Jupiter: Exploring Polar Flattening

Teacher Notes:

As a planet rotates centripetal force causes the equatorial region to "bulge" and the poles to flatten. Terrestrial planets are affected less than the gas giants. Jupiter is basically a huge sphere of hydrogen. (There is some helium present also.) It only takes Jupiter eight hours and fifty-five minutes to complete one rotation. The high rate of rotation causes Jupiter to bulge at the equator and flatten at the poles. The diameter at the equator is 98% greater than the diameter measured from pole to pole. (In comparison, Earth's ratio is 33%.)

Students will be constructing a working model that demonstrates this phenomenon.

Materials:

- One piece of 12"x9" construction paper for each student
- One soda straw for each student
- One-hole paper punch
- Masking tape
- "Sharpie" marking pens
- Glue sticks

Student Activity:

1. Introduce the activity using information in the Teacher Notes.
2. Pass out a 12"x9" strip of construction paper and a soda straw to each student.
3. Glue the strip of paper into a circle, overprinting the two ends by about a 1/4". Allow the glue to dry before going to the next step.


Student Activity (continued):

4. Gently squeeze the middle of the circle together at the overlapped area and punch a hole through both sides of paper circle.
5. Slip the paper circle over the soda straw, the overlapped area first.
6. Tape the bottom of the circle to the straw, using a small piece of masking tape. (The top of the circle should be about an inch below the top of the straw.) Do not tape the top of the circle.
7. Gently shape the circle with your fingers until it is round again. (Sometimes, during the taping, the circle becomes "out of round.")
8. Carefully mark the soda straw at the top of the circle.

When the students are finished with the construction, demonstrate how to use the models. (Fold the bottom portion of the soda straw between the palms of your hands and move them back and forth, rotating the circle forward and backward rapidly.)

As the students experiment with their models, ask them to watch how far the rotating circle drops below the mark on the soda straw.

After the students have had an opportunity to experiment with their models, ask them to explain what is happening. (The rotation causes the paper circle to "bulge" outward at the equator, causing the poles to flatten.)