Mars for Earthlings

## LESSON 3: Missions to Mars

***In-Class Activity 1***

*Measuring "the tiny"*

**Purpose**: Determine a method to detect elements of interest (water and/or life-indicating) on Mars and become familiar with mass spectrometer devices on Mars-bound missions.

**The Periodic Table**

1. Find the elements carbon, potassium, and oxygen on the periodic table provided by your instructor. How are they different, and how are they the same?

   What are the measureable attributes of these elements?

**Measuring "the tiny"**

1. With a few other students, devise a method to measure the amount of these elements in the rock provided.
   a. What exactly do you need to measure? The charge? The mass? The weight?

   b. Do you want the rock to remain a solid for measurement? Why or why not?

   c. List your method in at least (3) steps.

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2. Can you turn this method into an instrument? Describe your instrument and draw it below:

3. Watch the following NASA Mass Spectrometer Video: http://www.youtube.com/watch?v= L4U6ImYSj0. How does your instrument compare to the one in the video?

4. Can you use your instrument to detect elements on Mars? Why or why not?

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***Homework 1***
Views & Missions in Space_MFE
*A Mission Comparison*

**Objective**
Explore past exploration of Mars and discuss the increase in sophistication and resolution of data over century and decadal scales.

**Introduction**
Space exploration is an iterative process; current exploration builds on the knowledge and technological breakthroughs of past missions, which allows for further improvements to spacecraft and instruments. This process is best illustrated by comparing two wildly successful missions: Viking launched in 1975, and MSL (Mars Science Laboratory) launched in 2011.

**Part 1**
Watch the following videos then answer the following questions:

- Viking Missions to Mars:
  http://www.youtube.com/watch?v=ggjD3i7efKU
- 7-Minutes of Terror:
  http://www.youtube.com/watch?v=h2I8AoB1xgU
- MSL Curiosity Entry, Descent, Landing:
  http://mars.jpl.nasa.gov/msl/mission/timeline/edl/

1. What are some of the complicating factors with landing spacecraft on the surface of Mars?

2. How is the entry and landing of Viking similar to Curiosity?

3. How does the entry and landing differ?

4. What is your favorite component to Curiosity's landing procedure (EDL)?

5. How were the landing sites for Viking 1 and 2 selected? How does this differ for the landing site selection for MSL?

**Part 2**
**Discuss the increase in resolution and available data**
As imaging/data collection capabilities increase, our ability to comprehend geologic features increases. Consider this through the next activity.

# Mars for Earthlings

Exploration of historic maps available through google earth

1. Open Google Earth
2. Click on the planet icon in the toolbar and select Mars (alternatively, go to top tool bar and click "View" → "Explore" → "Mars") to switch to Google Mars.
3. In the "Layers" panel to the lower left, click on the arrow by "Historic Maps" to expand the layer options and check the circle next to "Giovanni Schiaparelli - 1890" (make sure that the global maps layer circle is unchecked).
   A. What are some general observations regarding this map?

   B. What are the prominent features?

4. Click on "Giovanni Schiaparelli" in the layer options to access information about this map.
   A. How and when did he make this map?

   B. What do you think the linear features are in this map?

5. Now click on the arrow by "Global Maps" to expand the layer options, and check the circle next to "Viking Color Imagery".
   A. What are the similarities between the historic maps and the global mosaic from spacecraft data?

   B. How do the historic maps differ from the global mosaics?

**"Face on Mars"**

Go to this website: http://www.msss.com/education/facepage/face.html

1. How does lighting direction influence the appearance of the "Face"?

2. How does the "Face" seem to change when viewed under higher-resolution imagery?

3. Does it still look like a face under higher resolution?

**Questions**

Based on the discussion of historic global maps and the "Face on Mars", answer the following questions:

1. How does the increase in resolution affect our understanding of geologic landforms?

2. How does this relate to the scientific process in general?