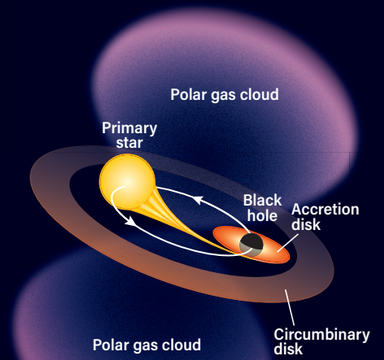
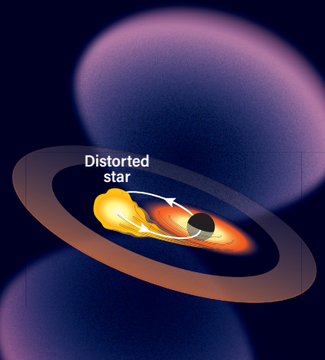
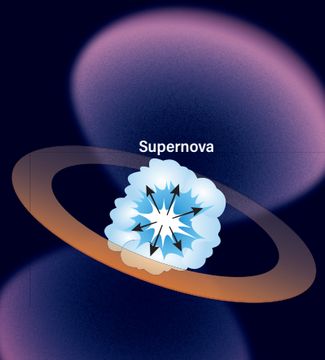
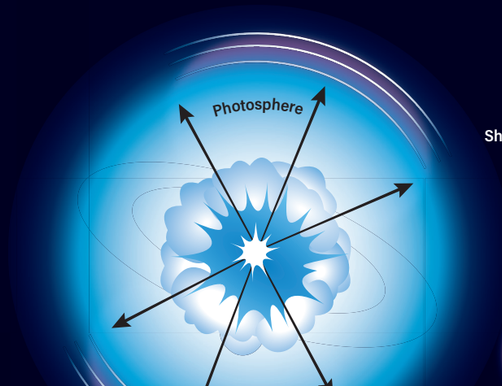
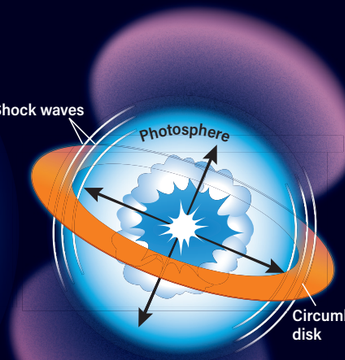
STAGES OF A STRANGE SUPERNOVA

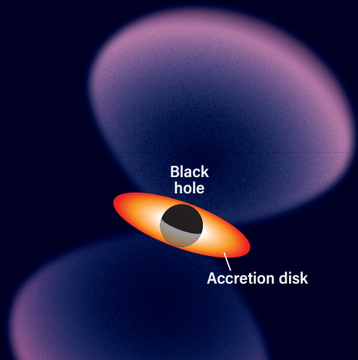












1 The system takes shape

Years before the explosion, a dying star and its black hole companion orbit in a tight spiral. The black hole's immense gravity siphons material from the star, forming a glowing-hot accretion disk. This process, along with messy outbursts ejecting polar gas clouds and a dense equatorial disk, causes the system to brighten steadily, creating the multiyear signal known as Precursor A.

2 A star stretched to its limit

In the final year before the supernova, the interaction becomes a runaway process. The star, now distorted and stretched, sheds its outer layers at an accelerated rate, leading to Precursor B. The two objects spiral chaotically and violently toward their final merger.

3 A new kind of supernova

The gravitational stress of the merger triggers the supernova. The blast wave rips outward from the center of the chaotic system.

4 The first peak

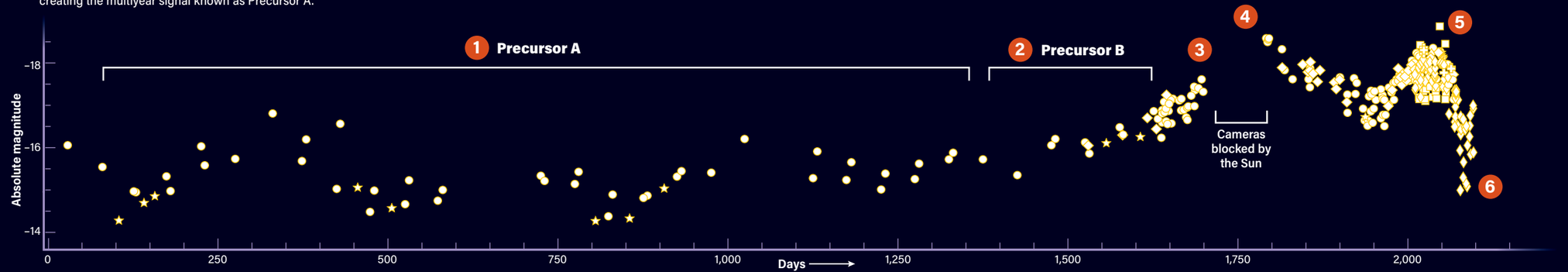
The supernova's shock wave expands rapidly, slamming into the less dense clouds of gas at the poles. The collision heats this material, creating a brilliant opaque photosphere that obscures the circumbinary disk. This creates the first peak in the supernova's brightness.

5 The second peak

After about 240 days, the photosphere has receded far enough to unveil the light from a far-longer-lived collision: the supernova shock wave slamming into the dense equatorial disk. This sustained, violent interaction powers a second, brilliant peak in brightness.

6 The aftermath

The star is gone, and all that remains is a single, slightly more massive black hole.



The supernova's unusual light curve (at left) shows its changing brightness over time. It reveals the long brightening of the precursor phase, followed by two distinct peaks: The shock wave hitting the polar clouds and the collision with the circumbinary disk. *ASTRONOMY*: ROEN KELLY, AFTER A. GAGLIANO ET AL., 2025, DOI: 10.3847/1538-4357/ADEA38