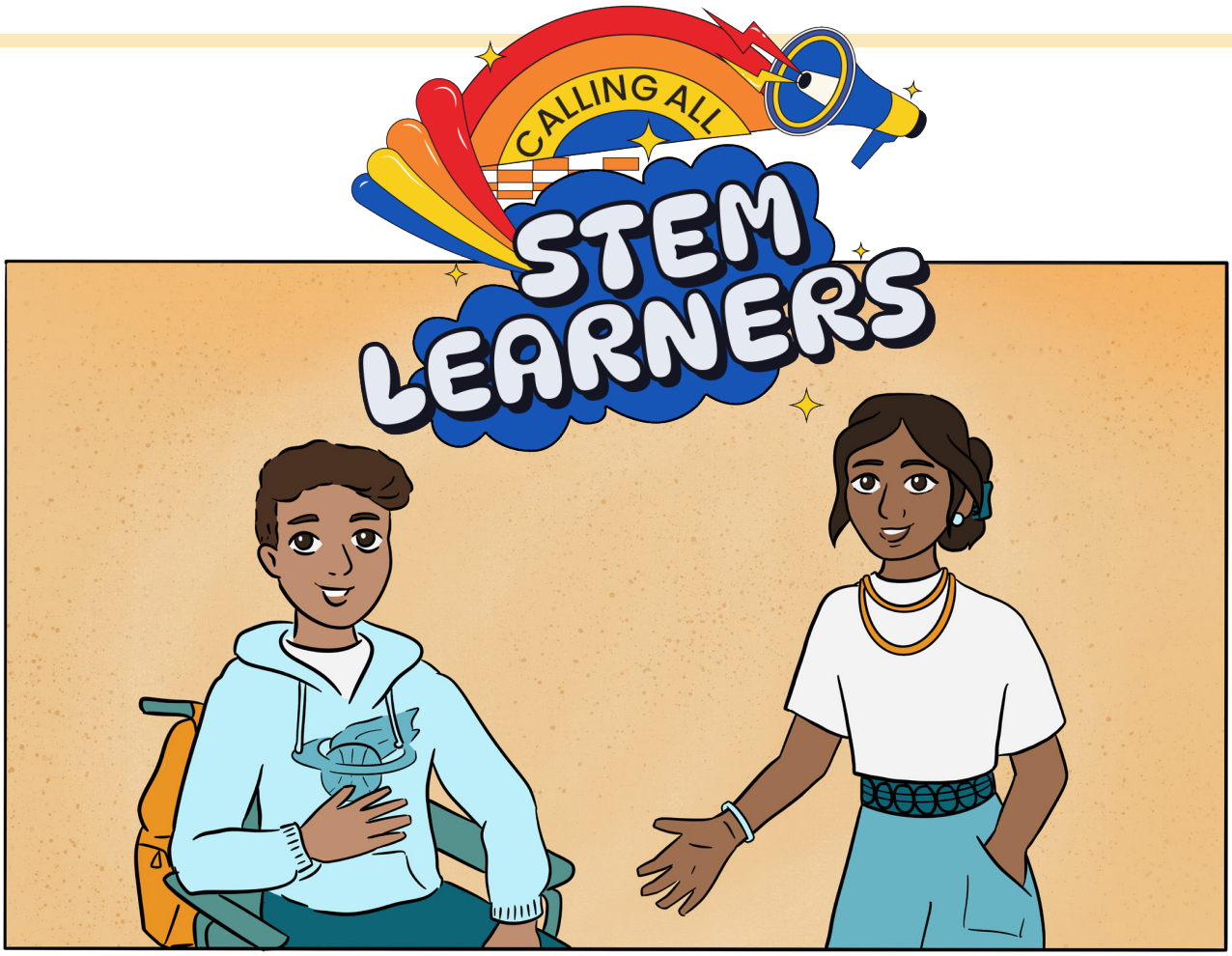


Your PLANETS Science Notebook

for:

Worlds Apart! Remote Sensing of Mars

Name: _____

PLANETS

Ready, S.E.T., Go!

