

# "The Antimatter Supernova" --One of the Largest Cosmic Explosions Ever Recorded

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In 2007, a supergiant star two hundred times bigger than the sun was utterly obliterated by runaway thermonuclear reactions triggered by gamma ray-driven antimatter production. The resulting blast was visible for months because it unleashed a cloud of radioactive material over fifty times the size of our own star, giving off a nuclear fission glow visible from galaxies away. SN 2007bi was discovered by the international Nearby Supernova Factory based at the U.S. Department of Energy's Lawrence Berkeley National Laboratory.

The explosion ejected more than 22 solar masses of silicon and other heavy elements into space, including more than six solar masses of radioactive nickel which caused the expanding gases to glow brightly for many months.

The super-supernova SN2007bi is an example of a "pair-instability" breakdown, and that's like calling an atomic bomb a "plutonium-pressing" device. At sizes of around four megayottagrams (that's thirty-two zeros) giant stars are supported against gravitational collapse by gamma ray pressure. The hotter the core, the higher the energy of these gamma rays - but if they get too energetic, these gamma rays can begin pair production: creating an electron-positron matter-antimatter pair out of pure energy as they pass an atom. Yes, this does mean that the entire stellar core acts as a gigantic particle accelerator.

The antimatter annihilates with its opposite, as antimatter is wont to do, but the problem is that the speed of antimatter explosion - which is pretty damn fast - is still a critical delay in the gamma-pressure holding up the star. The outer layers sag in, compressing the core more, raising the temperature, making more energetic gamma rays even more likely to make antimatter and suddenly the whole star is a runaway nuclear reactor beyond the scale of the imagination. The entire thermonuclear core detonates at once, an atomic warhead that's not just bigger than the Sun - it's bigger than the Sun plus the mass of another ten close by stars.

The entire star explodes. No neutron star, no black hole, nothing left behind but an expanding cloud of newly radioactive material and empty space where once was the most massive item you can actually have without ripping space. The explosion alone triggers alchemy on a suprasolar scale, converting stars' worth of matter into new radioactive element