Activity 3—

Mars Critters

About This Activity

This is the third in a sequence of activities borrowed from Destination: Mars. In groups or as individuals, students will use their knowledge of Mars and living organisms to construct a model of a plant or animal that has the critical features for survival on Mars. This is a "what if" type of activity that encourages the students to apply knowledge. They will attempt to answer the question: What would an organism need to be like in order to live in the harsh Mars environment?

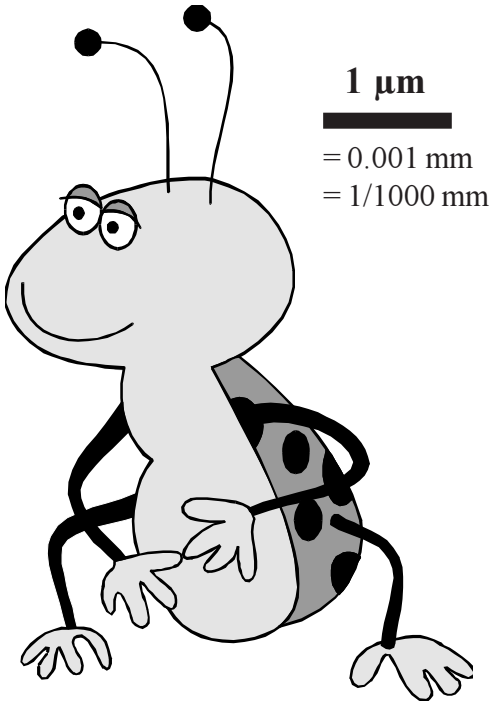
Objectives

Students will:

- draw logical conclusions about conditions on Mars.
- predict the type of organism that might survive on Mars.
- construct a model of a possible martian life form.
- write a description of the life form and its living conditions.

Background

To construct a critter model, students must know about the environment of Mars. The creature must fit into the ecology of a barren dry wasteland with extremes in temperature. The atmosphere is much thinner than the Earth's; therefore, special adaptations would be necessary to handle the constant radiation on the surface of Mars. Also the dominant gas in the Mars atmosphere is carbon dioxide with very little oxygen. The gravitational pull is just over 1/3rd (0.38) of Earth's. In addition, Mars has very strong winds causing tremendous dust storms. Another requirement for life is food—there are no plants or animals on the surface of Mars to serve as food!



Scientists are finding organisms on Earth that live in extreme conditions previously thought not able to support life. Some of these extreme environments include: the harsh, dry, cold valleys of Antarctica, the ocean depths with high pressures and no sunlight, and deep rock formations where organisms have no contact with organic material or sunlight from the surface.

Vocabulary

ecology, adaptations, gravity, geology, atmosphere, radiation exposure, weather, environment

Materials

- ❑ paper (construction, tag board, bulletin board, etc.)
- ❑ colored pencils
- ❑ glue
- ❑ items to decorate critter (rice, macaroni, glitter, cereal, candy, yarn, string, beads, etc.)
- ❑ pictures of living organisms from Earth
- ❑ Student Sheet, *Mars Critters* (pg. 3)
- ❑ Student Sheet - Activity 1, *If You Went to Mars* (pg. 5)
- ❑ Mars Fact Sheet (pg. 6)

Procedure

Advanced Preparation

1. Gather materials.
2. Set up various art supplies at each table for either individual work or small group work. This activity may be used as a homework project.
3. Review the "If You Went to Mars" sheet, Mars Fact Sheet, and the background provided above. Other research and reading may be assigned as desired.

Classroom Procedure

1. Ask students to work in groups to construct a model of an animal or plant that has features that might allow it to live on or near the surface of Mars. Have them consider all the special adaptations they see in animals and plants here on Earth. They must use their knowledge of conditions on Mars, consulting the Mars Fact Sheet, *If You Went to Mars*, and other resources such as web pages if necessary. Some key words for a web search might be "life in space" or "extremophile" (organisms living in extreme environments). They must identify a specific set of conditions under which this organism might live. Encourage the students to use creativity and imagination in their descriptions and models.
2. If this is assigned as homework, provide each student with a set of rules and a grading sheet, or read the rules and grading criteria aloud and post a copy.
3. Review the information already learned about Mars in previous lessons.
4. Allow at least 2 class periods for this project: one for construction, one for presentation.
5. Remind the students that there are no wrong critters as long as the grading criteria are followed.
6. Include a scale with each living organism.

