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Clearing the Fog Around Exploding Stars

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Looking up at the night sky, it's hard to believe that each of the small, twinkling points of light is a giant ball of hot, glowing gas. Even the smallest of these stars is several times bigger than Earth, while Earth's orbit around the Sun could fit comfortably inside the largest.

These truly colossal stars are called "red supergiants". They are stars in the very last stages of their lives, shortly before they blow up in a spectacular supernova explosion.

Supernovae are the largest explosions in the Universe. They shine with the brightness of 10 billion suns and give off more energy in a few days than our Sun will in its entire lifetime.

When a red supergiant goes supernova, something special happens: a brief but brilliant flash of light can be seen before the full explosion. This is called the "shock breakout".

The shock breakout only lasts about 20 minutes, so catching it isn't easy but back in 2016 it was seen for the very first time in visible light. However, scientists wanting to study the shock breakout more recently have been less lucky. Despite watching patiently as 26 red supergiants exploded, they didn't manage to spot a single flash of light.

To find out why the shock breakout has mysteriously disappeared, scientists turned to technology. Powerful supercomputers are able to create detailed simulations of supernova explosions. They created over 500 models, each one with a very subtle difference, such as the brightness of the star.

Before long, it became clear that one ingredient caused models to match real observations better than any other – a layer of star dust. This dust is found around many supernovae and traps the light from the shock breakout, hiding it from our telescopes.

Understanding these violent events might not seem important, but actually tells us how material is spread across our galaxy. All the silver, nickel and copper on Earth and even in our bodies came from the explosive death of stars. Life exists because of supernovae!

▲ **COOL FACT!**

When a red supergiant goes supernovae, it's known as a Type II supernova. These begin when the internal furnace of the star runs out of fuel, causing the core to collapse as gravity takes over and leading to a monstrous explosion.