Is There Soil on Mars?

Lauren Parker & Steve Jones

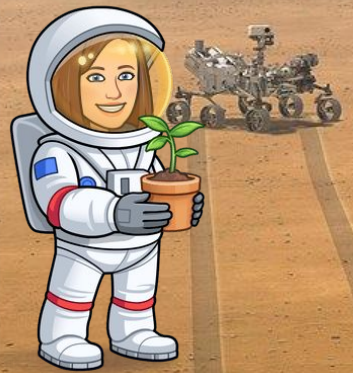

Image: JPL

Lauren

- **7th and 8th Grade Science**
- **Fort Worth Academy in Fort Worth, Texas**
- **14th year**
- **Previously taught grades 5-6 in public schools**
- **Solar System Ambassador, SEEC Crew, Space Station Ambassador**
- **Co-Principal Investigator- Magnitude.io**

Steve

- **6-8th grade STEAM connections Teacher**

- **15th year teaching (Every age from 3yo to 8th grade!)**
- **2012 Teacher of the Year (AHES, Fulton County, GA)**
- **NASA/JPL Solar System Ambassador/ Space Station Ambassador**

- **Member, NASA eClips Education Advisory Board**
- **Co-Principal Investigator, Magnitude.io**

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What Do We Know About Mars?

What are the Conditions on Mars?

Why Would Growing Plants on Mars be Important?

https://youtu.be/uqKGREZs6-w

Gardens on Mars

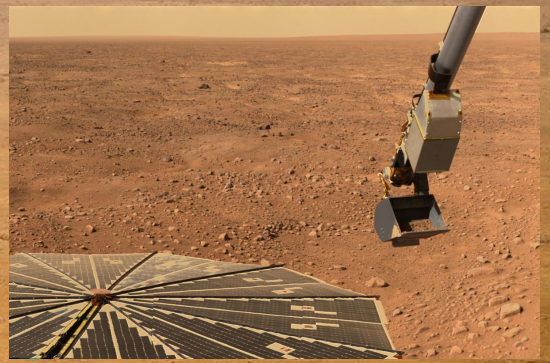
Dr. Ellen Stofan, Former NASA Chief Scientist

John and Adrienne Mars Director, National Air and Space Museum

What Is Regolith, Anyway?

Regolith is, essentially, dirt- it is small pieces of rock material, generally found on the surface of a solar system object.

Lunar Regolith



Martian Regolith

Martian Regolith is Toxic!

High levels of perchlorates have been detected.

Perchlorates are reactive chemicals first detected in arctic Martian soil by NASA's Phoenix lander in 2008.

Regolith formation on Earth, on the Moon, and on Mars.

National Aeronautics and Space Administration

MAKING REGOLITH

Activity topic selected from NASA's KSNN™ 21st Century Explorer newsbreak "What would you find on the moon's surface?"

Educator Section

Introduction
A fine dust called regolith covers the moon. The bombardment of micrometeoroids broke the moon's rocks into very tiny pieces, creating regolith. The Earth too, is covered with rocks, soil, and sand. On Earth we study this material to learn more about our world. Scientists have studied samples from the moon to learn more about the moon and to continue exploring space.

Lesson Objective
In this lesson students will make simulated regolith and observe its properties.

Problem
How does the bombardment of micrometeoroids make regolith on the moon?

Grade Level: 3-5

Connections to Curriculum: Science

Science Process Skills: observing, predicting, classifying, inferring, communicating
(Association for the Advancement of Science)

Teacher Preparation Time: 20 minutes

Lesson Duration: 45 minutes

Prerequisite: none

National Education Standards addressed in this activity include Science (NSES) and Geography (NCGE). For an alignment to standards in this activity, see page 5.

Teacher Page

Regolith Formation

Purpose

To compare the process of regolith formation on Earth and on the Moon.

Background [also see "Teacher's Guide" Pages 4, 5]

The loose, fragmental material on the Moon's surface is called **regolith**. This regolith, a product of **meteoritic bombardment**, is the debris thrown out of the **impact craters**. The composition and texture of the lunar regolith varies from place to place depending on the **rock** types impacted.

Generally, the older the surface, the thicker the regolith. The regolith on young **maria** may be only 2 meters thick; whereas, it is perhaps 20 meters thick in the older lunar **highlands**.

