GEOLOGY ON MARS
Unit I - Chapter 1-1
The Night Sky
Earth and space science is the study of processes on Earth and in other locations within our solar system and galaxy.

Your goal is to see the world like an Earth Scientist. Use what you to explain new ideas and to solve problems.

Earth Scientists question if there is life beyond planet Earth. Scientists use advanced tools to see if other planets could support life.

In this unit, you will learn how Earth scientists use what they know about Earth to help them in the search for possible life.
Planetary geologists use their understanding of Earth to guide the search for evidence that other planets could have supported life.
Your work is similar to the work of real scientists that are studying Mars. The data that you will work with is real data that scientists use in their research.
WHAT DOES A PLANET NEED TO SUPPORT LIFE?

- You will help the Universal Space Agency search for evidence that other planets could support life.
- Talk to a partner about what you think a planet would need to support life.

- Be ready to share!
WHAT IS NEEDED TO SUPPORT LIFE?

LIQUID WATER

ENERGY SOURCE
**Habitable**: having the conditions necessary to support life

When a place has the conditions necessary to support life, we say that place is habitable.
WHERE TO VIEW AND ACCESS VOCABULARY

• You will be provided a copy of vocabulary for your folder.
• You can also access vocabulary online…
  • On Quizlet (Go to class website)
  • On Amplify in digital resources
Unit Question

How can we search for evidence that other planets were once habitable?

The Unit Question refers to evidence that planets were *once* habitable.

Scientists are interested in evidence that a planet that is not habitable now could have been habitable in the past.
Rocky Planet: any planet with a solid surface, such as Earth or Mars
Since Earth is a planet that supports life, scientists have focused on nearby planets to see if they also have the conditions needed for life, or if they might have supported life in the past.
COMPARING THE ROCKY PLANETS

CLOSE TO THE SUN

MADE OF SOLID ROCK

LARGEST
How does our understanding of Earth help us learn about other rocky planets?

Planetary Geologists use their knowledge of Earth to learn about other rocky planets because of the similarities they have.

You will learn about this process over the next few days.
You will compare Earth to other rocky planets to identify similarities and differences.
**VOCABULARY**

**System:** a set of interacting parts forming a complex whole

![Diagram of The Earth System with hydrosphere, atmosphere, geosphere, and biosphere]
When scientists think of Earth as a whole, they think of it as a system. A system is a set of interacting parts forming a complex whole. The Earth system is made of several parts called spheres.

- **Hydrosphere**: water bodies on Earth.
- **Atmosphere**: the layer of air surrounding Earth.
- **Geosphere**: the solid part of Earth, including land and crust.
- **Biosphere**: the zone where life exists on Earth, including both living and non-living parts.
**FOUR SPHERE’S**

- **HYDROSPHERE**
  all the liquid water and ice on a planet.

- **ATMOSPHERE**
  mixture of gases surrounding a planet.

- **GEOSPHERE**
  solid part of a rocky planet.

- **BIOSPHERE**
  all the living things on a planet.
These spheres are constantly interacting, creating changes on Earth. Scientists examine other planets’ atmospheres, hydrospheres, and geospheres and compare them to those on Earth. They try to determine whether other planets might also have a biosphere.
Comparing Rocky Planets activity.

• You need to determine which planet or planets are good places to search for evidence of current or past habitability.

• We already know that the rocky planets are more similar to Earth than other planets within our solar system and planets outside of our solar system.

• This activity will help you compare Earth to the other rocky planets so we can learn more about where to search for evidence of habitability.
Comparing Rocky Planets activity.

Each student in a group of four will examine one sphere for all four rocky planets.

Quickly decide who will be examining each sphere (geosphere, biosphere, atmosphere, and hydrosphere) in your group.

If sitting in a group of 5, two students will work on the same sphere.
1. View Student Screens to see where to enter information.

2. When prompted - Move to your designated Investigation Tables and work with a partner to become experts on your sphere.
   • Tables 1-2: Atmosphere
   • Tables 3-4: Hydrosphere
   • Tables 5-6: Geosphere
   • Tables 7-8: Biosphere

   With a partner, make comparisons between planets’ spheres to find out which rocky planets are the most similar and the most different from Earth.

