Make a Supernova!

This is a short demonstration to show what happens when a star explodes!

Time: 5 minutes
Materials: Ping pong ball and tennis ball for each person
Note: This activity works best on a hard floor.

Stand in a circle and ask participants to imagine they are inside a massive star that is about to explode. Give each participant a tennis ball and a ping pong ball. The tennis ball will represent the core of the star and the ping pong ball will represent the outer layers of the star. Repeatedly toss up the tennis ball up in the air and catch it. You are using energy to push the ball up each time and gravity is pushes the ball back down. The same thing is happening inside a star. When the star stops generating heat, gravity takes over. The core collapses under its own weight and the outer layers start falling in towards the core.

Hold the ping pong ball (outer layer of star) stacked on top of the tennis ball (core of star) about 2 to 3 feet above the ground. Explain that you will count down to make a supernova; 3, 2, 1, and drop on the word "supernova". What happened?

The outer layers are blasted into space! During core collapse, the electrons and protons in the core of the star become so tightly packed that they interact to form neutrons (and release neutrinos!). The core collapse stops when the neutrons can't be packed any more tightly. In this demonstration, the floor represents the point at which this happens. When the collapse stops, all the material falling in will bounce back out. There's a momentum transfer from the denser material of the core (represented by the tennis balls) to the lighter material of the outer layers (represented by the ping-pong balls).

A Supernova detector at SNOLAB!
The Helium and Lead Observatory (HALO) is a dedicated supernova neutrino detector 2km underground at SNOLAB. It uses 79 tons of lead blocks along with 128 tubular Helium-3 neutron detectors to detect the neutrinos from supernovae within our Milky Way Galaxy.

HALO is part of the worldwide Supernova Early Warning System (SNEWS). SNEWS will help to detect supernovae by their neutrino burst before their light reaches Earth then notify both professional and amateur astronomers!