Lesson 3

Mapping the Geological Features of Mars

GRADE LEVEL(S)

4 – 6

LENGTH

60 minutes

MATERIALS

- Giant Destination Mars Map
- *Mars Mapping* Student Sheet
- Colored Markers (red, green, blue)

VOCABULARY

- Crater
- Erode
- Ejecta
- Channel
- Sun Angle
- Sequence

ESSENTIAL QUESTION

How can we use the Mars Map and photographs of Mars to learn about the geologic history of the planet?

LESSON OBJECTIVE(S)

Students will be able to:

- Identify geologic details on the Mars Map
- Construct a simple features map
- Interpret the geologic history of a part of Mars' surface

ENGAGEMENT

1. Explain to students that scientists use maps to illustrate the geologic history of a planet or moon. Geologic maps show present-day features and evidence of past events. The maps show features that were formed earlier or later than others, giving scientists a relative time sequence of events (not precise dates). On Earth these maps are made using photographs taken from airplanes and spacecraft, and form research on the Earth's surface. To make maps of other planets we must use photographs taken by spacecraft and use lander information from the planet's surface.

EXPLORATION

1. Have students discuss how photographs may have been used to create the Mars Map. Hand out the Earth/Mars comparison worksheets to help guide students as they make their choices.
2. Show students on an overhead display the image of the Mars handout (without key markings). Ask them to discuss what markings they see on the map. Students should mention circles (craters), lines (rivers), ridges or raised areas (mountains). Next, ask them to look at

the Mars Map in the classroom and identify what they think are craters with small yellow post-its, rivers with small green post-its, and mountains with small pink post-its. Have the student group discuss the classifications and come to a consensus on the labels.

3. Using the Mars handout on the overhead projector, show students an example of a crater with a continuous, sharp-edged, unbroken rim. Ask students on their own handouts to highlight the same crater by drawing the rim and not the fairly flat interior (see drawing on student sheet) with red pencil. If time and skill allow, students may also note and draw the ejecta for the fresh sharp rimmed craters. The ejecta is the material that is blasted out of the crater and falls outside the rim of the crater. The ejecta is usually more irregular than most of the craters. Review with students how to tell what is a depression and what is a hill slope by knowing the direction of illumination from the Sun.
4. With a partner, have students carefully outline the rims of all sharp-edged craters red.
5. Next, show students an example of a crater with an uneven, eroded, broken rim (see student sheet) and have students carefully outline the rims of all eroded craters green on their student handout.
6. Next, show students an example of a river channel and ask students to color (not outline) all channels blue. They may try to show both sides of the channel but a single line in the middle of the channel is adequate.
7. When all items have been labeled on the student handout, pairs should be provided 20 minutes to answer the questions on Student Sheet.

EXPLANATION

1. When all student pairs have completed the questions, discuss each question and student responses as a group.

EXTENSION

1. To extend student learning in this lesson, provide students time to go back to the Mars Map and examine their initial classifications. Students should be asked to identify any items that were missed in the first round and to label the craters (on post-its) that have ejecta.
2. Additionally, student groups can apply measurement skills by measuring the diameter of the craters on the Mars Map and create a classroom inventory of the Mars craters that should be copied into their STEAM notebooks.

EVALUATION

1. During this lesson, the teacher is encouraged to use formative assessment such as questioning and examining student responses/notes throughout the lesson to elicit evidence of learning and deepen student understanding. Teachers may wish to grade team or map handouts and/or review students' science notebooks to formally assess student understanding.
2. Teachers are encouraged to create their own grade-level and ability-level assessment so as to best meet the needs of their students.

STUDENT SHEET

Mars Mapping

Objective

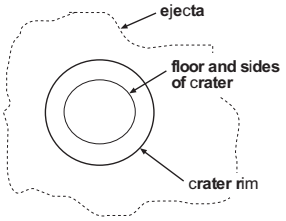
To make a simple features map and interpret the geologic history of a part of Mars' surface.

Background

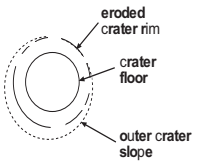
Scientists use maps to illustrate the geologic history of a planet or moon. Geologic maps show present day features and evidence of past events. The maps show features that were formed earlier or later than others, giving scientists a relative time sequence of events, although not precise dates. On Earth these maps are made using photographs taken from airplanes and spacecraft, and from research on the Earth's surface. To make maps of other planets we must use photographs taken by spacecraft and use lander information from the planet's surface.

Mark these features on the photograph using the examples below. Then answer the questions on the back of this page.

