**Dynamic Design:
A Collection Process**

Finding the Perfect Fit

STUDENT ACTIVITY

In this introductory activity you will investigate how different shapes will fit into a set background. The sample return capsule (SRC) on the Genesis spacecraft contains wafers for collecting solar wind particles. The wafers are suspended on a frame. In this activity the background represents the frame and the shapes represent the wafers. Your job will be to experiment with different shapes to find the shape or combinations of shapes that will cover the most area of the background frame.

JOHNSON SPACE CENTER

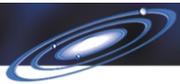*The Payload Canister contains wafers that collect solar wind particles.*

Procedure:
1. Obtain a copy of the frame. Trace this pattern onto graph paper and count the number of squares that the frame encloses. Use the "half or more than half" rule for counting squares. (If half or more of the square is in the frame, count it; if there is less than half of the square in the frame, do not count it.) Record this area on your data sheet.

2. Obtain the materials from your teacher. Arrange the shapes in the frame so that they cover the greatest area. Once this is done, shade in the area that is not covered and calculate the area covered with the shapes. Repeat this procedure with different shapes in order to find the shape that covers the greatest area of the frame.

3. When you have found the arrangement that provides the greatest coverage, use colored pencils and trace the shapes onto the graph paper. Color the shapes so that your design will be easily seen. Calculate the area that you were able to cover with this final design. Calculate the percent of the frame area covered with each shape combination (percent covered by shape divided by area of frame). Count the number of pieces used. Post your completed frame. Compare your design with those of other groups, analyzing the area covered.

$$\text{Percent Area of Frame Covered} = \frac{\text{Area covered by shapes}}{\text{Total area of frame}} \times 100$$

Table 1: Shapes that fit into the frame.
Total Area of Frame

Description of shapes used	Area covered by shapes	Percent of frame covered	Number of pieces used	Other factors to consider when using this design

Questions:

1.a. What shapes best fit into the background frame? Why?

1.b. What shapes do not fit well? Why not?

2.   What other shapes would you like to try? Why?

3.   Would some shapes cost more than others to produce? Why or why not?

4.   What factors beside cost should be considered when designing a collector wafer?

5.   Which of the above factors are most important? Which are least important? Why?