Missions to Mars

1. Choose one type of survey mission to design for:
   - **Global Survey**: a long-term mission to explore and map a new planet or moon
   - **Landing Site Selection Survey**: a short-term mission to choose the best place to land a robot or human on the surface

2. Figure out what your survey mission needs to do:
   - **Level of Detail for Images**:
     High Detail Low Detail
   - **Measuring Shape and Texture of Surface**:
     Required Optional
   - **Measuring What the Surface Is Made Of**:
     Required Optional

3. List the limits on your design:
   - **Space Required**: All instruments must fit inside the fairing without overlapping.
   - **Power Required**: _____
   - **Data Volume Required**:_____
   - **Weight Limit**:_____

NASA Career Spotlights

Photo Credit: N4 Solutions

Dr. Berhanu Bulcha

My job at NASA is to create advanced technology that collects images and data on planetary bodies, like Saturn's moon Enceladus, so that we can detect what molecules are there and look for potential life in space.

Mike Scott

My job at NASA is to make sure we always have enough power (and battery charge) on the space station.

Science Activity 1: Technology Stories: Sharing Experiences

Why is technology important?

My Technology Story

Think of a story about a technology or tool that made a big difference in your life.

- It can be a story you heard, watched, read, or experienced.

Then

- write or draw your story on this page, or
- build something to demonstrate it.

NASA Career Spotlights

Photo Credit: Aubrey Gemignani/NASA

Dana Bolles

My job at NASA is to ensure all users can enjoy our science websites.

Science Activity 3:
Red Planet Places: Landforms on Mars

Landforms We Notice

Review the images of the landing sites. Circle the landforms you find. If a landform is evidence of water, circle the water droplet.

Gale Crater

River Valley 

Layered Rocks 

Alluvial Fan 

River Delta 

Lava Flows 

Sand Dunes 

Jezero Crater

River Valley 

Layered Rocks 

Alluvial Fan 

River Delta 

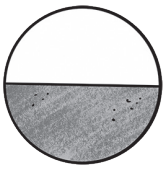
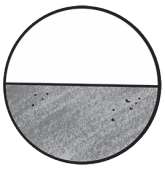
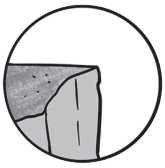
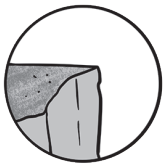
Lava Flows 

Sand Dunes 

Science Activity 5:
Cliffs and Craters: Exploring Topography on Mars

Topography We Notice

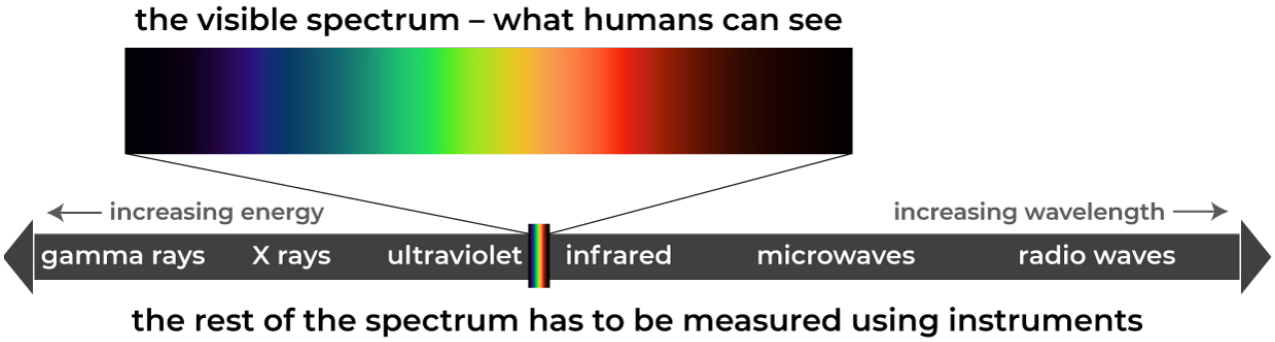
Review the topographic maps of the landing sites.
Circle the features you find.

