Modeling the Solar System

OVERVIEW

Students will investigate a model of our solar system that will help them contextualize the content of the exhibition. Students will then generate questions about space exploration to investigate in the exhibition, and share their findings upon their return. The activities culminate with sharing what they have learned and writing an imaginative story about travelling in space.

NYS Science Core Curriculum

PS 1.1c: The Sun and the planets that revolve around it are the major bodies in the solar system.

BACKGROUND FOR EDUCATOR

The distances in our solar system are vast and the planets comparatively tiny, so models are vital tools for understanding how planets are placed in space. They're also useful for visualizing how the planets move in relation to each other, since from our vantage point on Earth we can't see all of the planets around us.

BEFORE YOUR VISIT

Plan how your students will explore *Beyond Planet Earth* using the student worksheets. Divide your class into two teams: Moon Explorers and Mars Explorers. You may wish to have students explore the exhibition in pairs.

Prior to your visit, students will have already begun the exhibition worksheets; make sure they bring their worksheets to the Museum.

Discussion: Structure of the Solar System
Review with students the structure of the solar system. Ask them:

- What is at the center of the solar system?
  (Answer: The Sun, our star, is at the center of the Solar System.)
- What types of planets are there, and where are they found?
  (Answer: There are four inner, rocky planets that orbit closest to the Sun: Mercury, Venus, Earth, and Mars. Beyond the Asteroid Belt, the four outer, gas giant planets are Jupiter, Saturn, Uranus, and Neptune. The Kuiper Belt contains Pluto and other small icy objects. This area of the solar system begins just inside Neptune's orbit and extends well beyond it.)
- Describe how the planets move around the Sun. What are their orbits shaped like? Do they all move at the same speed?
  (Answer: Planets revolve around the Sun in nested, nearly circular orbits. The closer an object is to the Sun, the faster it revolves.)
- Where in the solar system, besides the Earth, have human beings traveled? Where have we sent robots/spacecraft?
  (Answers may include: Humans have walked on the Moon, and robotic rovers have explored Mars. Unmanned spacecraft have also visited the Moon and Mars, as well as planets and moons in the outer solar system. The Voyager 1 and 2 spacecraft have traveled beyond the orbit of Neptune and continue beyond our solar system.)

Activity: Earth as a Peppercorn: noao.edu/education/peppercorn/pcmain.html
Use the online lesson plan at to have students create a scale model of the solar sstem that is accurate both in the planet size and interplanetary distance.

Optional Extension Activity: Moving Solar System Model: kepler.nasa.gov/files/mws/HumanOrrerySSSmsGEMS.pdf
Use this lesson plan to create a moving model of relative planet speed.

Preparation for the Investigation in the *Beyond Planet Earth* Exhibition
From what students know about planets and space, along with what they observed in their models of the solar system, have them think about the challenges that humans would face in travelling to and living on another planet. Tell students that humans are most likely to return to the Moon and to visit Mars before they travel to other places in the solar system. Divide the class into two teams: Moon Explorers or Mars Explorers. Using the Student Worksheet, have each team complete columns 1 and 2, charting what students know about the Moon or Mars, (depending on the team). Have them write down any questions that come up about traveling to or living on a heavenly body other than Earth. (This can also be done as a class or in small groups.) They will complete column 3 in the exhibit and after they return.

DURING YOUR VISIT

Beyond Planet Earth: The Future of Space Exploration
3rd floor (45 minutes)
As a class, look at the "Exploring our Solar System" wall panel (across from the Introduction Theater) to review the objects in the solar system and to see if they can find any new information, for the Moon and Mars in particular. Have students walk through the exhibition in pairs or small groups and think about the questions they raised on columns 1 and 2 of their charts prior to their visit, focusing on either the Moon or Mars section. As they find relevant information in the exhibition, have them write it in column 3. You may wish to use the "Teaching in the Exhibition" section of the Educator's Guide to help your students identify challenges and approaches to travelling and living in space.

Scales of the Universe
1st floor (30 minutes)
In the Rose Center for Earth and Space, students will be using the Hayden Sphere and the walkway around it to investigate relative sizes of celestial objects. First walk around the sphere (with the glass windows on your right) to the area that displays the planet models. (Some of the planets are suspended above you, while others are mounted on the railing.) Draw students' attention to all eight planet models. Remind students that the 87-foot sphere represents the size of the Sun. Ask students to observe the planets' sizes relative to it. Remind them of the sizes of the planets in the "Earth as a Peppercorn" model that they built at school; ask them to imagine how large a model on this scale would be if the planets were placed at the correct distance from the Hayden Sphere.

BACK IN THE CLASSROOM

Wrap-Up: Beyond Planet Earth
As a class or in small groups, have student teams share what they've learned about traveling in space and living beyond Earth. Have them chart their findings for each team on chart paper, and review as a class.

Extension Activity: Space Travel Guide: amnh.org/ology/spacetravel
Have individual students use the online activity to create an imaginative story about travelling to the destination they studied with their team. Encourage them to incorporate information that they learned in the exhibit to make their story more realistic

STUDENT WORKSHEET

Grades 3–5

Name: _____ **Team:** Moon Explorers Mars Explorers (Circle one)

What I know about the Moon/Mars :	What I want to know about traveling in space and living on other planets:	What I learned from the exhibition about traveling and living outside of Earth:

BEYOND PLANET EARTH the future of space exploration

STUDENT WORKSHEET

ANSWER KEY

Grades 3–5

Name: _____ **Team:** Moon Explorers Mars Explorers (Circle one)

What I know about the Moon/Mars :	What I want to know about traveling in space and living on other planets:	What I learned from the exhibition about traveling and living outside of Earth:
Sample answers may include: *Moon:* *• The Moon orbits the Earth.* *• The Moon has no atmosphere.* *• 12 people have walked on the Moon's surface.* *Mars:* *• Mars is the fourth planet from the Sun in our solar system.* *• Humans have sent robot rovers and probes to explore Mars, but people have never travelled there.* *• Mars has an atmosphere but it is very different from the atmosphere on Earth.* *• Mars is very cold.*	*Sample answers may include:* *• What kind of food do astronauts eat?* *• What is the point of going to other planets?* *• How can people live on a planet with no atmosphere?* *• How long would it take to travel to Mars/the Moon?* *• Could we find life on Mars?* *• Could Mars be made habitable?*	*Sample answers may include:* *• To travel in space, a person should have certain qualities to tolerate loneliness, boredom, danger, and limited personal space.* *• People could live on the Moon in inflatable modules.* *• It might be possible to terraform Mars, making it habitable for humans.*