused by an 12-year-old element, named a nebula. A similar idea led to the discovery of helium through spectral analysis of the Sun in 1868. [8] While helium was isolated on Earth shortly after its discovery in the Sun's spectrum, the nebula was not. In the early 20th century, Henry Norris Russell proposed that, rather than being a new factor, the line at 500.7 nm was due to a familiar factor in unfamiliar conditions. [8] Physiotherapy has shown in the 1920s that in gases at extremely low densities, electrons can account for super-stable energy levels in atoms and ions that would otherwise be provoked by collisions that would occur at higher densities. [17] Electron transitions from these levels in nitrogen and oxygen ions (O+, O2+ (also known as O iii) produce emission lines of 500.7 nm and other ions. [8] These spectral lines, which can only be seen in very low density gases, are called forbidden lines. Spectral observations therefore show that nebulas produced from gases are extremely rare. [18] The planet nebula NGC 3699 is distinguished by an unusual spot shape and a dark crack. The central stars the central stars of the planet's nebula are very hot. [2] Only if a star depletes most of its nuclear fuel can it collapse at a small size. The planet's nebula is understood to be the final stage of star evolution. Spectral observations show that all planet nebulas are expanding. This led to the idea that the planet's nebula was caused by the outer layers of a star being thrown into space at the end of its life. [8] Modern observations In the late 20th century, technological innovations helped further the study of planeted nebula. [20] The space telescope allowed astronomers to study the wavelength of light outside the wavelengths transmitted by the Earth's atmosphere. Infrared and ultraviolet studies of chimpanzees The planet allows to more accurately determine the nebular temperature, density and elemental abundance. [22] Charging combined device technology many faint spectral lines are measured more accurately than previously possible. The Hubble Space Telescope also points out that while many nebulas appear to have simple and frequent structures when observed from the ground, very high optical resolutions that can be achieved by telescopes in Earth's atmosphere show extremely complex structures. [24] According to the Morgan-Keenan spectral classification diagram, the planet's nebula is classified as Type-P, although this symbol is rarely used in practice. [25] Origins Computer simulations of planet nebula formation from a star with warped disks, suggests the complexity may be the result of a small initial asymmetry. Stars larger than 8 solar masses (M⊙) are likely to end their lives in significant supernova explosions, while planetal nebulas appear to occur only at the end of the life of medium-mass and low-mass stars between 0.8 M⊙ and 8.0 M⊙. [26] The predecessor stars that form the planet's nebula will spend most of their lives converting their hydrogen into helium in the star's core by a nuclear fusion reaction at about 15 million K. This generates energy that generates external pressure from fusion reactions in the core. , balancing the inner crushing pressure of the star's gravity. [27] This state of balance is known as the main sequence, which can last tens of millions to billions of years, depending on mass. As the hydrogen source in the core begins to decrease, gravity begins to compress the core, causing a temperature increase to about 100 million K.[28] Such a higher core temperature then causes the star's colder outer layers to expand to produce much larger red giant stars. This end stage causes a significant increase in the brightness of the star, in which the released energy is distributed over a much larger surface area, which in fact causes the average surface temperature to be lower. In terms of star evolution, stars experiencing such an increase in brightness are called asymptotic giant branch stars (AGB). [28] During this period, the star may lose 50 to 70% of its total mass from its star wind. [29] For giant, asymptotic giant cymoid stars that form planetary nebulas, which have ancestors exceeding about 3M⊙, their cores will continue to shrink. When the temperature reaches about 100 million K, the available helium nucleus esests into carbon and oxygen, so that the star once again radiates energy, temporarily preventing the contraction of the core. This new helium combustion phase (helium nucleus esting) form a growing inner core of inert carbon and oxygen. Above it is a thin helium burning shell, which in turn is surrounded by a hydrogen burning crust. However, this new period lasted only 20,000 years or so, a very short period of time compared to the entire lifespan of the star. The vent of the atmosphere continues not to be destroyed into intersc star space, but when the outer surface of the exposed core reaches temperatures in excess 30,000 K, with enough