

# Dead Men's Tales

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## Activity 1: Grades 5-8 Splatter Spread

In the segment "[What Really Happened at Jamestown?](#)" forensic anthropologist Doug Owsley studies the remains of a Jamestown colonist who was wounded by a firearm. To better understand the nature of this incident, Owsley analyzes the spread of lead shot imbedded in the bones, and revealed by an x-ray. This pattern is then compared to a series of spread patterns produced by a firearm from the era. A match between these two spread patterns identifies the most likely distance between muzzle and gunshot victim.



### Modeling the Difficulties

Although you will not discharge a firearm, in this activity you will assemble a projectile-hurling device called a potato cannon. By analyzing the spread pattern of paint soaked projectiles, you can observe a similar relationship between scatter and distance.

### OBJECTIVE

This activity page will offer:

- Hands-on activity in assembling and operating a potato cannon
- An opportunity to emulate the work of a forensic scientist
- An arena for critical thinking

### IMPORTANT TEACHER NOTE: CAUTION!

All students **MUST** wear eye protection during this investigation. You should warn students about the dangers of inappropriate use of this launcher, both in and out of class. Also, remind students to **use care** when cutting the potato slices.

## **MATERIALS**

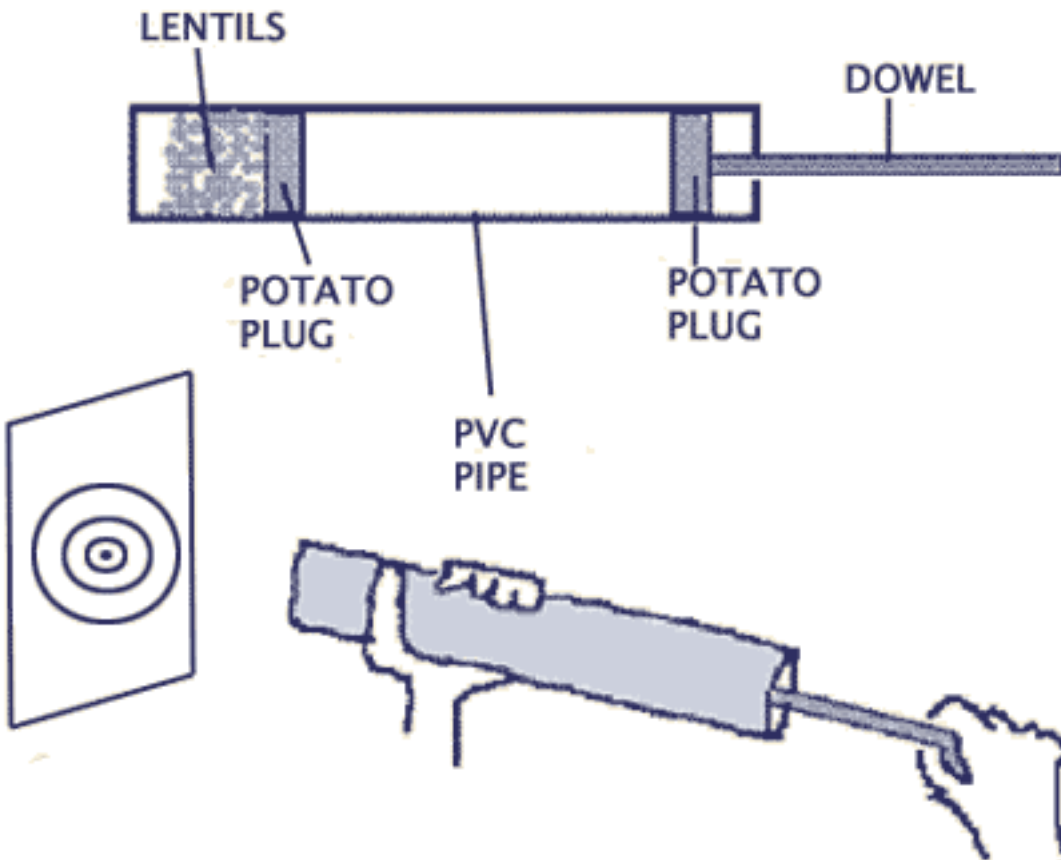
- Safety goggles
- PVC pipe section - about 1.5 feet (45 cm) long and about a 2-inch (5 cm) diameter
- Potato
- Knife
- Dowel - about 2 feet (30 cm) long and narrow enough to fit inside the pipe
- Lentils
- Water-based paint
- Paper targets

