

## **The Explodatorium**

Barry Warthen, Scientist Ambassador at the Bradbury Science Museum, works at Los Alamos National Laboratory's Dual Axis Radiological Hydrodynamic Test facility where they take high speed x-rays in three dimensions of things exploding. He built the Explodatorium in a plywood box about 35X35X60 cm. He hands a blown egg\* to a visitor to measure its length and width with a caliper. He enters these numbers in a computer program to calculate its volume. Then he injects just the right proportion\*\* of propane into the egg shell and seals the holes with transparent tape.

He skewers the egg through the tape on two copper wires with a small gap between them. The wires are connected to a grill igniter button. Behind the egg, a clothes pin and some aluminum foil have been fashioned into a sensitive pressure switch. This will fire a photo flash strobe when a shock wave strikes it. A diagonal mirror above the egg shell gives a second dimensional view. Barry slides this apparatus to the back of the box. The box is closed up and dark inside.

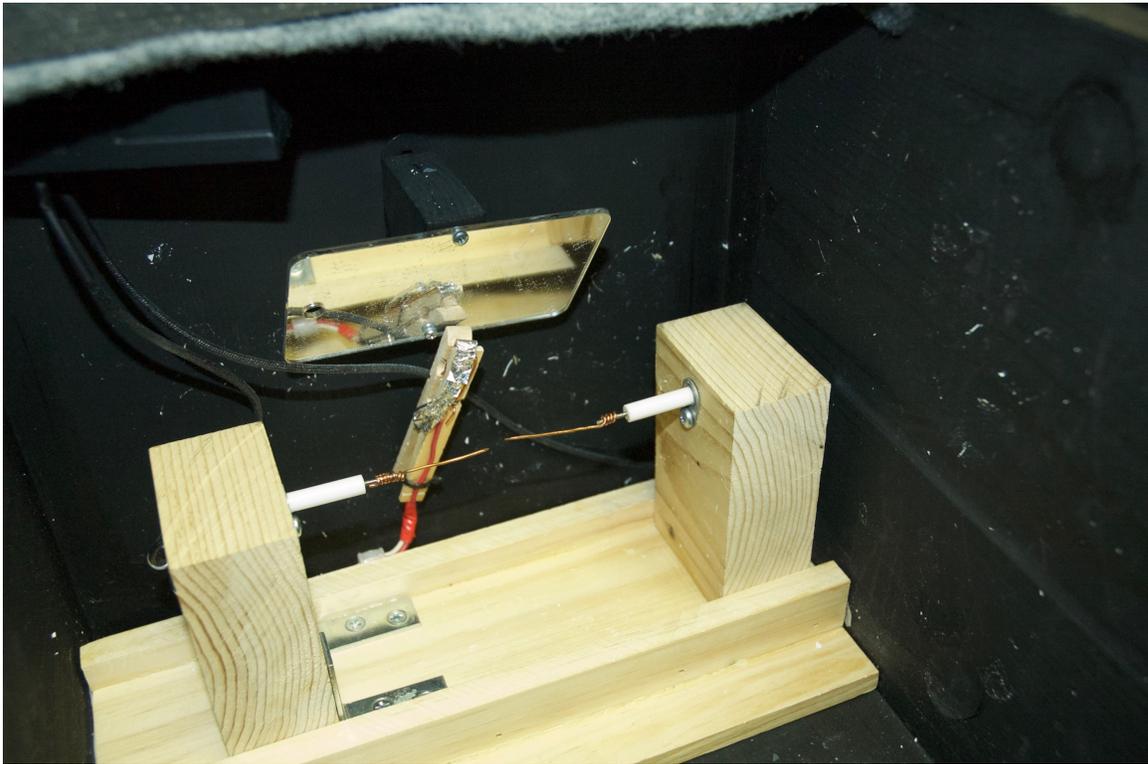
A digital camera views through a small window in the front of the box. The camera is set to open its shutter for several seconds. The shutter is tripped, the igniter button is pushed, the egg shell explodes, tripping the foil switch which triggers the strobe to flash. The result is a photograph of an exploding egg shell. Barry actually takes a before picture, using a second switch to the strobe, and an after picture, and composes them into a three image movie on his computer.

\*To blow an egg: Use a 1/8" drill bit turning backwards, gently press it through both ends of the egg. Drive the drill in far enough to break the yolk. Blow the contents of the egg into your pancake batter. We then rinse the egg out several times. Then we leave some water in it, and microwave it for a minute to sterilize it. We have the impression that we get better images if the egg shell has aged for a few months, and is thoroughly dried out.