ultraviolet photons to ionize the ejamed atmosphere, causing to shine like a planet nebula. [28] The Lifelong Necklace Nebula consists of a bright ring, measuring about two light-years, dotted with dense, diamond-like gas nodes in a necklace. The knots glow brightly due to the absorption of ultraviolet light from the central stars. [30] After a star passes through the asymptomatic giant branch phase (AGB), the short planetary nebula stage of star evolution begins[20] when the gas blows out of the central star at a rate of several kilometers per second. The central star is the remnant of its AGB ancestor, an electron-degenerate carbon-oxygen core that has lost most of its hydrogen envelope due to mass loss on AGB. [20] As the gases expanded, the central star underwent a two-stage evolution, first developing hotter as it continued to shrink and hydrogen reatric reactions occurred in the shell around the core and then slowly cooled when the hydrogen shell dried up through a synthetic reaction and mass loss. [20] In the second stage, it radiates energy and its fusion reaction ceases, as the central star is not heavy enough to produce the core temperature required for carbon and oxygen to integrate. [20] In the early stages, the central star maintained a constant brightness,[20] and it grew hotter than ever, eventually reaching a temperature of about 100,000 K. In the second stage, it cooled so much that it did not release enough ultraviolet radiation to ionize the gas cloud increasingly distant. The star becomes a white dwarf, and the expanding cloud of gas becomes invisible to us, ending the period of planet nebula evolution. [20] For a typical planetary nebula, about 10,000 years[20] passes between the formation and re-combining of the collected plasma. [8] The role in galaxies-enriched planet nebulas may play a very important role in galaxies evolution. Newly born stars consist almost entirely of hydrogen and helium,[31] but as stars evolution through the giant cymoid phase asymptofiable,[32] they produce heavier elements through nuclear atoms that are eventually expelled by strong star winds. Planet nebulas typically contain larger proportions of elements such as carbon, nitrogen and oxygen, and they are recycled into inters star environments through these strong winds. In this way, planetal nebula enrich the Milky Way and their nebula with these heavier elements – referred to by astronomers as metals and specifically referred to as the Z metal parameters.[34] The next generation of stars formed from this nebula also tend to have higher metallicity. Although these metals are present in stars in relatively small quantities, they have a pronounced impact on the evolution of stars and synthetic reactions. When stars formed earlier in the universe, they theoretically contained a smaller amount of heavier elements. [35] Known examples are metal-poor Population II stars. (See Star Population.) [37] Determination of content type of star found by Physical characteristics NGC 6720, Nebula Lemon Nebula (IC 3568). A typical planet nebula is about a light-year old, and consists of extremely rare gases, with a density usually between 100 and 10,000 particles per cm3. [38] (Earth's atmosphere, by comparison, contains 2.5×1019 particles per cm3.) The young planet nebula has the highest density, sometimes as high as 106 particles per cm3. As the nebula age, their expansion reduces their density. The mass of the planet's nebula ranges from 0.1 to 1 solar mass. Radiation from the central star heats the gas to a temperature of about 10,000 K.[39] Gas temperatures in the central regions are usually much higher than on the peripheral reaches of 16,000 –25,000 K. [40] The volume in the vicinity of the central star is usually filled with very hot gas (rims) with a temperature of about 1,000,000 K. This gas originates from the surface of the central star in the form of a star wind Fast. [41] The nebula can be described as restricted matter or bordering radiation. In the previous case, there was not enough matter in the nebula to absorb all the UV photons inginged by the star, and the visible nebula was fully ionized. In the second case, there are not enough UV photons inginged by the central star to ionize all the surrounding gases, and an ionized front spreads outward into the surrounding neutral atoms. [42] The number and distribution of about 3000 planetal nebulas is now known to exist in our galaxy,[43] out of 200 billion stars. Their very short life expectancy compared to the total star lifetime account for their rarity. They are found mainly near the plane of the Milky Way, with the largest concentration near the galaxies center. [44] This animated er state-of-the-match broadcasting vehicle shows how two stars at the center of a planet nebula such as Fleming 1 can control the creation of spectacular jets of material ejed from the object. Only about 20% of planetal nebulas are systically symmetrical (see