

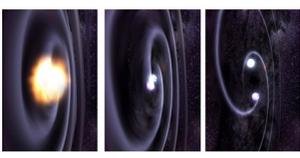
Two **type II** supernovae in nearby spiral galaxies: on the left in the Hunting Dogs galaxy M51; on the right, again in M101. In M101, the type II supernova was observed in 2011 and the type II supernova in 2023.



Credit: David Mellisens

Credit: David Mihalic

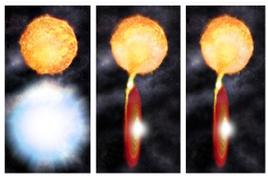
The explosion mechanisms of the two types of supernovae are very different. They are very complex and are actively studied.



Credit: G9FC/D.Berry

Two white dwarfs in a binary system gradually approach each other until they collide, which causes the explosion.

Credit: NASA/CXC/M.Weiss



A white dwarf accumulates matter from a companion star. The mass transfer takes place via an accretion disk. The explosion occurs when the white dwarf approaches the critical mass of 1.4 solar masses. It then explodes as a supernova.

Two scenarios leading to the explosion of a Type I supernova:

Today, several hundred supernovae are discovered each year, some at distances exceeding one billion light-years!



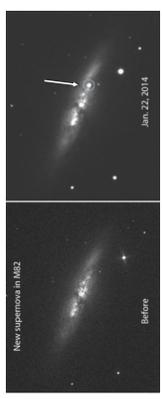
The Mount Wilson telescope was commissioned in 1917. At the time, it was the largest telescope in the world, with its 2.5 m diameter mirror.



Walter Baade



Fritz Zwicky



A supernova that appeared in the galaxy M82.

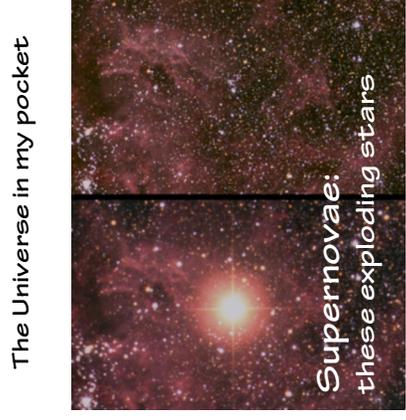
The SNI mechanism is completely different from that of SNIIs, although the critical mass of 1.4 solar masses again plays an important role. The star that explodes is a white dwarf, the residue from the evolution of a star of a few solar masses. It is made of carbon and oxygen and is 'degenerate', like the iron core of massive stars, but its mass is less than 1.4 solar masses. However, in a binary system, the mass of the white dwarf can increase by 'accretion' from a companion or by coalescence with another white dwarf. It then contracts and heats up. New nuclear reactions can thus start in its center and ignite the entire star. A combustion front propagates outwards and transforms carbon and oxygen first into nickel, cobalt and iron, then into silicon and magnesium. The white dwarf is destroyed and its matter dispersed.

**QUIZ**

1) Here is a series of spectra of supernova supernova 1992H at different times after maximum brightness. Was it type I or type II?

2) Here are three supernovae observed simultaneously (in January 2022) in the same spiral galaxy! Were there really three explosions so close in time?

3) When will the next supernova visible to the naked eye occur in our galaxy, the Milky Way?



The Universe in my pocket



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