MARS CRITTERS

In order to better understand what types of life scientists will look for when they go to Mars, you will construct a model or draw a picture of an organism that has features that might allow it to live on or near the surface of Mars.

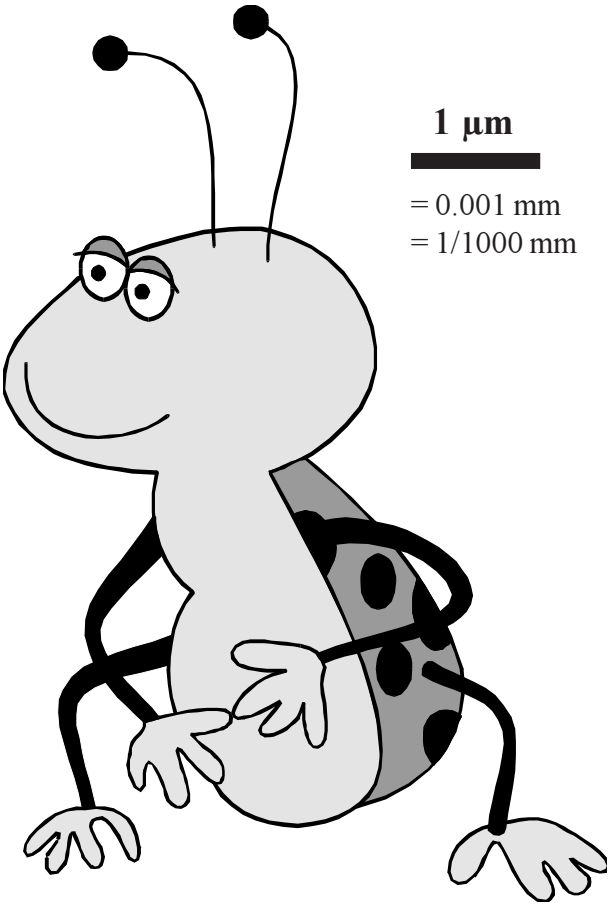
Conduct research about the environment on Mars. Consider the geology, gravity, atmosphere, radiation exposure, and weather. Choose a habitat somewhere in the Mars environment for the organism to live. Then construct a model of the plant or animal and include the special features it would need to live in that harsh environment. You may want to research the special adaptations animals and plants have to survive in difficult places here on Earth. Be creative and use your imagination.

Make a scale model or picture of your critter. Answer all the questions on the next page and attach them to the picture or model of your critter.

GRADING

1. Your entry will be graded on scientific accuracy (40%) and creativity (40%). Remember that everything on Mars must obey the laws of nature and your creature must have good martian survival traits. Provide a scale to indicate the true size of your critter.

2. Clear writing and correct grammar count for the remaining 20% of your total score.



Description and Questions

Use another page if more space is needed.

1. The critter's name:

2. Describe the habitat and climate in which your critter lives:

3. How does it move? Include both the form and method of locomotion. (For example: The miniature Mars Gopher leaps on powerful hind legs).

4. What does it eat or use as nutrients? Is it herbivorous, carnivorous, omnivorous, or other? What is its main food and how does it acquire this food?

5. What other creatures does it prey on, if any? How does it defend itself against predators?

6. How does your creature cope with Mars' extreme cold, unfiltered solar radiation, and other environmental factors?

7. Is it solitary or does it live in large groups? Describe its social behaviors.

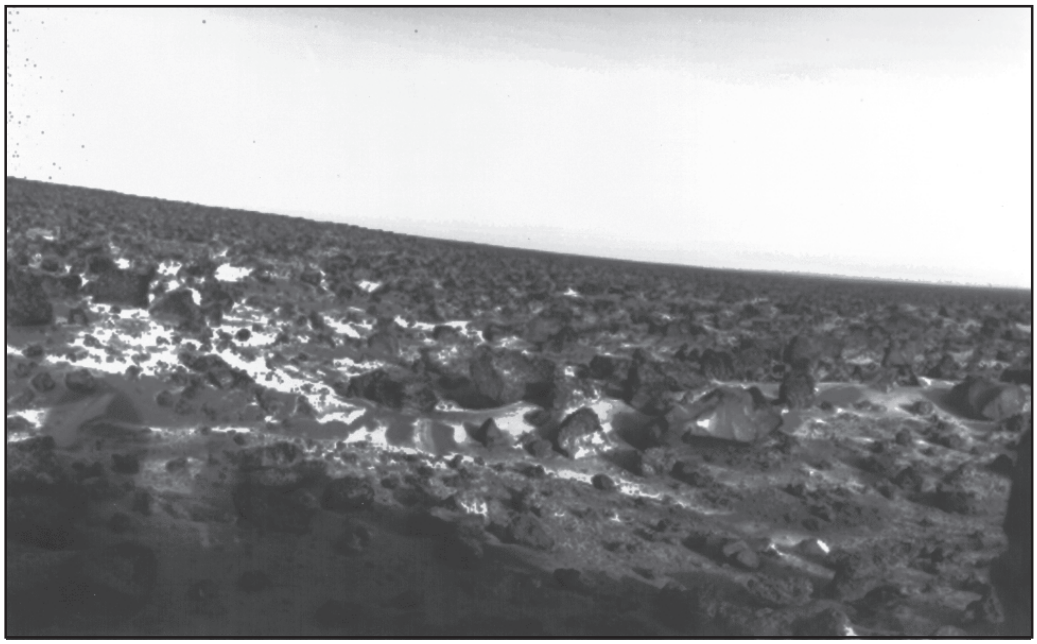
8. What else would you like others to know about your critter?

