

DOUBLE STARS

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Ken Tapping, 6th August, 2024

On a clear, dark night, you should be able to see that Mizar, the second star from the end of the handle on the Big Dipper has a companion, Alcor. A telescope will show Mizar has another, much closer companion.

Mizar is a multiple star: a number of stars orbiting around one another.

Around this time of year and into the autumn, the constellation Cygnus, "The Swan", passes almost overhead. The five brightest stars form a cross. The head of the swan, on the end of a long neck, is marked by a faintish star, Albireo. If you look at this inconspicuous star with a small telescope you will see the star is a beautiful double comprising an orange and a blue star. Since we orbit a single star, it might be a surprise to know that well over half the stars we see in the night sky are members of multiple star systems, that is, two or more stars orbiting around each other.



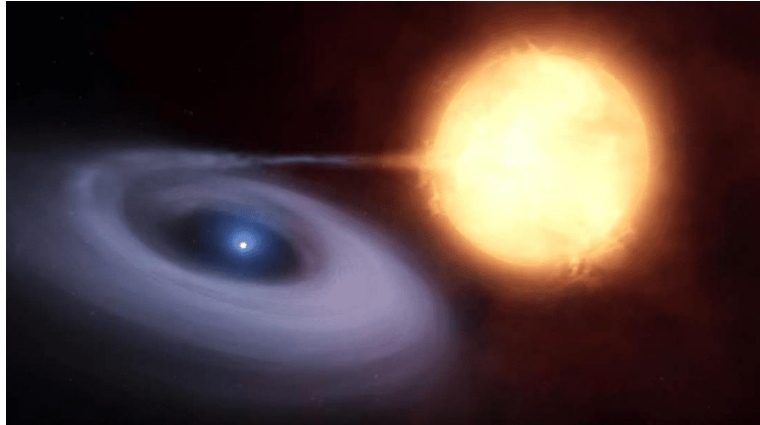
Stars form from collapsing clouds of gas and dust. The births are usually multiple, producing a number of siblings. Initially the combination of the mutual gravitational attraction between the stars and the remnants of the birth cloud hold the family together. However, as the remaining birth cloud material is evaporated or blown away by the stars, the gravitational glue decreases and the stars start to drift apart, going their own ways. However, if two or more stars form close together, their mutual gravitational attraction will be enough to keep them close, orbiting one another as a double or multiple star system. In most cases planets orbiting stars in such systems will have a difficult time. If there is out there a planet like Tatooine, featured in the Star Wars movies, it is highly unlikely anything will be living on it. Its orbit would be too unstable. Orbiting one star in a system where the other stars in the system are much further away would be a little better, but even this system may not be stable enough for life as we know it to develop.

In his book "Cycle of Fire", science fiction writer Hal Clement wrote about a world that orbited a single star, which was unlucky enough to have a new star form nearby. The star and planet duo went into a highly elliptical orbit around the new star, resulting in huge variations in temperature on the planet. Life on the planet solved this problem by having alternating "hot" and "cold" generations. On the whole, planets orbiting stars in double or multiple star systems might not

be the best places to search for life. Moreover, there are additional challenges for any life on such worlds.

In most cases stars in double or multiple star systems will have different masses. In the case of stars, the more mass you have, the faster you burn your fuel and the shorter your life. This can lead to very interesting interactions as the stars age. One star could explode as a supernova, destroying the other.

Alternately, imagine that one of the stars in a pair has run out of fuel, sneezed off its outer layers and become a white dwarf star, about the size of the Earth, but with the mass of a star. It has no fuel left and is cooling off very slowly. Then its partner star gets old and expands into a red giant. Its gravitational hold on its



enlarged outer layers is so weak that the white dwarf starts to pull in material from its partner. This is "unburned fuel", and when enough has accumulated, it explodes in a huge blast known as a Type I supernova. This may totally destroy the two stars, but if it does not, the white dwarf starts to pull in more material and the process starts all over again. These explosions are useful because since they are triggered by the accumulation of a critical mass of fuel, they should produce flashes of around the same brightness. This means we can use them to estimate the distances of far-away galaxies. Double and multiple stars are observationally and scientifically interesting. At least check out Mizar and Albireo.

Around midnight see Mars and Jupiter close together in the northeast and Saturn low in the south. Venus lies low in the sunset glow. The Moon will reach First Quarter on the 12th.

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