By contrast, regolith on Earth is a product of **weathering**. Weathering encompasses all the processes that cause rocks to fragment, crack, crumble, or decay. These processes can be *physical* (such as freezing water causing rocks to crack), *chemical* (such as decaying of minerals in water or acids), and *biological* (such as plant roots widening cracks in rocks).

What Is Regolith, Anyway?

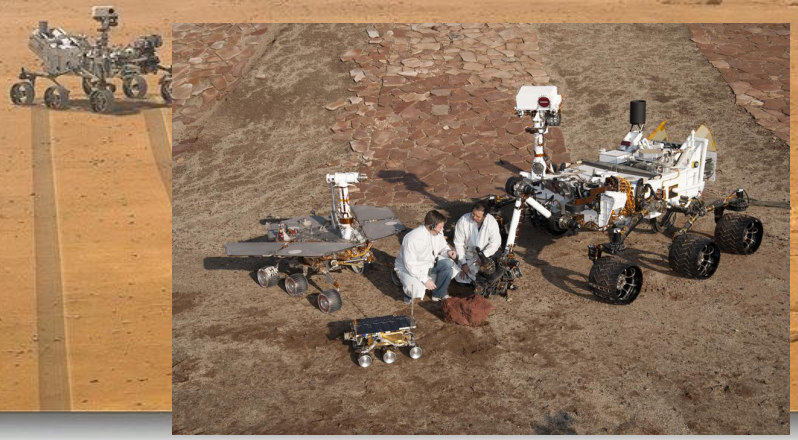
What is soil?

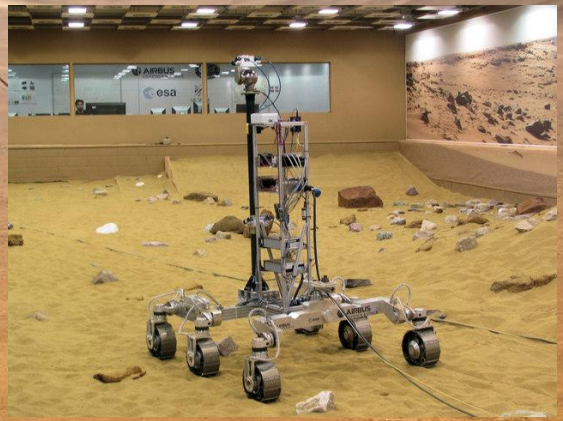
How is that different than regolith?

What is Martian Regolith Simulant?

NASA developed the first simulant - JSC-Mars 1 - in 1997.

During the Mars Phoenix mission, MMS-1, a more accurate simulant, was developed.





Simulants


Magnitude.io
Can we garden on Mars? • Simulants and Basalt / Types of Rocks

Organic Amendments

Examples of Experiments

From Left to Right

- Vermiculite
- M&S Agar
- Coffee Grounds
- Grass Clippings
- Knox Gelatin

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Examples of Experiments

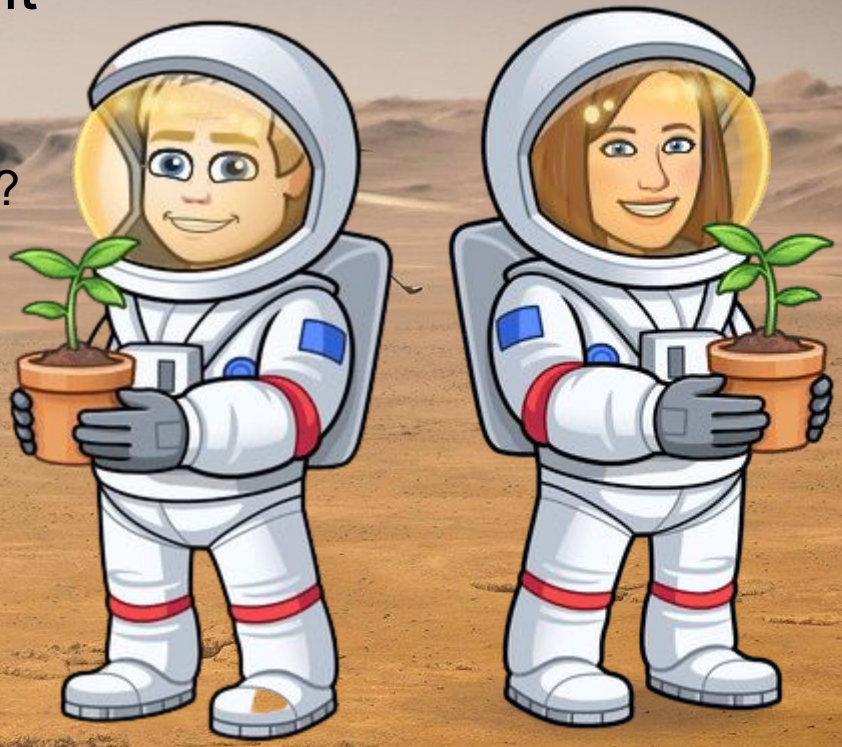
Sources for Regolith & Regolith Alternates

