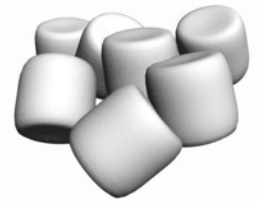




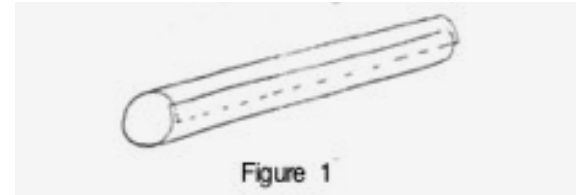
# Marshmallow Puff Tube Lab



**Objectives** - To use cardboard tubes of different lengths and observe the distance a marshmallow travels when blown out of each tube length.

## **Materials** -

- A toilet paper roll AND a paper towel roll.
  - OR 1 file folder (or other lightweight cardboard)
- Scissors
- Masking tape or transparent tape
- A few marshmallows (full-size, not miniature)
- A few spoonful's of flour



## **Building Cardboard Tube: (follow only if paper towel roll is unavailable)**

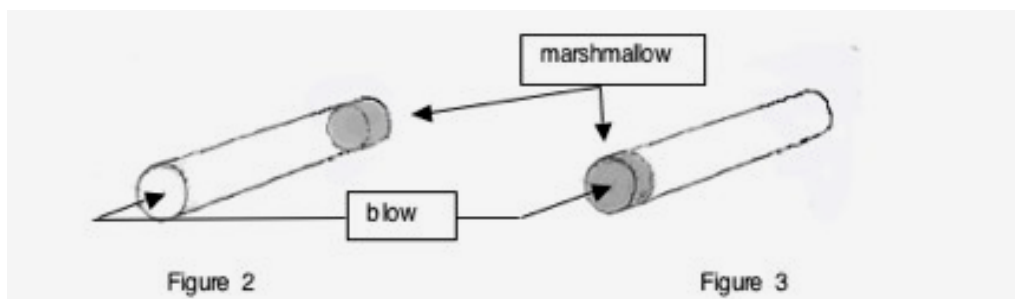
1. Cut a rectangle from the file folder about 29.5 cm (the entire width of an unfolded file folder) by about 19 cm (11.5 in. by 7.5 in.).
2. Place one of the long edges of the file folder inside the other, and tighten to form a tube (see Figure 1) that fits around the shape of a marshmallow - snug enough so that there's no air space around the marshmallow, but not so tight that the marshmallow won't be able to move.

**Note:** It may be easier to make the tube if you first pull the folder over the edge of a table to establish an initial curvature.

3. When the tube is rolled to the appropriate size, tape it so it maintains this size. Then place tape along the entire length of the seam on the tube to seal it.

## **Procedure: Getting the Marshmallow Airborne**

1. Make your predictions on the "Marshmallow Flight Analysis Table".
2. Roll the marshmallow in flour, then shake it or tap it to remove any excess. The flour will help prevent any sticky spots on the marshmallow from sticking to the tube.
3. Place the marshmallow in the end of the tube. **Holding the tube horizontally**, put your mouth over the empty end, and blow hard into the tube (see Figure 2). Measure how far the marshmallow travels and record both the measurement and a few notes about its flight and landing in the data table.



**NOTE:** Decide if you will measure the marshmallow from where it first hits the ground or the place it stops moving. You will need to be consistent by recording all measurements in the same way.

4. Again place the marshmallow in the end of the tube, but this time put your mouth around the end of the tube where the marshmallow is located. Blow hard against the marshmallow itself, so that it has to travel the length of the tube before exiting (see Figure 3). Be sure to keep the tube horizontal, and keep blowing the whole time the marshmallow is in the tube. Did the marshmallow go farther this time?
5. Repeat steps 2 and 3 using your longer length tube.

**Trouble Shooting:** If you blow and the marshmallow won't move, check the diameter of the tube. The tube may either be too tight (in which case friction prevents it from moving) or too loose (in which case air blows right by the marshmallow instead of pushing it).

## Marshmallow Flight Analysis Table

- In the "predictions" column place a number 1 next the tube that will propel the marshmallow the furthest. Continue rating in order so you have 1-4, with 4 representing the tube that should have had the shortest distance.
- Referring to your Data Table, use the same rating 1-4 in the "Actual Results" column, only rating what actually happened.
- In the "Explain" column: Compare your prediction to the actual result. Was your prediction correct or incorrect? Explain why: Describe why the tube performed the way it did and the factors that influenced the results.

	Prediction (Rank 1-4)	Actual Results	<u>Explain</u> why the tube performed the way it did. <u>Explain</u> the factors that influenced the results
<u>Short</u> cardboard tube w/ marshmallow at the <u>far</u> end			● ● ●
<u>Short</u> cardboard tube w/ marshmallow at the <u>near</u> end			● ● ●
<u>Long</u> cardboard tube w/ marshmallow at the <u>far</u> end			● ● ●
<u>Long</u> cardboard tube w/ marshmallow at the <u>near</u> end			● ● ●

## Marshmallow Flight Data Table

	Distance (m,cm)	Description of Flight (point form)
<b><u>Short</u></b> cardboard tube w/ marshmallow at the <b><u>far</u></b> end		<ul style="list-style-type: none"><li>●</li><li>●</li><li>●</li></ul>
<b><u>Short</u></b> cardboard tube w/ marshmallow at the <b><u>near</u></b> end		<ul style="list-style-type: none"><li>●</li><li>●</li><li>●</li></ul>
<b><u>Long</u></b> cardboard tube w/ marshmallow at the <b><u>far</u></b> end		<ul style="list-style-type: none"><li>●</li><li>●</li><li>●</li></ul>
<b><u>Long</u></b> cardboard tube w/ marshmallow at the <b><u>near</u></b> end		<ul style="list-style-type: none"><li>●</li><li>●</li><li>●</li></ul>

## Post Lab Questions:

- 1) Using the tubes you already constructed, how could you "cheat" or what would you change to make your marshmallow go further?

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- 2) Keeping in mind your answer to number 1, write a list of rules for a competition between several people to make it "fair." Come up with at least three.

a.

b.

c.

d.

- 3) Predict: What would happen if you doubled or tripled the length of the tube? Why?

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