Gale Crater	Jezero Crater
 Flat Area	 Flat Area
 Gradual Slope	 Gradual Slope
 Steep Cliff	 Steep Cliff
 Small Hill	 Small Hill
 Large Hill	 Large Hill
Other:	Other:

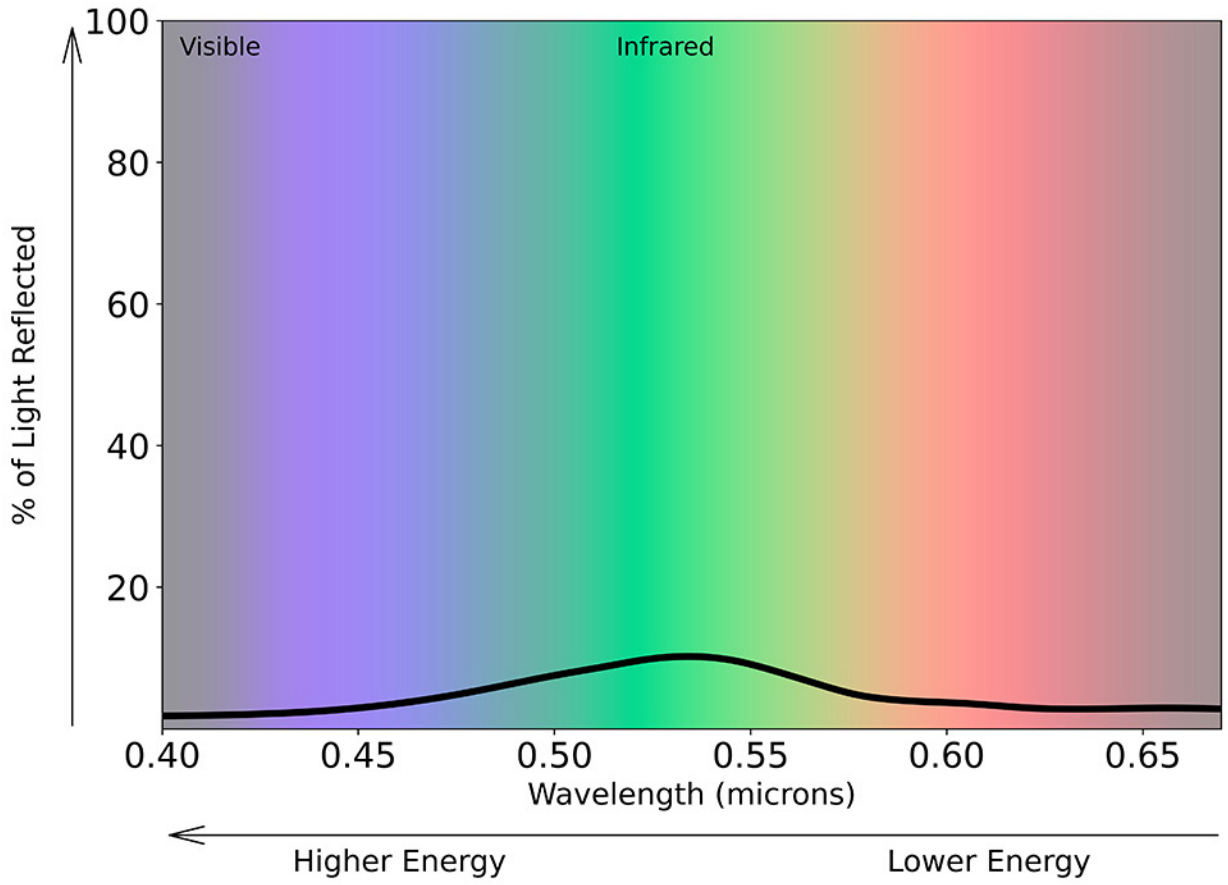
Science Activity 6: Beyond the Rainbow: Introducing Spectroscopy

