

# RAFT IDEAS

**Topics:** Forces, Pressure,  
Fluids, Properties of Gases

## Materials List

- ✓ Flex straw
- ✓ Styrofoam ball

This activity can be used  
to teach:

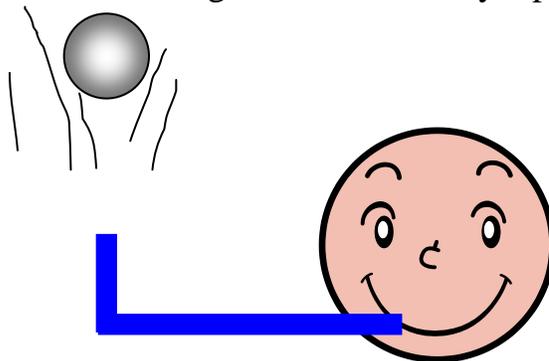
Next Generation Science  
Standards:

- Forces & Motion  
(Grade K, Physical  
Science 2-1, 2-2;  
Grade 3, Physical  
Science 2-1, 2-2;  
Middle School,  
Physical Science 2-2;  
High School, Physical  
Science 2-1)
- Structure of matter  
(Grade 5, Physical  
Science 1-1; Middle  
School, Physical  
Science 1-1)



## Bernoulli or Not?

How Long Can the Ball Stay Up?



A blown column of air will suspend the ball in mid-air... but for how long?

### To Do and Notice

1. Hold the flex straw between the thumb and first two fingers such that the short end of the straw points toward the ceiling and the long end of the straw can be placed the mouth.
2. Place the ball over the upward pointing short end of the straw.
3. Blow into the straw and at the same time gently release the hold on the ball letting go completely when the column of air suspends the ball. Hint: blow slowly at first. This does take a bit of practice.
4. Tilt the blower. How far can the blower be tilted and still suspend the ball?
5. What must be done to maintain the ball above the straw?

### The Science Behind the Activity

There are two main explanations for this phenomenon. The main principles involved with the ball blower are simple Newtonian mechanics; forces (pushes and pulls), action/reaction, and gravity all have a significant effect. The ball is pushed by upcoming and surrounding air that keeps it afloat, in much the same way that a kite is pushed upward by wind from below, keeping it aloft.

The qualitative behavior that is usually labeled with the term "Bernoulli Effect" is the lowering of fluid pressure in regions where the flow velocity is increased. Because it flows, air is a fluid. The high velocity/low pressure area exists on all sides of the ball, thus no matter in which direction the ball tends to fall, as it moves out of the air stream, it falls into slower air and greater pressure which forces the ball to move back into the air stream. While the Bernoulli Principle does play a role in this activity - especially when the blower is tilted or the ball is pulled out of the stream - the entire effect is more complex.

### Taking it Further

- Have students time how long they can keep the ball in the air.
- Measure how high the ball can be suspended above the straw.
- Have students develop and participate in challenges and competitions.

**Web Resources** (Visit [www.raft.net/raft-idea?isid=290](http://www.raft.net/raft-idea?isid=290) for more resources)

- For an animated demonstration of Bernoulli's Principle visit:  
<http://mitchellscience.net/Physics/BernoulliPrinciple>
- Discussions about lift - <http://www.grc.nasa.gov/WWW/k-12/airplane/lift1.html>  
& <http://www.allstar.fiu.edu/aero/airflylv13.htm>