## **PROCEDURE**

### **Part 1- Assembling the Potato Cannon**

1. Use a knife to cut several uniform slices of raw potato. Each slice should be about one inch (2.5 cm) thick, with a diameter greater than that of the pipe opening (5 cm).
2. Before you proceed to the next step, make sure that everyone in the class is wearing safety goggles.
3. Position a potato slice on a table. Place one end of the pipe on top of the potato slice. Gently, but steadily, push down on the slice so that a circular plug is cut by the pipe edge.
4. Use the dowel to push the plug about four inches (10 cm) into the pipe. Remove the dowel.
5. Turn the pipe over and position the other end over another potato slice on top of the table.
6. Again push down on the potato to form a second plug at the opposite end of the pipe. Use the dowel to push this plug about one inch (2.5 cm) into the tube. Once the plug is inserted, keep the dowel inserted in the pipe. SEE DIAGRAM.
7. Obtain a handful of lentils. Coat the lentils with a thickened layer of water based paint.
8. Carefully load the lentils onto the end of the pipe opposite the dowel (in which the plug was pushed in four inches). This is the muzzle of your potato cannon. SEE DIAGRAM.
9. Tape a sheet of white paper to a nearby wall.
10. Position the muzzle one foot from this target.
11. While holding the PVC pipe, push in the dowel so that it "pops" out the other plug along with its lentil load. SEE DIAGRAM. NOTE: Try to apply quick, even pressure when pushing the dowel. You will need to mimic this pressure when you repeat the activity.
12. Examine the recorded scatter pattern made by the impact of the lentils. Measure and record the circumference of the scatter pattern.
13. Repeat the activity, but this time position the loaded muzzle two feet from the target.

14. Measure and record the circumference of this scatter pattern.



## QUESTIONS

1. Why were two plugs of potato needed for this cannon?
2. Would the cannon fire if the plugs did not form an airtight seal?
3. How did the distance to the target affect the spread of projectiles?
4. How does the friction between the "load" plug and the chamber wall affect the air blast?
5. Why was it important to apply the same amount of pressure to the dowel during the two tests?

## EXTENSIONS

### On Your Own

How might the size of the projectiles affect the scatter pattern? Think about it. Then design an inquiry strategy that would determine if and how projectile size affects scatter. Share your plan with your instructor. With the instructor's permission, perform this experiment and report your results back to the class.

### Powder Burns

Unlike a shotgun or pistol can leave powder burns formed by the hot gases and materials that escape from the muzzle of the fired weapon. Explain how these burns might be used to infer the distance between weapon and victim.

## **Living Tissue**

All bones are formed around a living matrix of cells. It is these cells that repair bone fractures and injuries, and it is the minerals deposited around living bone cells that account for a bone's hard and inflexible characteristics. To observe this rubbery protein structure, remove the meat from a chicken bone. An adult can boil the bone to further remove the soft tissue. Then, seal the cleaned bone in a jar full of vinegar. After several days remove the bone and rinse it off in running water. You'll observe that the bone is now soft and rubbery and can be tied into a knot! (For a more detailed activity about bone density, see [Getting the Minerals Out.](#))

## **WEB CONNECTION**

### **[Forensic Science Website](#)**

*<http://home.earthlink.net/~thekeither/Forensic/forsone.htm>*

A great introduction to the field of forensic science.

### **[Handgun Wounding Factors and Effectiveness](#)**

*<http://www.firearmstactical.com/hwfe.htm>*

An FBI site on handguns and the wounds they inflict.

The activities in this guide were contributed by Michael DiSpezio, a Massachusetts-based science writer and author of "Critical Thinking Puzzles" and "Awesome Experiments in Light & Sound" (Sterling Publishing Co., NY).

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### Answers

### QUESTIONS

1. Why were two plugs of potato needed for this cannon?  
**(One plug sealed the muzzle end of the cylinder. The projectiles were placed atop of this "load" plug. The second plug was needed to seal the airtight chamber. This second plug was pushed into the cylinder and produced the increased air pressure needed to "pop" the load plug.)**
2. Would the cannon fire if the plugs did not form an airtight seal?  
**(No. If the seals were not airtight, then the necessary pressure would not build within the cannon cylinder.)**
3. How did the distance to the target affect the spread of projectiles?  
**(The further the distance, the greater the circumference of the scatter pattern.)**
4. How does the friction between the "load" plug and the chamber wall affect the air blast?  
**(If the friction is increased (i.e. if the dowel is pushed quickly), then the plug can withstand a greater pressure. With a greater pressure, the projectiles would be hurled a further distance. If the friction is reduced, then the load plug moves with very little pressure. Since an explosive pressure would not build within the chamber, the projectiles would slowly be pushed out of the pipe.)**
5. Why was it important to apply the same amount of pressure to the dowel during the two tests?  
**(The diameter of the scatter would also be affected by the amount of friction, or the amount of pressure applied to the dowel. To try to eliminate this variable, the dowel should be pushed at a similar rate.)**

### **Powder Burns**

Unlike a shotgun or pistol can leave powder burns formed by the hot gases and materials that escape from the muzzle of the fired weapon. Explain how these burns might be used to infer the distance between weapon and victim. **(The nearer the target, the more likely the target will be peppered with the chemicals that are released during the discharge.)**