Electromagnetic Spectrum

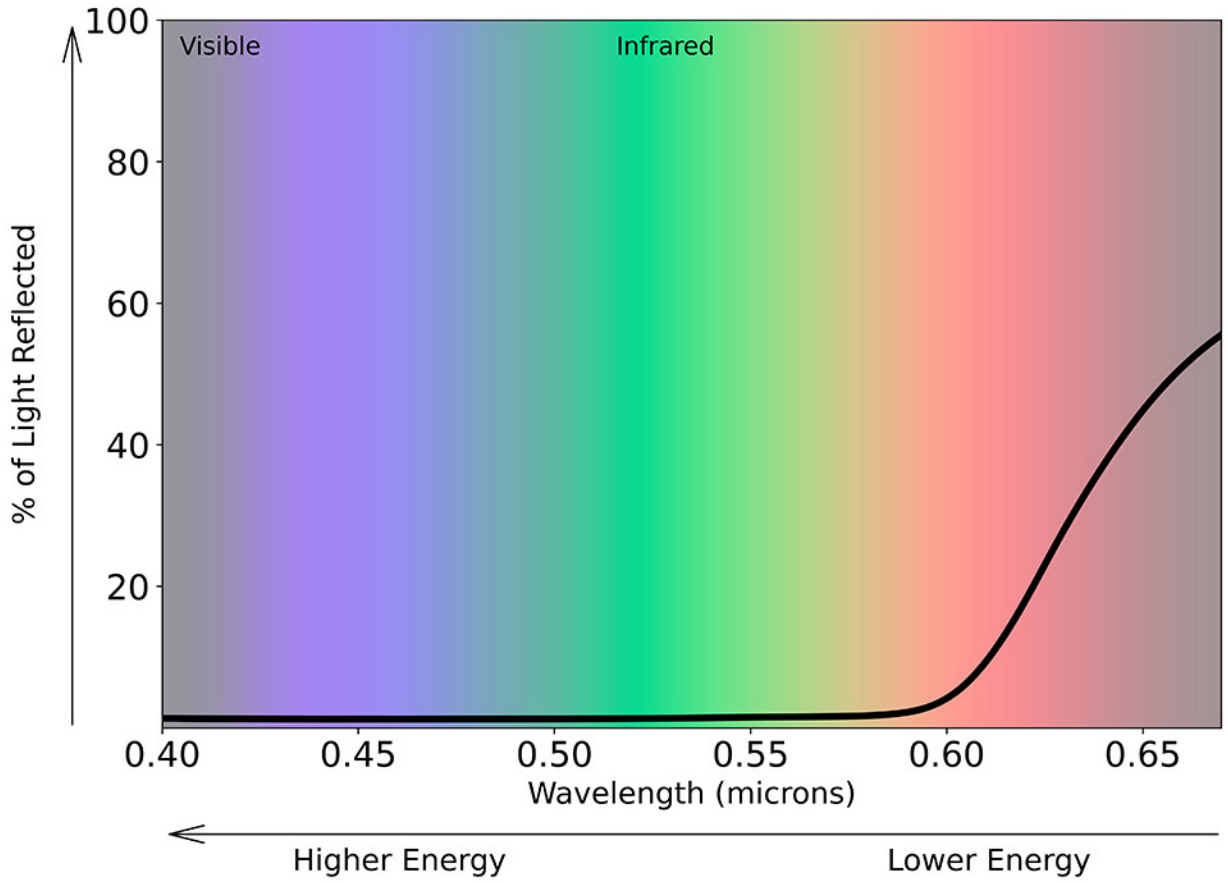
You might know more about the electromagnetic spectrum than you think! Different parts of the spectrum have different names, including gamma rays, x-rays, ultraviolet (UV) rays, visible light, infrared (IR) waves, microwaves, and radio waves.



