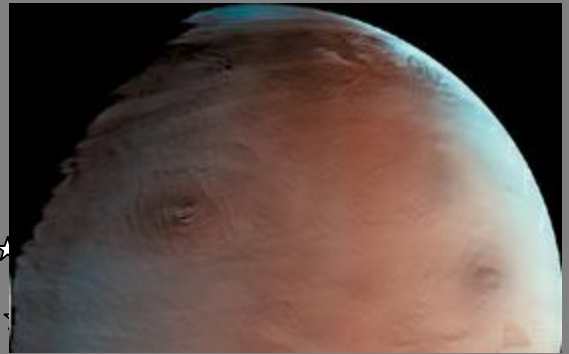


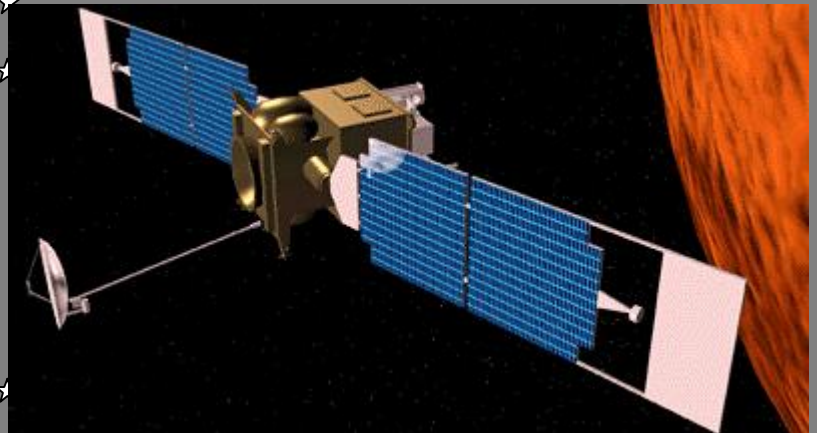
Mars and Beyond!



Mars taken by Mars Orbital Camera



Family Portrait of Jupiter's Great Red Spot and the Galilean Satellites



Mars Global Surveyor

By Nancy Wilkinson

Mars and Beyond
Lesson 6
Mars Global Surveyor and Thermal Emissions Spectrometry

Objectives:

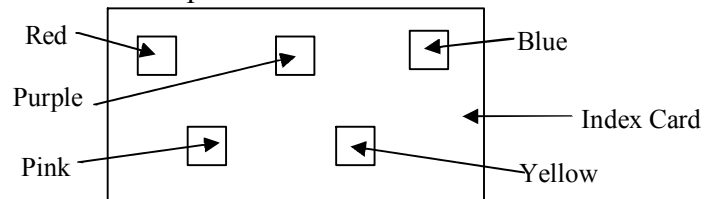
Use a variety of strategies to determine how the change in one quantity affects the change in another quantity.

Materials Needed:

- 1) Prism
- 2) Overhead
- 3) Draw the following picture on the overhead or chalkboard
- 4) A light probe for each team.
- 5) Five different colors of cellophane paper and two index cards for each group. Cut out five squares in each index card. Make sure the holes are all in the same spot for each card. Cover each hole with a different color



Thermal Emissions Spectrometer-
Courtesy of Arizona State University



of cellophane. Glue the other index card on top so that the five holes match each other. Make one card for each team.

Opening Activity:

- 1) Read the following excerpt to the students:

On September 11, the Mars Global Surveyor began orbiting Mars. One item on the Mars Global Surveyor, otherwise known as M.G.S., is called T.E.S. T.E.S. stands for Thermal Emissions Spectrometer. This experiment took spectra or a sort of picture of Mars while it is performing a polar orbit. A polar orbit goes around the planet passing over the north and south poles. "TES provides information to determine the kinds of rocks and minerals on Mars. It also measures temperature and pressure of the atmosphere, observes how the polar ice caps grow and shrink with the seasons and looks for dust storms." (K. Edgett).

- 2) Put the prism on the overhead. Say to the students:

What colors do you see? The prism takes the light and breaks it up into colors. The colors are called a spectrum. T.E.S. has a prism like feature also. It breaks the light up into 143 colors. Each color's wavelength is measured and then plotted on a line graph.

Essentially, T.E.S. takes the infrared light that is reflected off of different objects and breaks them up into individual wavelengths. Each rock type or mineral makes a different line graph. A computer program at Arizona State University, will match the line graphs or spectra with Earth mineral spectra. This will tell the scientists what minerals are on Mars.

Activity:

- 1) Go outside. Using a light probe, measure the amount of light reflecting off of the object or the sun. Write this number down.
 - 2) Place a red filter in front of the light probe. Measure the amount of light reflecting off of the object or the sun through the red filter. Write this number down.
 - 3) Repeat step two with the blue, purple, orange and yellow filters. Write each number down.
 - 4) Be sure to check the natural light between each measurement.
 - 5) Do the same activity in the shade.
- 1) Create a graph with the X-axis showing the five colors. The Y-axis should show your numbers. Make sure you choose a scale that will show the change clearly.
 - 2) Mark a dot for each color filter.
 - 3) Connect the dots. You now have a mini spectra graph of five colors.

