

## **Sizing Up the Planets** Exploration

**Challenge:** How can you determine the relative sizes of the bodies of the solar system if you are given only one of the members?

**Materials:** various materials for making clay spheres

### **Let's Dig In:**

Your teacher will provide you with a mass of clay as well as a sphere. The sphere represents the sun. The amount of clay you have been given is equal to the total volume of all the major planets in the solar system with respect to your sun model.

Using this clay, make a representation of each of the planets in the solar system based on your ideas of their relative size. You must use all of the clay. Once made, arrange your planets in the proper sequence from the sun.

### **Go Figure:**

1. Based on your model, how many planets could fit inside Jupiter at one time, and which ones are they?
2. What did you find most difficult about making your models?
3. All the planets in your model are made of the same material. Name at least two problems with this model.
4. Are there any objects present in the solar system not included in this model? Explain your answer.
5. Based on the way you arranged the planets, in what part of the sky would you have to look to find each of the planets?
6. According to your model, which planets would be the heaviest?

## Sizing Up the Planets

### Exploration

**GEOMES Topic:** Earth and the Universe – The Solar System

<b>Lab setup:</b>	none	easy	<u>moderate</u>	difficult
<b>Reasoning level:</b>	easy	<u>moderate</u>	difficult	
<b>Time required:</b>	<u>20-40 minutes</u>	40-60 minutes	60-90 minutes	
<b>Process skills:</b>	<u>comparing</u>	<u>communicating</u>	<u>predicting</u>	<u>utilizing models</u>

**Objectives:** Students will construct models of the relative sizes of the major planets of the solar system.

#### National Science Education Standards:

Content Standard: Earth and Space Science - Earth in the solar system

Science as Inquiry: Abilities necessary to do scientific inquiry

**Materials:** a ball to represent the sun – a sphere approximately 13 cm in diameter is best (softball sized) one sphere per student groups is needed  
clay - the amount of which is based on the size of your sun

#### Teaching Strategies:

Before you start this activity with your students, ask them the following questions. Do not answer the questions for them. Simply use the questions as a way to get students talking about the topic of relative sizes of the planets.

- What is the largest planet in the solar system?
- What is the smallest planet in the solar system?
- What is the sequence of planets in the solar system?
- Are there any planets that are similar in size?

The size of your sun is very important for this activity. Do not choose one that is too small, otherwise the planets will be too small. Likewise, a sun that is too large will require too much clay.

The total diameter of a mass of clay equivalent to the volume of all the planets combined is 12% the diameter of the sun. You will be giving each group of students a sphere of clay that is 12% the diameter of your sun. They will use this sphere of clay to construct all the planets.

For example, if you have a ball 3 cm in diameter to represent your sun, the sphere of clay you would give your students is 0.36 cm in diameter. For a 0.5 m sun, students should get a 6 cm lump of clay to work with. Select a sun size that is compatible with the amount of clay you have available. Make sure you select clay that is malleable, otherwise it will be difficult for you and your students to work with.

### **Sample Responses to Go Figure:**

Most of these answers will depend on how students put together their models.

1. Most students will pick three or four planets that could fit inside Jupiter simultaneously. In actuality, all of the planets can fit inside Jupiter at once.
2. Answers will vary when identifying what is difficult about putting together the model. Some students will say getting them into spheres will be difficult, and others will identify getting them to the right size as difficult. Few students will probably not have trouble putting the planets in order from the sun.
3. Each of the planets has a different composition. The predominant difference between the planets is between the terrestrial and the gaseous planets. The gaseous planets (Jupiter, Saturn, Uranus, Neptune) are a much lower density than the terrestrial planets (Mercury, Venus, Earth, Mars).
4. Yes, there is material not included in this model. Possible answers may include comet, asteroids, moons, rings, dust, and man-made objects.
5. If students put all the planets in a straight line (which is a common manner to do this), then in order to find the planets outside our orbit you would have to look in the direction of the sky opposite the sun. The planets inside our orbit would be found by looking directly at the sun. This question should challenge students' misconception that all the planets are found lined up in order beyond the sun.
6. As far as their model is concerned, their biggest planet would be the heaviest.