If You Went to Mars

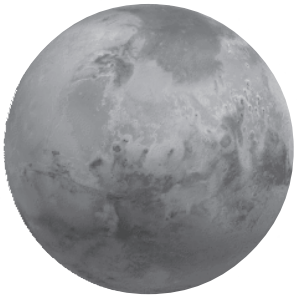
from "Guide to the Solar System,"
by The University of Texas, McDonald Observatory

Mars is more like Earth than any other planet in our solar system but is still very different. You would have to wear a space suit to provide air and to protect you from the Sun's rays because the planet's thin atmosphere does not block harmful solar radiation. Your space suit would also protect you from the bitter cold; temperatures on Mars rarely climb above freezing, and they can plummet to -129ºC (200 degrees below zero Fahrenheit). You would need to bring water with you; although if you brought the proper equipment, you could probably get some Martian water from the air or the ground.

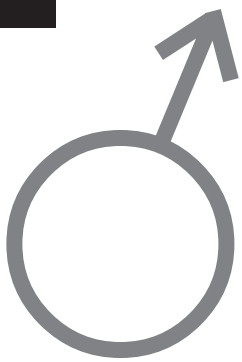
The Martian surface is dusty and red, and huge duststorms occasionally sweep over the plains, darkening the entire planet for days. Instead of a blue sky, a dusty pink sky would hang over you.



Mars Fact Sheet



Fourth planet from the Sun



Distance from the Sun:
Minimum: 206,000,000 kilometers
Average: 228,000,000 kilometers
(1.52 times as far as Earth)
Maximum: 249,000,000 kilometers

Eccentricity of Orbit: 0.093 vs. 0.017 for Earth (0.00 is a perfectly circular orbit)

Distance from Earth: Minimum: 56,000,000 kilometers
Maximum: 399,000,000 kilometers

Year: 1.88 Earth years = 669.3 Mars days (sols) = 686.7 Earth days

Day: 24.6 Earth hours

Tilt of Rotation Axis: 25.2° vs. 23.5° for Earth

Size: Diameter: 6794 kilometers vs. 12,756 kilometers for Earth
Surface Gravity: 0.38 (or ~1/3) Earth's gravity
Mass: 6.4 x 1026 grams vs. 59.8 x 1026 grams for Earth
Density: 3.9 grams/cc vs. 5.5 grams/cc for Earth

Surface Temperature: Cold
Global extremes: -125°C (-190°F) to 25°C (75°F)
Average at Viking 1 site: high -10°C (15°F); low -90°C (-135°F)

Atmosphere: Thin, unbreathable
Surface pressure: ~6 millibars, or about 1 /200th of Earth's
Contains 95% carbon dioxide, 3% nitrogen, 1.5% argon, ~0.03% water (varies with season), no oxygen. (Earth has 78% nitrogen, 21% oxygen, 1% argon, 0.03% carbon dioxide.)
Dusty, which makes the sky pinkish. Planet-wide dust storms black out the sky.

Surface: Color: Rust red
Ancient landscapes dominated by impact craters
Largest volcano in the solar system (Olympus Mons)
Largest canyon in the solar system (Valles Marineris)
Ancient river channels
Some rocks are basalt (dark lava rocks); most others unknown
Dust is reddish, rusty, like soil formed from volcanic rock

Moons: Phobos ("Fear"), 21 kilometers diameter
Deimos ("Panic"), 12 kilometers diameter

From LPI/NASA EW-1997-02-127-HQ