Abell 39, for example). [45] A variety of shapes exist with some very complex forms seen. Planet nebulas are classified by different authors into: stars, disks, rings, uneven, helical, bipolar, four-sided,[46] and others,[47] although most of them belong to only three types: 600, elliptical, and bipolar. The bipolar nebula is concentrated in the galaxies plane, likely produced by relatively young predecessor stars; and bipolars in galactic bulges appear to prefer their orbital axis orientation parallel to the galactic plane. [48] On the other side, the syceous nebula is likely produced by older stars similar to the Sun. [41] The large variety of shapes is part of the projection effect—the same nebula when seen at different angles will appear differently. [49] However, the reasons for the large diversity of physical shapes are not fully understood. [47] Engaging interactions with companion stars if stars that are binary stars can be a cause. Another possibility is that planets disrupt the flow of matter out of the star as the nebula forms. It has been determined that larger stars produce nebulas with more unusual shapes. [50] In January 2005, astronomers announced the first discovery of the field around the central stars of the two planets, and hypothesized that the fields may be partly or completely responsible for their remarkable shape. [52] Member of the Abell 78 cluster, the 24-inch telescope on Mount Lemmon, AZ. Courtesy of Joseph D. Schulman. The planet's nebula has been discovered as a member of four galactic systact clusters: Messier 15, Messier 22, NGC 6441 and Palomar 6. Evidence also indicates the possibility of detecting planet nebulas in systical clusters in the galaxy M31. [55] However, there is currently only one case of planet nebula discovered in an open cluster agreed to by independent researchers. Indeed, through cluster membership, PHR 1315-6555 possesses one of the most accurate distances established for a planet nebula (i.e., a 4% distance solution). Cases of NGC 2818 and NGC 2348 in Messier 46, showing a non-matched velocity between planet nebulas and clusters, show that they are a coincidence of vision. [58] A sub-sample of the expected cases is likely to be /PN cluster pairs including Abell 8 and Bica 6,[59][60] and He 2-86 and NGC 4463. [61] Theoretical models predict that planet nebulas could form from the main sequence stars from one to eight solar masses, placing the age of the predecessor star at an age greater than 40 million years. Although there are a few hundred known open star clusters in that age group, a variety of reasons limit the chances of finding an inner planet nebula. [44] For one reason, the planet's nebula stage for larger stars is in order for thousands of years, which is a cosmic blink. In addition, partly due to their small total mass, open clusters have relatively poor attractive cohesion and tend to disperse after a relatively short time, usually from 100 to 600 million years. [62] Current problems in the study of planeted nebula The odd old star pair sculpts the spectacular shape of the planet's nebula. Small planet nebula NGC 6886. The distance to the planet's nebula is often poorly defined. [64] Distances to the nearest planet's nebula can be determined by measuring their expansion rate. High-resolution observations several years apart will show the expansion of the nebula perpendicular to the line of sight, while spectral observations of the Doppler change will show the rate of expansion in sight. Comparing angular expansion with the originating expansion velocity reveals the distance to the nebula. [23] The issue of how such a diverse range Shapes that can be produced are a controversial topic. It has been hypothesized that interactions between materials moving away from the star at different speeds give off the most observed shapes. [47] However, some astronomers have suggested that close binary central stars may be responsible for more complex and extreme planetal nebula. [65] Some have been shown to have strong fields,[66] and their interaction with ionized gas may explain some planet's nebula shapes. [52] There are two main methods for determining the metal abundance in the nebula. They rely on re-combining lines and collision lines. Large differences are sometimes seen between results derived from the two methods. This can be explained by the presence of small temperature fluctuations in the planet's nebula. The difference may be too large to be caused by temperature effects, and some hypothesized the existence of cold nodes contains very little hydrogen to explain the observations. However, such knots have not yet been observed. [67] See also The Giant Branch Star Portal asymptomousLy Space Distance Rapid Escalates Low Ionizing Emission Zone Nova remnants PG 1159 stars (predecessor) Supernova pron planetary nebula remnants White Dwarf List Of Planetary Nebula References

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