Deep-Space Model

Purpose
To make a model of a deep-space feature using common materials.

Process Skills
Make a model, communicate

Background
From Earth, outer space looks fairly simple—black space filled with tiny white points of light. But the universe beyond our solar system, or **deep space**, is actually filled with many interesting features. Billions of **galaxies** come in many shapes and sizes, filled with stars in every stage of their life cycles. Some stars increase greatly in size, to become giants or supergiants, while others shrink, becoming dwarf stars. Sometimes a star explodes, creating a **supernova**. Clouds of dust and gas, called **nebulas**, can take on distinctive shapes and beautiful colors. **Black holes** have such strong gravity that all energy and matter, even light, cannot escape it. In this project, you will use art supplies to create a model of one deep-space feature. This will help you and your class better understand some of the wonders of the universe outside our solar system.

Time – 45 minutes
Grouping – Pairs or small groups

Materials
- ❏ Science A–Z *Nonfiction Book: Outside the Solar System*
- ❏ library books and/or the Internet
- ❏ variety of common items to represent parts of a deep-space feature (e.g., beans, dry pasta, paper clips, Styrofoam spheres or peanuts, buttons, yarn, straws, clay, cardboard, glitter, tissue paper)
- ❏ coloring supplies
- ❏ scissors
- ❏ glue stick, tape, stapler, or other supplies for connecting materials
- ❏ Deep-Space Model Questions

Optional Materials
- ❏ cardboard sheet or box
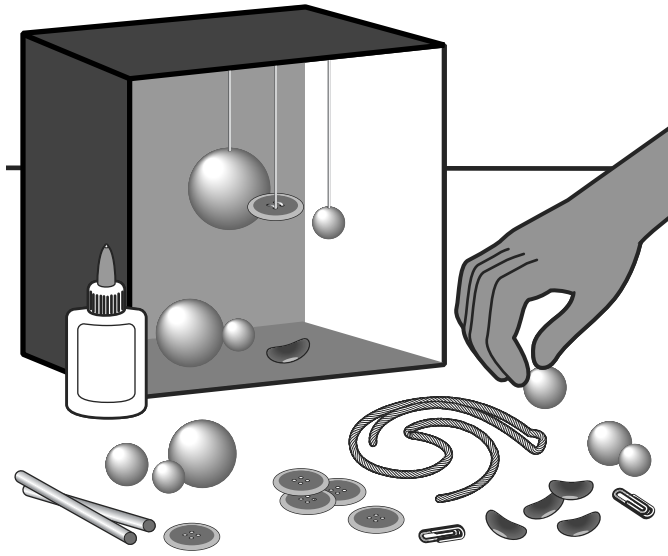
an irregular galaxy   a spiral galaxy   a nebula   an artist's rendering of black hole

Procedure

1. In this project, you will make a model to represent a feature found in deep space. Your teacher will either assign a deep-space feature for each group or let each group choose a feature on their own. Suggested subjects for your deep-space model include:

   • the life cycle of a star

   • a cluster of galaxies

   • a spiral galaxy

   • an elliptical galaxy

   • an irregular galaxy

   • a nebula

   • a supernova

   • a black hole

   • the big bang theory

   • a planetary system other than our own—including a star, exoplanets, comets, and asteroids

Your group may choose to create a model of a known deep-space feature, such as the Horseshoe Nebula or the Milky Way Galaxy. Or you may select a type of feature, and then create a fictional example.

2. Find photos or drawings of your deep-space feature in the *Nonfiction Book Outside the Solar System* and in other resources. Your teacher may provide time for you to research images in the library or on the Internet. Study the images that you find very carefully. Notice all the parts of the feature and their location compared to the other parts. Notice the colors and any other details that will help make your model look more accurate.

3. Before assembling your model, make a sketch on scratch paper to be sure the whole group agrees on the plans. Choose one person to make the drawing, but be sure everyone is involved in the discussion.

4. Once your group agrees on the plans for your model, select art materials to represent each of the parts of your deep-space feature. As a group, discuss which materials would work best to make your model. It may be helpful to use a piece of cardboard or a box to support your model, but remember that you are building a three-dimensional model, not a poster.

5. Lay out the parts of your model where they belong, before attaching any parts together. Discuss what kinds of materials you will use to connect the parts.

6. Begin assembling your model, letting all group members help with selecting materials, deciding where to place the materials, and actually putting the model together. Attach parts with glue or other materials. If using a cardboard sheet or a box, you may want to use both sides of the cardboard sheet or both the inside and outside of the box. You might even design and construct the model so that it will hang in the air.

7. Once your deep-space model is nearly complete, check back with the photos and drawings you found in your research. Decide whether you should make any changes or additions.

8. Write your names somewhere on the model, and prominently label it with the type of deep-space feature you built. If you created a fictional space feature, consider giving it a name.

9. As a group, complete the Deep-Space Model Questions.

10. Your teacher may ask you to present your model to the class. Plan how you will describe your model in a way that helps your classmates learn about the space feature it represents.

