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# Fireworks from Outer Space, A Gift from Betelgeuse

*Understanding the Life of an Iconic Star From Astronomers' Recent Observations*

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**H**ave you ever looked up on a clear night and been curious about the thousands of stars twinkling in the sky? Well, maybe you do not think about it too much, but all of those stars go through life cycles, and they are each at different stages in their life. Sadly, an iconic star named Betelgeuse seems to near the end of its life after astronomers noticed it dimming.

First, let us get to know Betelgeuse. Betelgeuse, pronounced like the 1988 film, *Beetlejuice*, is the tenth brightest star in our night sky. It sits on the top left shoulder of the winter constellation, Orion. Although we can see Betelgeuse shining brightly in the sky, it is actually 642.5 light-years away, so about 385 million miles. If you were to look for it in the Orion constellation, you might notice it looks orange, unlike some other stars around it. This is because Betelgeuse belongs to the red supergiant category. Stars fit into different categories as they go through different stages during their lifetime, and supergiants are the largest stars among

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any of the categories. Betelgeuse itself is almost 1,000 times larger than our sun. Red supergiants also typically mark the beginning of the end of a star's life, which is the case for ten million-year-old Betelgeuse.

In late 2019, astronomers noticed Betelgeuse beginning to drastically dim. This created a lot of buzz among the scientific community in hopes that we could possibly observe the death of this famous star in our lifetime. But why would seeing it die be so exciting? For most of a red supergiant's life, it uses a process called nuclear fusion to convert hydrogen to helium providing the source for the star's brightness. Nuclear fusion is the process of two nuclei from two different atoms sticking together to form a heavier element. However, once the hydrogen runs out, the countdown begins for the inevitable explosion. With a giant star, like Betelgeuse, the force of gravity is massive. This inward pull from gravity causes nuclear fusion to occur more rapidly. Helium

fuses to carbon, carbon fuses to neon, and then neon to silicon. Finally, silicon fuses to iron. Once iron begins to form in that final step, the star's days are numbered. As fusion occurs, the center of the star gets denser and denser. At this point, gravity takes over, and the star collapses in on itself. When this happens, it sets off an explosion known as a supernova, and it looks spectacular.

With the death of Betelgeuse comes an incredible celestial performance, which is why the recent observations of Betelgeuse dimming are so exciting. It raises the possibility that the star may die soon and result in a supernova! Other astronomers speculate that the reason for its dimming was just a giant dust cloud, but let us stick to the more exciting hypothesis.

Some astronomers wonder whether or not it will die in our lifetime. Many believe it may take up to 100 thousand years before we see Betelgeuse go supernova, but I like to be optimistic. Let us say the star dies and explodes in our lifetime. What would this mean for us on Earth? We can compare Betelgeuse to a very large nuclear power plant; when it explodes, nearly everything within 50 light-years will be destroyed or engulfed by radiation. Do not worry, though — we will be just fine. Being almost 650 light-years away, we would just see a really cool light show. You may be thinking, "What would it look like?" and astronomers have the same question. In fact, no one really knows. This would be the first known time a star this close would go supernova in human history. Astronomers believe that when it happens, the star's brightness will increase rapidly and tremendously. At first, it would appear as bright as a thin crescent moon, then gradually get brighter and brighter to eventually appear brighter than a full moon! It would stay like this for a while and gradually dissipate, leaving an empty spot on the shoulder of Orion.

One last thing I will leave you with is that it might have already happened. But how? Did we miss it? This entire time we have been discussing "what if's," so how could it be possible that it already happened? I mentioned earlier that Betelgeuse is 642.5 light-years away. Light only travels so fast, so this means that it takes 642.5 years for Betelgeuse's light to reach Earth. When we look at the stars, we are looking into the past at events that have already happened because it takes such a long time for that information to reach us. So, when we observe the star eventually exploding, the event actually happened almost 650 years ago. The supernova may have already occurred, and now we are just waiting around to see it from Earth. So, the next time you look up at the stars, make sure to take a look at Betelgeuse, and think about the potential it has to pull off one of the most remarkable cosmic light shows that any human has seen. ● ● ●