   You will individually record your comparisons – Take good notes.

   Return to your table to share what you learned about your sphere.
OBTAIN YOUR CARDS FROM CENTER OF TABLE

BEGIN COMPARING ROCKY PLANETS

1. Read Card from Earth
2. Read other planet cards to make comparisons
3. Take thorough notes on your screen

RETURN TO YOUR TABLE

1. Begin sharing the information you learned.
2. Listen and take notes for each planet.

By sharing your notes and ideas with one another, you will begin to see how the four rocky planets compare overall.

Earth’s atmosphere is made of a mixture of gases, mainly nitrogen and oxygen, but also small amounts of other gases, including carbon dioxide. Earth’s atmosphere keeps its rocky surface warm, but not too hot.
Share your table’s similarities and differences, or findings that came up during group discussion

- The atmospheres of Earth and Venus both have carbon dioxide;
- Earth is the only planet with a biosphere.

It may have seemed like the other rocky planets in our solar system were very different from Earth.

It is clear that some spheres on Mercury, Venus, and Mars are similar to the same sphere on Earth.
Earth and Mars have similar geospheres;

• There is evidence that volcanoes once erupted on Mars.

• Mars also has frozen water at its poles, which makes it the only other rocky planet to have water (other than Earth).

These similarities suggest that Mars could be the best rocky planet in our solar system to search for evidence of life.
Clip your cards back together.
You already have some idea of what planetary geologists do.

You will hear from a real planetary geologist who is using what she knows about Earth to learn about Mars.

This will help you better understand your role as student planetary geologists and how what you are doing in this unit is similar to what real scientists do.
Dr. Lauren Edgar is a real scientist.

• In this video, you will meet Dr. Lauren Edgar.
• Just like her, you will get to analyze real data collected by NASA.
WHAT TWO THINGS ARE NECESSARY FOR HABITABILITY?

LIQUID WATER  

ENERGY SOURCE
Scientists are looking for evidence of past habitability.

Scientists have looked and have not found bodies of liquid water, it’s not likely that Mars is habitable right now.

Just because Mars doesn’t have bodies of liquid water now, doesn’t mean it didn’t in the past.

A planet’s system is constantly changing.
**Investigation Question:**

- How does our understanding of Earth help us learn about other rocky planets?

- You will now watch the video again, paying careful attention to how Dr. Edgar uses what she knows about Earth to learn about Mars.
PARTNER: PAIR-SHARE

- Turn to a partner to discuss how Dr. Edgar uses what she knows about Earth to learn about Mars.
- Earth supports many types of life, so we can study how life exists on Earth in order to understand how life could possibly exist on other planets.

What questions do you have about the video, Mars, or your role as student planetary geologists.
This is where we will keep track of our questions, ideas, and vocabulary during this unit.

You can refer to this area to remember some of the new things we are learning.
DISCUSS THE UNIT QUESTION

You might already have some ideas about the Unit Question.

Share how comparing Earth with other rocky planets helped you learn about how scientists search for evidence that other planets were once habitable.

Remember your comparisons of the rocky planets and the similarities between Earth and Mars.

We were able to narrow our focus to Mars as a good place to search for evidence of past habitability.

**Unit Question** - This is the question you will try to answer throughout the unit.

*How can we search for evidence that other planets were once habitable?*
Scientists who study the rocky planets, including geologists, often compare the spheres of other rocky planets to those of Earth—the rocky planet that we know the best.

Key Concept

Earth, Mars, and other rocky planets can be thought of as systems. These systems are made up of interacting spheres that can include the geosphere, atmosphere, hydrosphere, and biosphere.
Vocabulary

- habitable,
- rocky planet, and
- system

The vocabulary list on the wall serves as a reminder of these words, you will continue to use throughout the unit.
1.1.5: (Activity 5).
Record your ideas about what signs of habitability to look for on Mars.
You will also read an article about scale in the solar system.