The Martian Garden -The Martian Garden supplies Mojave Mars Regolith Simulant and Kits to Researchers, Hobbyists, and Educators Around The World. Based on NASA and JPL Research, Mojave Mars Simulant is as close as you can get to Mars without leaving the Earth. https://www.themartiangarden.com/

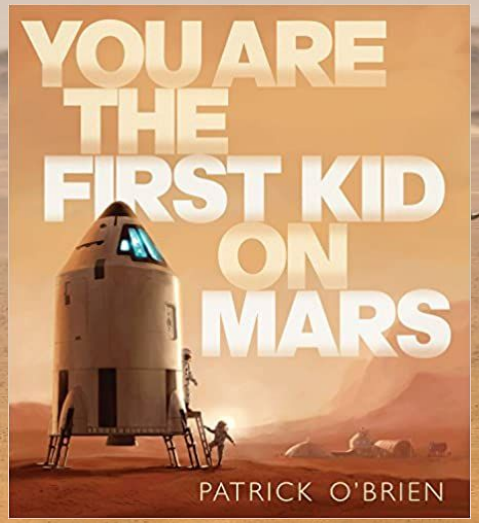
Exolith Lab - The Exolith Lab is a not for profit extension of CLASS at UCF in Orlando, dedicated to regolith simulant production and applied research. Martian, Lunar, & Asteroid simulants available. https://exolithsimulants.com/

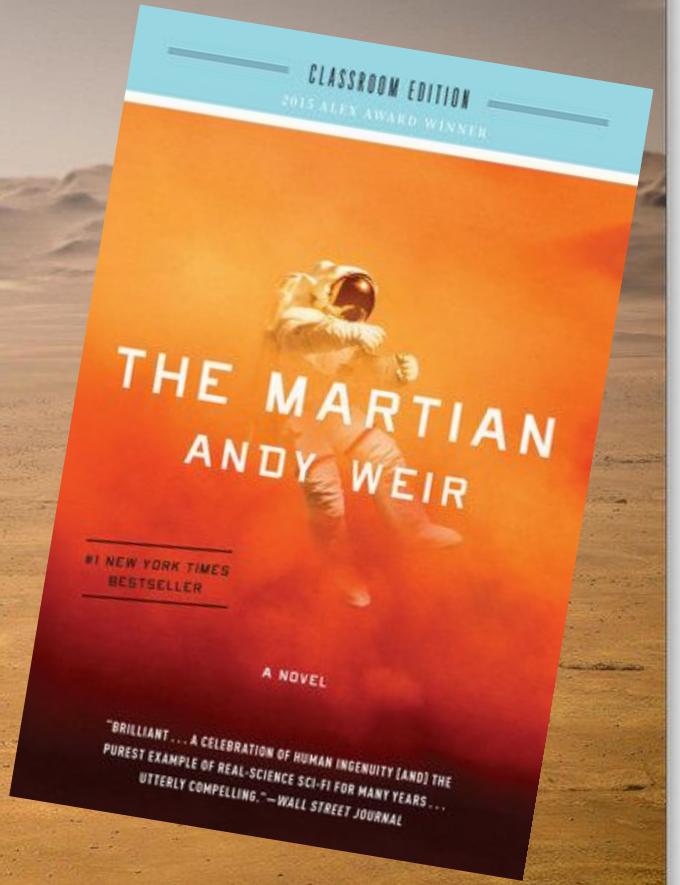
Design Your Experiment

- What are your variables?
- What materials will you use?
- What is your hypothesis?



Literacy Connections





Questions?

Thanks for joining us!

We'd love to hear the results of your experiments!

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Lauren Parker- LParker@fwacademy.org

GIVEAWAY TIME!!