**The Toroidal Vortex Cannon**

**Background:**

A vortex is a spinning flow of fluid or gas. Examples of a vortex include tornados and the bathtub vortex (water going down the drain). The Toroidal Vortex Cannon expels a vortex that is donut shaped or, mathematically, a torus. The air in the ‘donut’ rolls from the center to the edge. The air forms this shape because the air leaving the cannon at the center of the hole is traveling faster than the air leaving around the edge of the hole. The air keeps its shape since the surrounding air is relatively slow moving (and under higher pressure).

**Contents of Kit:**

* The cannon itself.
* A tub containing:
  + Fog machine.
  + Fog solution

**How to use the cannon:**

1. Add fog solution to the fog machine
2. Plug in and warm up the fog machine
3. Use the fog machine to fill the inside of the cannon with fog
4. While firmly holding the cannon parallel with the floor, strike the rubber membrane located on the large end of the cannon with the palm of your hand.
5. A “ring” of fog should be shot across the room.

**Things to consider:**

* The Toroidal Vortex Cannon was designed to be a demonstration of creating a vortex.
* Never fire the rings at a person who in not wearing safety glasses as it could get particles in their eyes.
* You could have students design and build their own Vortex Cannon out of various materials such as a paper cup with a balloon rubber banded on the opening or a cardboard box with plastic taped on.
  + Questions to explore:
    - Will the volume of the container make a difference in the vortex?
    - Will the shape of the hole change the shape of the vortex?
    - Does the hole have to be in the center of the cannon?