Demonstrations for Supernova Explosions

Core Density

Materials: two angel food cakes, serrated knife, a few sheets of colored cellophane, an electronic balance (optional)

Demonstration: Cut one of the cakes into pieces and use them to stuff the hollow center of the second angel cake. Use the knife to cut pieces of the stuffed angel cake into a roughly round shape. Loosely wrap the round angel cake with a few sheets of the colored cellophane. Take the cellophane layers off and throw them into the air. Squeeze the angel cake into as small a sphere as possible.

Related Physics: The supernova remnant consists of the outer atmospheric layers (analogous to the cellophane) and a highly dense core (analogous to the squeezed angel cake.) The expelled atmospheric layers contain approximately 5% of the mass of the star, and the remaining 95% of the mass is in the core. The density of an object increases if the volume of the object decreases. The volume of the angel cake can be decreased until there is no more air between the pieces of cake. The mass of the cake does not change – it is the same before squeezing as it is after squeezing. The mass of the core of the star does not change – it simply occupies a smaller volume. (With an electronic balance this can be demonstrated mathematically by taking the mass of the angel cake before and after. The change in density can also be calculated by measuring the diameter of the angel cake before and after squeezing.)