12.10: Nova, Novae, and Supernova

The word nova comes from the Latin, for ‘new. ’ Novae can brighten as much as **100,000 Suns, 100,000L $_{sun}$** . Material from the Nova fusion event radiates outward from the White Dwarf; we can view this outward radiating material as a planetary nebula. The nova process can repeat itself, *but not infinitely* . When the White Dwarf accreting mass reaches the low-mass star 1. 33M $_{sun}$ limit, a **Type 1a Supernova** is possible. First the White Dwarf begins to collapse, with fast, quick heating. Carbon fusion begins (12 in the stellar core) and then the Star “ignites,” exploding as a White Dwarf Supernova. These are usually one-time events.

Type 1a supernovae produce elements up to iron on the atomic table, and also produce elements heavier than iron, like gold, silver, and uranium. These type of supernovae have the same characteristics, such as how bright they will become and length of maximum brightness. Therefore astronomers can use them as a “standard candle,” that is a standard brightness.

Supernovae may also produce **cosmic rays**, which are composed of electrons, protons and neutrons and move at close to the speed of light. **Ultra-high energy cosmic ray particles** were discovered in 2005. These are the brightest and fastest radio blasts ever seen on the sky, seen as radio light that appear more than 1000 times brighter than the Sun and almost a million times faster than normal lightning.

The very bright star in the lower left is Supernova SN1994D in Spiral Galaxy NGC4526. Compare the brightness of the supernova to its home galaxy.

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