\*\*As I recall, it is around 4% propane, but I encourage experimentation. Barry uses a dulled hypodermic syringe. He found useful information by searching the internet about potato guns.



Explodatorium Exterior: The camera stage is in the foreground. The front push button fires the strobe manually. This is for test exposures and pre and post images. The rocker switch is a master on-off control. A central panel lifts off for access to the insides, and the rear pushbutton is the human end of a barbecue igniter. The igniter's business end is connected to the electrodes in the egg shell.

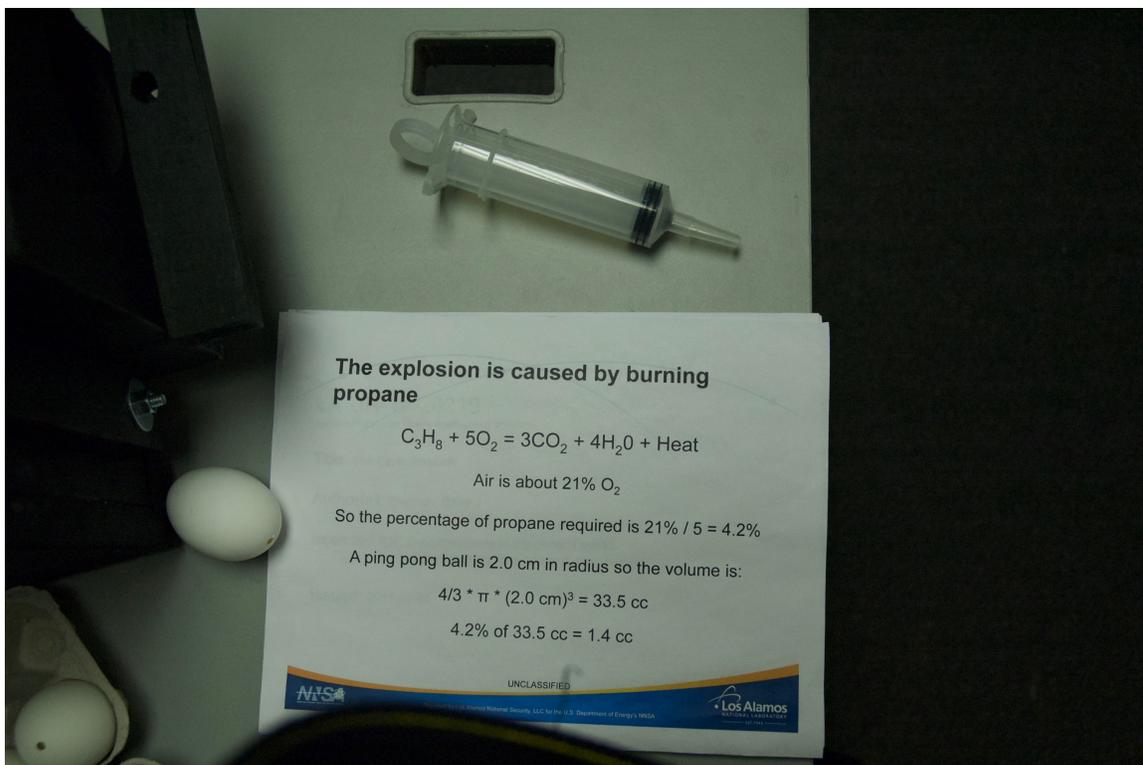


The Explodatorium egg stage: Two blocks hold pointed copper wire electrodes. The left-side block slides back and forth. These two wires will perforate the tapes covering the holes in the ends of a blown egg. The wires are energized by the barbecue lighter push button.

The clothes pin holds the foil switch which fires the strobe light. The strobe (not shown) is a photo flash gun located in the front end of the box. The switch can be adjusted closer and farther from the egg shell for different timing. The foil contacts a conductor when it is impacted by either the shock wave or a shell fragment from the explosion.

Above and behind the egg there is a mirror which allows the camera to capture a second view of the explosion.

The blocks holding the electrode and their base, holding the foil switch can slide forward from the back of the box for service.



This is the formula Barry uses to adjust the amount of propane he puts in the egg shell. He also has a computer program that takes the length and width of an egg shell and tells him its volume. This is not the syringe he uses, it is much too big. He uses an actual hypodermic syringe with a dulled needle. The force of the explosion is quite sensitive to the propane-oxygen mixture.