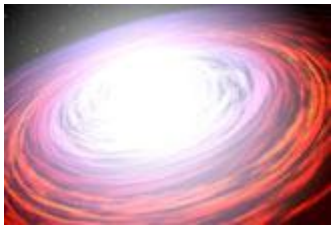

Neutron Star Found Where a Black Hole was Expected

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A star 40 times the mass of the Sun collapsed to form a neutron star instead of a black hole, researchers said today.

When a massive star burns out, its outer layers crash down on the star's core, creating a dense ball of matter from which nothing could escape. Scientists previously thought that when a massive star died and collapsed on itself, it had no choice but to create a black hole.

Now, new data from NASA's Chandra X-ray Observatory suggests that massive stars have a little wiggle room, and sometime produces a neutron star instead.

"Our discovery shows that some of the most massive stars do not collapse to form black holes as predicted, but instead form neutron stars," said study lead author Michael Muno of University California, Los Angeles.

Researchers discovered this neutron star, a dense neutron ball about 12 miles in diameter, in the midst of an extremely young cluster of stars. By estimating the age and mass of the other stars in the cluster, the scientists were able to determine that this neutron star's parent was at least 40 times the mass of the Sun.

Very massive stars evolve faster than smaller massive stars, so a star's mass can be estimated if its evolutionary stage is known. Neutron stars and black holes are the end stages of a star's life, so the stars that produced them must have been among the most massive stars in the cluster.

When very massive stars shirk convention and turn into neutron stars instead of black holes, they have a greater influence on the composition of future generations of stars. Instead of having most of its mass gobbled up by a black hole, the star sends more than 95 percent of its mass – mostly metal-rich material from its core – into the surrounding space.

"This means that enormous amounts of heavy elements are put back into circulation and can form other stars and planets," said J. Simon Clark of the Open University in the United Kingdom.

Although researchers now know that the death of a massive star can produce a neutron star, they don't completely understand the mechanism that determines a star's fate. Most likely it depends on how massive the star is, but astronomers don't know how massive a star must be to form a black hole instead of a neutron star.