Lesson 7: Life Hosting Rocks

Summary
This learning module and related laboratory exercise exposes students to the types of lithologies on Earth that host life and the sedimentary processes that formed them.

Learning Goals

Students will be able to:

- Recognize and identify sedimentary rocks on Earth and Mars.
- Identify sedimentary structures that provide clues as to the environment of formation (i.e. mud cracks, cross-bedding etc.).
- Observe the expansion of clays and explain why water influences clay-rich rocks at the molecular level.

Context for Use
This learning module is meant for adaptation in an introductory earth science course and/or planetary science course. Students need a prior knowledge of minerals before going through this module. Provide an understanding of grain sorting and sedimentary structures resulting from varying energy in the system (i.e. low energy = laminations; cross-bedding = higher energy system).

Description and Teaching Materials
In-Class Activity
In-Class Activity 1: Swelling Rocks
In-Class Activity 2: *Understanding Albedo*
Homework/Lab
Homework 1: The Energy of Rocks

Teaching Notes and Tips

1. The *In-Class Activities* can be utilized as homework as well. The activity is designed as such that students can effectively complete the activity at home.

Assessment

- Each *In-Class Activity* and *Homework* has its own method of assessment.

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References and Resources

1. Image file: Life-Hosting Rocks
2. Swelling clay-rich soil demonstration: http://www.youtube.com/watch?v=ACpuYED9WkU
3. Ripple-formation video: http://www.youtube.com/watch?v=zRGuMddjRGg&list=PL17AFB4B8AB3DCCF7
4. Laminar-flow video: http://www.youtube.com/watch?v=W3YZ5veN_Bg

Mars for Earthlings

Homework 1
Life-Hosting Rocks_MFE
The Energy of Rocks

Purpose: Recognize the energy of the environment by its sedimentary structures.

Corn Syrup and Water Experiments
Watch the following videos:

- Flume Experiment: http://www.youtube.com/watch?v=zRGuMddjRGg&list=PL17AFB4B8AB3DCCF7
- Corn-Syrup Experiment: http://www.youtube.com/watch?v=W3YZ5veN_Bg

1. As the students watch the videos, compare/contrast the following parameters:

Parameter	Corn Syrup	Water
Velocity of flow		
Type of structures formed		
High or low energy environment		

The dynamics of sedimentary environments

2. Compare the following environments of deposition according to the following parameters: [Have the students write their answers a-c to the right of the image]
    a. Processes at work
    b. Strength of weathering and/or erosion
    c. Preservation potential of life

Figure 1: Cathedral Cove; Channel Islands National Park, CA. Image: nps.gov

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Figure 2: White Sands National Monument, NM. Image: nps.gov

Sedimentary structures/textures on Mars

3. Similar to Question #3, annotate to the right of each image of Mars below:
    a. What structures do the students see?
    b. What is a likely environment of formation?
    c. Was the environment high or low energy in your opinion?

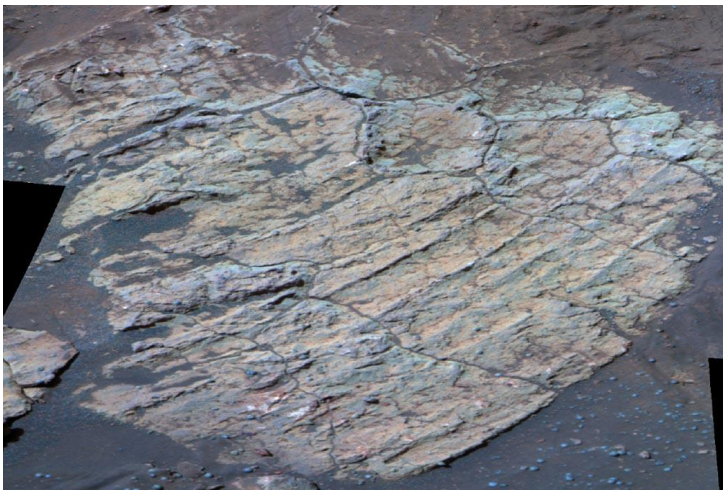

Figure 3: "Escher" rock in Endurance Crater investigated by Opportunity rover; Image Credit: NASA/JPL

Mars for Earthlings

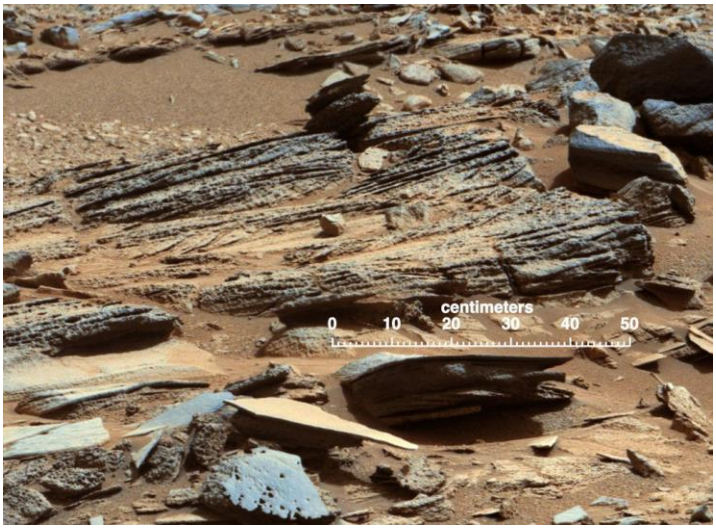

Figure 4: "Shaler" outcrop at Gale Crater investigated by MSL Curiosity rover; Image Credit: NASA/JPL-Caltech/MSSS