## **Neutron Stars**<sup>1</sup>

Neutron stars are the smallest and densest type of star observed in the Milky Way galaxy and are formed after a supernova explosion. Supernovae are enormous explosions that occur in the final life cycle of a massive star. After a supernova explosion, the star collapses inward until the core's density consists of atomic nuclei, and a neutron star is formed [1].

## **Basic Structure**

The basic structure of a neutron star consists of four layers including a mix of mostly neutrons and some electrons (neutrons are subatomic particles with no electrical charge). These layers include an outer and inner crust, as well as an outer and inner core. The mass of a neutron star can range from 1.1 solar masses (1 solar mass is equal to our sun) to 3 solar masses. If it were to reach a mass greater than 10 solar masses, it would become too dense and collapse into a black hole. The core temperature of a neutron star is about 10<sup>6</sup> kelvin [2].



Figure 1. Basic structure of a neutron star [4].

## Location and Population

Neutron stars are mostly concentrated throughout the disk of the Milky Way Galaxy. They have a somewhat large spread perpendicular to the disk because of the powerful nature of the triggering supernova explosion. Currently about 2000 neutron stars have been discovered. Two of the closest neutron stars are RX J1856.5-3754, which is about 400 light years away and PSR J0108-1431, which is about 424 light years away [3].

## Sources

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2. Feryal O., Dimitrios P., Ramesh N., Antonio V. "On the Mass Distribution and Birth Masses of Neutron Stars" September 2012 [accessed Nov. 5 2016] http://adsabs.harvard.edu/abs/2012ApJ...757...550

3. Coleman M. "Introduction to neutron stars" [accessed Nov. 5 2016] http://www.astro.umd.edu/~miller/nstar.html

4. Robert S. "Neutron star cross section" September 2, 2010 [accessed Nov. 5 2016] https://en.wikipedia.org/wiki/File:Neutron\_star\_cross\_section.svg

 $<sup>^{\</sup>rm 1}$  The audience for this extended definition would be those who are studying the different types of observed stars in the galaxy.