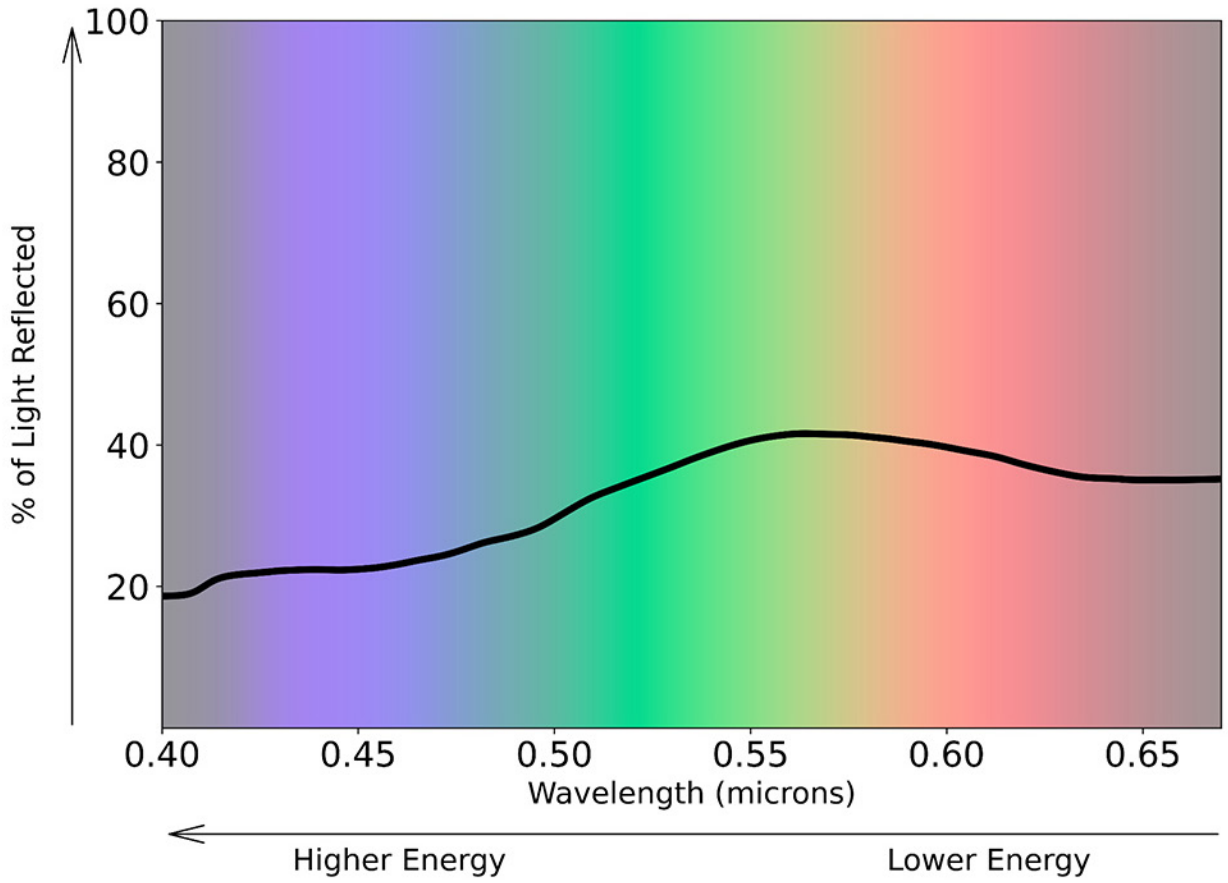
Green Paint


100
80
60
40
20
% of Light Reflected
Visible
Infrared
0.40
0.45
0.50
0.55
0.60
0.65
Wavelength (microns)
Higher Energy
Lower Energy

