ORIGAMI UNIVERSE

National Aeronautics and Space Administration

Introductory Exercise: Crumpling vs Folding

Objective:

Introduce the idea that taking anything into space requires that it take up a minimum amount of space. There are often objects that are very large in their open state. Think of telescopes, solar arrays, surface rovers (e.g., Mars Curiosity Rover), etc.

Introduce the idea that folding is a solution for this problem. Folding is a technique that purposefully minimizes the space that an item takes, but allows for efficiently unfolding the item into its useable state without damage to the item.

Using ordinary paper, such as copy paper, students will experiment with ways to compress paper into the smallest area and/or volume. While keeping a free-form and experimental frame of mind, students will be encouraged to try a variety of techniques, which might include folding or crumpling the paper followed by observations of the effectiveness of each method.

Materials:

- 2 sheets of rectangular (or square) paper of the same size for each student
- If time permits, you can have an extra 2 sheets of paper that are lighter or heavier than the original sheets.

Ages: Any

Time Needed: 20-30 minutes

Process:

Working in small groups (2-3 students), each student will take the 1 of the sheets of paper and crumple one sheet as small as you can get it.

Each student will fold the other sheet to take up as small an area as you can get it, while making it as flat as possible.

Try different ways of crumpling and folding to see if the method makes a difference and compare results.

Try to estimate the “amount of space” taken up by (or volume of) each of these compacted sheets.

If supplies are available, do the same experiment with lighter (or heavier) weight paper. Compare results.

Thought Questions:

- Why does folded paper take up less space than crumpled paper?
- Does this advantage become greater or less depending on the thickness of the paper?
- Is there ever any advantage to crumpling paper instead of folding it?
- If you flatten out the crumpled paper, can you notice any pattern in the creases?