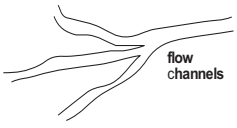
Features found on the Map are:



1. Craters with continuous, sharp-edged, unbroken rims.
   Carefully outline the rims all such craters **Red**.



2. Craters with uneven, eroded, broken rims.
   Carefully outline the rims of all such craters **Green**



3. River channels.
   Color (not outline) all channels **Blue**.

Questions

Use the map to answer the questions.

1. Which are older — river channels or green craters? How do you know?

2. Which are older — river channels or red craters? How do you know?

3. Which features are oldest, youngest, and of medium age?

4. Are big craters older or younger than small craters?

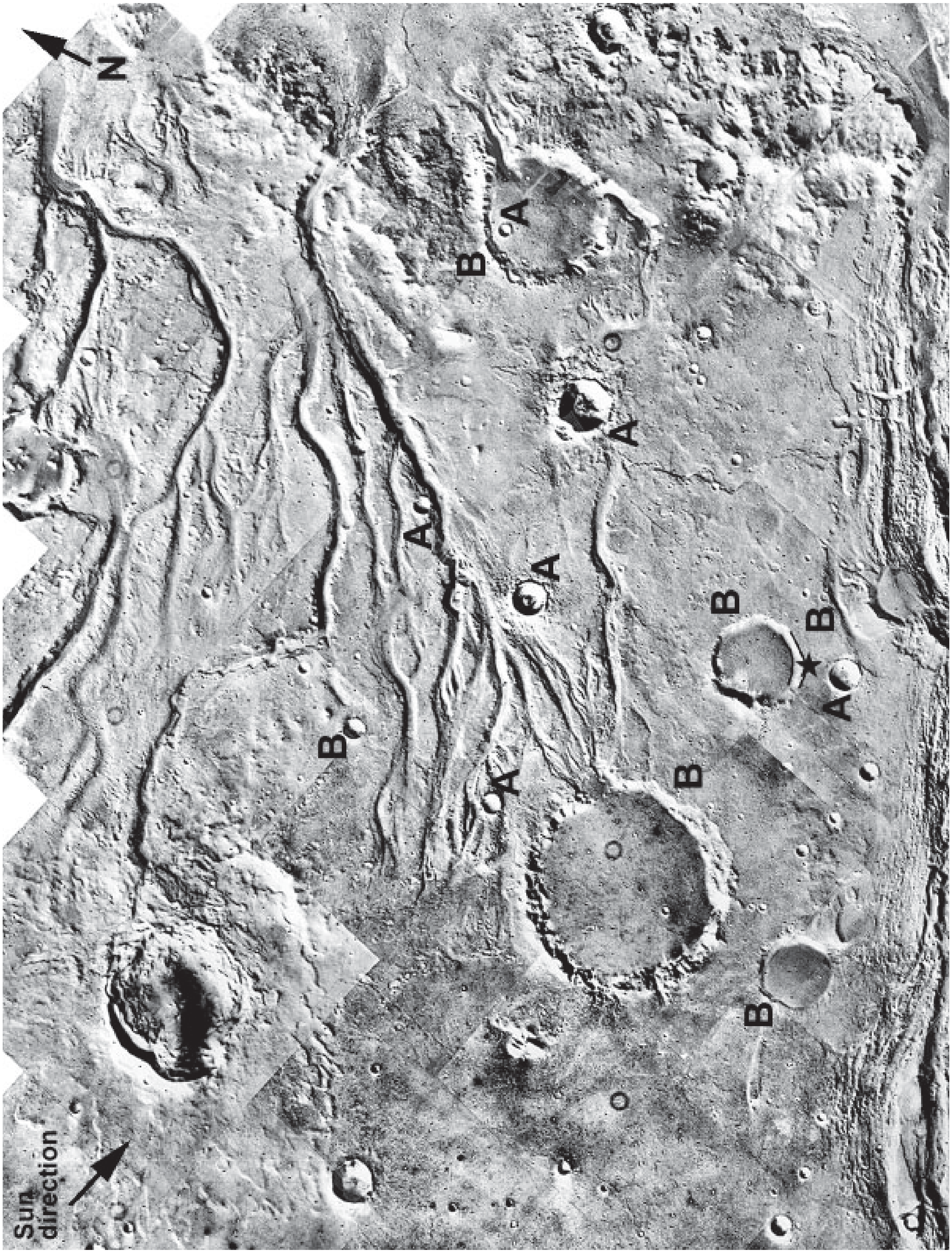
5. Write a simple geologic history of this part of Mars.

Challenge

What caused the difference in size between the young craters and the older craters?

Which way does the land slope?

MAPPING MARS KEY



A = sharp-edged crater B = eroded crater ★ = crater wall as seen in sunlight