

**Document ID:** 11\_28\_96\_1

**Date Received:** 11/28/96    **Date Revised:** 02/11/97    **Date Accepted:** 02/11/97

**Curriculum Topic Benchmarks:** S1.2.4, S1.3.3, S10.2.3

**Grade Level:** [3-5] Upper Elementary

**Subject Keywords:** air, air pressure, gas, mass, straw, bottle

**Rating:** Easy

## There's Air in There!

**By:** Lorraine Remer, Code 913, NASA/Goddard Space Flight Center, Greenbelt MD 20771  
e-mail: [remer@climate.gsfc.nasa.gov](mailto:remer@climate.gsfc.nasa.gov)

**From:** The PUMAS Collection <http://pumas.jpl.nasa.gov>

©1996, California Institute of Technology. ALL RIGHTS RESERVED. Based on U.S. Gov't sponsored research

**Concept:** Air pressure. Air has mass and takes up space. This is sometimes a difficult concept for kids to really understand.

**Materials:** 20 oz, preferably long-necked soda bottle; 1 inch square newspaper wadded up into a ball; some drinking straws.

**Physical Set-up:** Put soda bottle horizontally on table in front of class. Place wadded-up newspaper in mouth of bottle. Paper should be just inside bottle neck but close to opening.

**Patter:** Step right up! Step right up! Who can blow the paper into the bottle? How about you, young woman? (pick a student from the audience). Without touching the bottle or paper, go ahead and blow the paper into the bottle. (She blows hard and the paper ball blows right back into her face. You will probably have to hold the bottle in place.) I said, INTO the bottle, not OUT of the bottle! Next! (Choose another student. Set it up again. Hold the bottle and have him or her blow. The paper ball will come back OUTSIDE the bottle.) What's wrong with you people? Can't you do a simple thing and get the paper INTO the bottle? Next!

**Experience:** The students will begin to try different angles and different amounts of pressure. Some will be able to blow the paper without it coming out of the bottle, but none will be able to blow it in. Some will want to put their lips on the bottle mouth. You may want to discourage this for sanitary reasons, but physically it won't make a difference. Sometimes I take the paper wad outside the bottle and blow it across the table just to demonstrate the yes, my breath CAN move the paper. **Caution:** This demonstration (like ALL demonstrations) should be practiced at home before introducing it into the classroom. There may be difficulties associated with the size and shape of the bottle and/or paper wad.

**Physics:** There is no room in the bottle for the blown air from the students' breath because the bottle is already filled with air. Air coming from the students' mouths just rebounds from meeting the air already in the bottle. The paper wad is simply a tracer for the air stream coming from the students' mouths.

**Solutions:** 1) Some students will suggest putting a hole at the back of the bottle. Yes, this would work because it permits the bottle air to leave and make room for the blown air.  
2) Another solution involves changing the way **The Straw** is used: Let several students try with a straw. Most will keep BLOWING air into the bottle. This will not work. Finally, someone will solve the problem. Stick the straw into the bottle without disturbing the paper wad and SUCK air out. The paper will jump inside the bottle. You've removed air with the straw and created room inside the bottle for outside air carrying the paper wad to enter.