

2.7: Black Hole Formation

A black hole forms when all of its mass is concentrated inside of the event horizon, which can happen when a star undergoes gravitational collapse. Under normal circumstances, the gravitational attraction of the gas molecules in a star is held at bay by an outward thermal pressure. When a star runs out of fuel, however, the equilibrium is destroyed and the gas will collapse. The resulting object is called a **stellar remnant**, and it can take one of three forms.

1. **White Dwarf**: a star that is held stable by **electron degeneracy pressure**. White dwarves can have a mass similar to our sun but compressed to a size comparable to earth.
2. **Neutron star**: a star in which protons and electrons have fused together to form an object that consists only of neutrons. It is held stable by **neutron degeneracy pressure**. Neutrons stars can have a mass similar to our sun but compressed to the size of a city.
3. **Black Hole**: an object where gravity overcomes neutron degeneracy pressure and collapses all of the mass into the central singularity.

Exactly which of these stellar remnants is formed during a collapse depends on a number of factors, including the mass of the original star, the mass of the remnant (some of the gas can recoil after the implosion), and whether the star was accreting mass from another star.

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