

# Ice Scream [DRAFT]

*Press a metal plate onto dry ice to produce sounds that will haunt your nightmares*



## Materials

- \_\_\_ dry ice
- \_\_\_ safe containment tub
- \_\_\_ a few electrophori\*
- \_\_\_ insulating gloves

## GREAT OPTIONS

- \_\_\_ water ice
- \_\_\_ insulating plates
- \_\_\_ metal spoon  
(thinner and more conductive = better)
- \_\_\_ plastic spoon
- \_\_\_ access to cold water

**NOTE:** dry ice can burn skin; direct exposure to bare skin is to be avoided. Use insulating gloves to handle dry ice. Most vendors of dry ice require purchasers to be 18 or older. Parents may be helpful here.

*\*Mr. Baird has some*

- PHASE CHANGE
- THERMAL CONDUCTION
- SOUND

## Introduction

Pressing a metal plate onto a block/mound of dry ice can produce sounds that are surprising, dissonant, and very loud.

## Assembly

Place a block of dry ice in the safe container tub. You'll want a well-ventilated space where loud sounds will not disturb others too much.

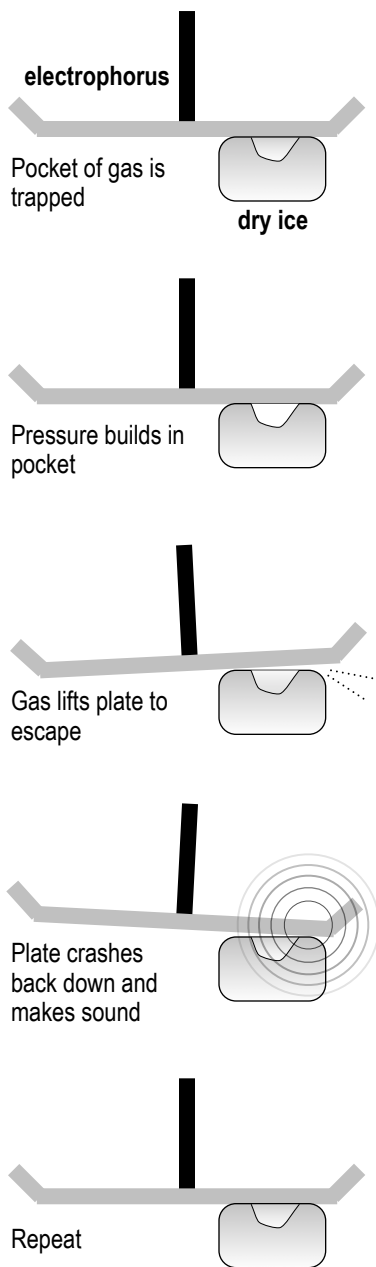
## To Do and Notice

1. Grasp an electrophorus by its insulating handle.
2. Press it onto the ice, pushing the metal downward onto the ice. You're not trying to push the ice in any direction—just squeezing it as if you were cooking a hamburger.
3. Try different orientations for the electrophorus—flat, on-edge, angled, etc. Whenever you don't get sound, change the orientation until you do. Sometimes simply rotating the electrophorus plate helps.

## GREAT OPTIONS

1. What happens if you use water ice instead of dry ice?
2. What happens if you use an insulating plate instead of the conducting plate of the electrophorus?
3. What happens if you use spoons filled with water? Metal spoon? Use insulation to prevent freeze-burns here. Plastic spoon?

Exhibitors: What variations can you think of / try. Be sure to detail your experiences in the Notes to the Future.



### What's Going On?

Regular ice is frozen water. When the solid melts, it turns to liquid water. Dry ice is frozen carbon dioxide. It doesn't melt, it sublimates: the solid transforms to gas.

The gas occupies more space than the solid did.

If the metal plate of the electrophorus traps a bit of gas in a small pocket, continued sublimation will increase the pressure in the pocket until the gas pushes the metal away from the dry ice. But as soon as the gas escapes, there is not pressure in the pocket, and the metal plate crashes back into the solid dry ice. The collision between metal plate and solid dry ice “pings” the plate, and that makes a sound. The pockets are small, and this process can repeat itself many, many times each second.

With many small pockets trapped by the metal plate, the pinging can be rapid. The large size of the metal plate means it can vibrate enough air to create a loud sound.

The metal of the plate is a good thermal conductor. it transfers heat to the ice very nicely. Rotating the plate allows the cold part to warm back up while placing a warm part in contact with the ice.