Demonstrations for Supernova Explosions

Core Contraction

Materials: empty aluminum soda can, hot plate or bunsen burner with a ring stand and screen, a bowl full of cold water, an oven mitt or set of tongs with grippers

Demonstration: Place approximately two tablespoons of water in an empty aluminum soda can. Set the can on a hot plate or a screen/ring setup over a bunsen burner. Heat the can until the water starts to boil. When the steam starts to come out of the opening in the top of the can, quickly pick up the can with an oven mitt or tongs and invert into a bowl of cold water. The can will instantly implode with a crunching sound.

Related Physics: The empty aluminum can is held in equilibrium by the pressure of the air inside the can directed outwards and the pressure of the air outside of the can directed inwards. Heating the water in the can causes the water to turn into steam. The steam drives all of the air out of the can. Now the can is held in equilibrium by the pressure of the steam pushing outwards (analogous to the radiation pressure in the core of the star) and the pressure of the air outside of the can directed inwards (analogous to the gravity of the star directed inwards.) When the can is inverted over the cold water, the steam instantly condenses. Now there is no pressure inside the can. The outside air pressure then causes the can to implode (analogous to the core of a star collapsing without radiation pressure as a counterbalance to gravity.)