Closure:

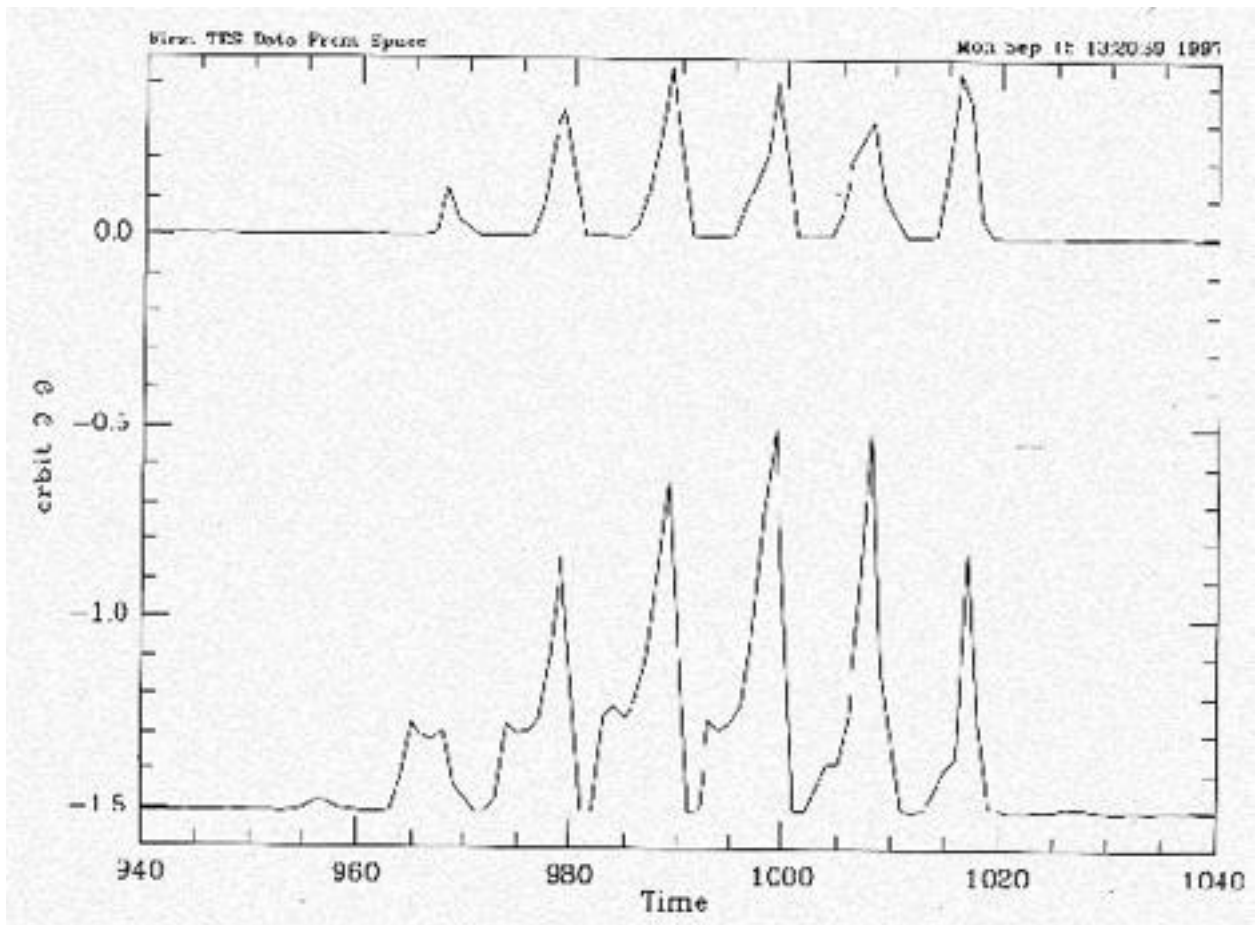
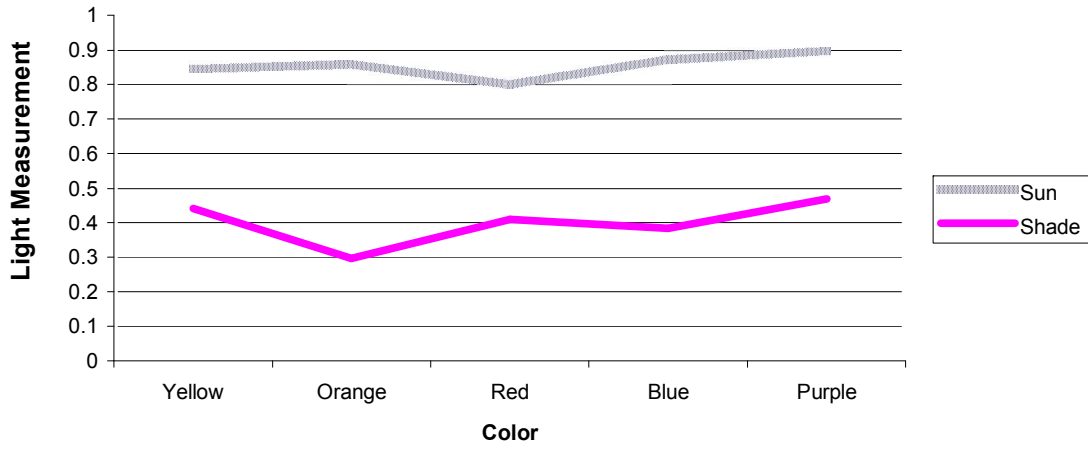
Students may share their graphs with the class.



Mars Observer launched September 25, 1992 - Attempted Mars Orbiter (Contact Lost)

Example Spectra Graph

Thermal Emissions



An Actual Martian Spectra Taken from T.E.S.