3

Names_____ Date_____

Analyze Data

1. What kind of space feature does your model represent?

2. What are the main characteristics of this kind of space feature?

3. Explain what each material represented in your model. Fill as many blanks as apply to your model, using the back of the page if necessary.

On our deep-space model,

_____ was/were represented by_____

_____ was/were represented by_____

_____ was/were represented by_____

4. Name another material you would like to have used in building your model. Then explain which part of your deep-space feature the new material would have represented.

5. Why did your group choose this type of space feature? Explain what made the space feature interesting or appealing to your group.

6. What was the most challenging part of building your model? Why?

7. Rate how well your group worked together as a team. Circle a number on the scale. Then explain how the group could improve.

1	2	3	4	5
Did not work well together		Average		Worked well together

4

Deep-Space Model

TEACHING TIPS

This process activity will help students better understand the universe. It is filled with countless stars, galaxies, and other features, including planetary systems, nebulas, supernovas, and black holes. The history of space exploration is still being written, and theories about the origins of the universe continue to change. As time marches on, humankind will continue to pursue an understanding of the universe and its many amazing features. Someday—perhaps even in students' lifetimes—we may get answers to some key questions, including how the universe began and whether life exists anywhere but on Earth.

SET-UP AND PROCEDURES

- Decide in advance whether you want groups to freely choose their own subject matter for the models, or whether you want to guide the selection, to ensure a broad representation of deep-space features.

- A list of suggested deep-space features is provided in the procedures. You may want to expand the list to include other options that exist outside the solar system. However, highly complex (e.g. the entire universe) or simplistic (e.g., a constellation) models may not be suitable for all students.

- Refer students to the section on their space feature in the *Nonfiction Book Outside the Solar System* to review information and images that will help them design and construct their model. Also help students conduct image research in the library and/or on the Internet. You may want to check out several books with good photos and illustrations to have on hand in the classroom as planning begins.

- Remind students to lay out the complete plans for their model before assembling any of the parts.

- Once all groups have finished their models, have each group present their work to the class. You may also want groups to share responses from the Deep-Space Model Questions. Allow time for all students to browse the models made by other groups.

- Encourage groups to involve each group member during each part of the project, from planning to presentation.

SAFETY

- Be sure students are safe with scissors, glue, and all other supplies used in construction of their models. You may want to precut the cardboard pieces, or closely supervise students as they cut the cardboard.

1

MATERIALS
- The art supplies in the materials list are only examples. Add any art supplies you feel students may need for their models.
- You can introduce the activity on one day to let students plan the materials they would like to use, and then ask students to bring from home any supplies they need on the day of assembly.
- If photos or illustrations are found in consumable materials, have groups clip and attach to their models a picture of what their space feature really looks like.

EXTENSIONS AND VARIATIONS
- *Writing:* Once groups have made their models, have students write about them in their science journal.
- *Variation:* Challenge students to create a model that includes motion, such as the revolution of planets around a star or the explosion of star matter in a supernova.
- *Variation/Writing:* Have the whole class make one large display with their completed models. Then you can have students write a creative story about taking a journey through deep space and passing each feature depicted by the models.
- *Math:* Have students research data on the actual dimensions of their space feature and report it to the class. Then discuss as a group which of their models would need to be enlarged or reduced to show them to scale in relationship to each other.
- *Research:* Guide students in investigating more about their space feature, then have them present their findings in a group report, including visuals.
- *Research:* See Using the Internet in the *Unit Guide* for suggested websites to extend the learning.

ANSWER KEY AND EXPLANATIONS

Analyze Data

1. What kind of space feature does your model represent?

Groups should write either the general type of feature they selected (e.g., a spiral galaxy) or the name of the real feature they selected (e.g., the Andromeda Galaxy).

2. What are the main characteristics of this kind of space feature?

Answers will vary. Students should examine the space feature and note any distinguishing characteristics, which may include colors, shapes, movement, or other special attributes.

3. Explain what each material represented in your model. Fill as many blanks as apply to your model, using the back of the page if necessary.

Answers will vary. Each material used should represent a part of the deep-space feature.

On our deep-space model,

_____ was/were represented by_____
_____ was/were represented by_____
_____ was/were represented by_____

4. Name another material you would like to have used in building your model. Then explain which part of your deep-space feature the new material would have represented.

Answers will vary.

5. Why did your group choose this type of space feature? Explain what made the space feature interesting or appealing to your group.

Answers will vary. Ideally, students should demonstrate an understanding of the space feature in their reasoning.

6. What was the most challenging part of building your model? Why?

Answers will vary. Students may find it difficult to find materials to represent each part of the space feature, or may find it challenging to fit all the parts together.

7. Rate how well your group worked together as a team. Circle a number on the scale. Then explain how the group could improve.

1	2	3	4	5
Did not work well together		Average		Worked well together

Groups should circle a number and write about how their group could improve its teamwork, regardless of the score they circled.

3