Red Paint

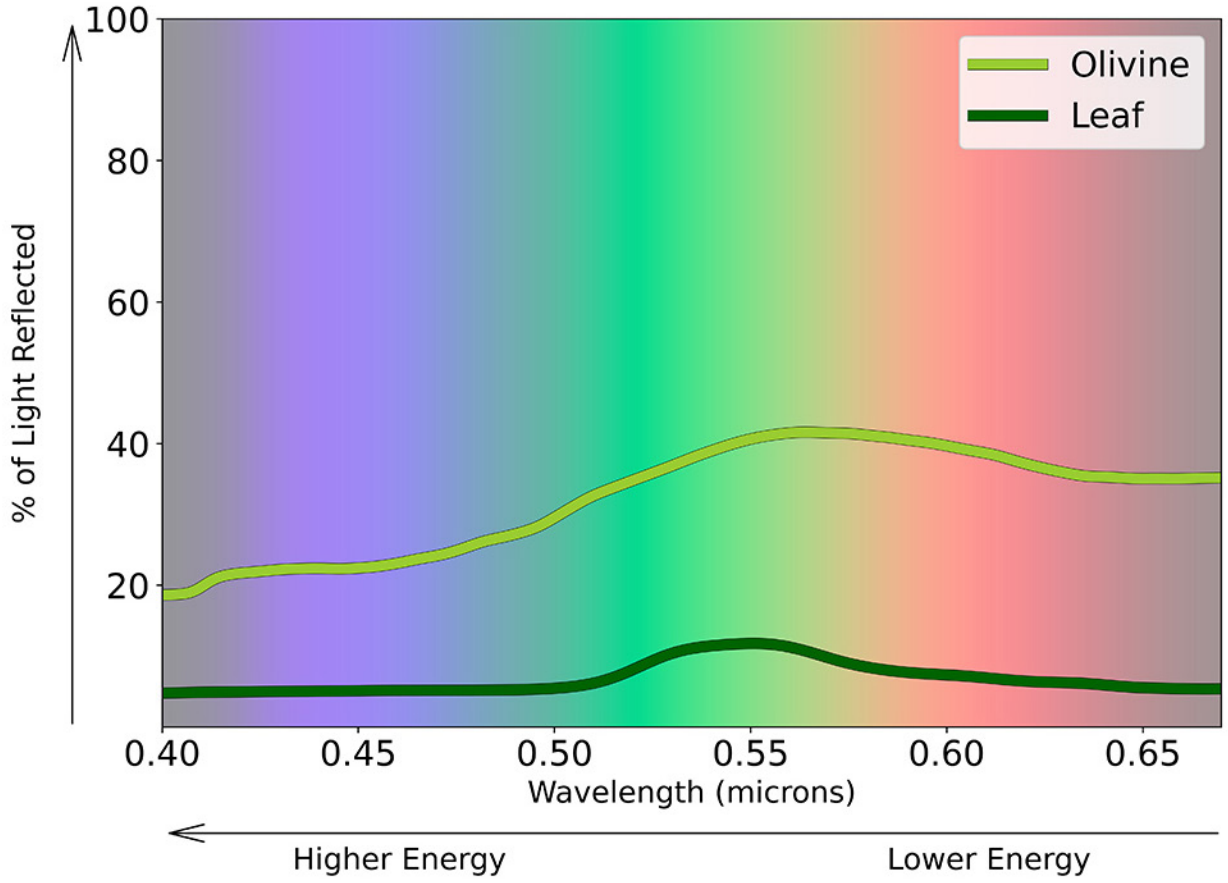

100
80
60
40
20
% of Light Reflected
Visible
Infrared
0.40
0.45
0.50
0.55
0.60
0.65
Wavelength (microns)
Higher Energy
Lower Energy

Olivine


100
80
60
40
20
% of Light Reflected
0.40
0.45
0.50
0.55
0.60
0.65
Wavelength (microns)
Higher Energy
Lower Energy

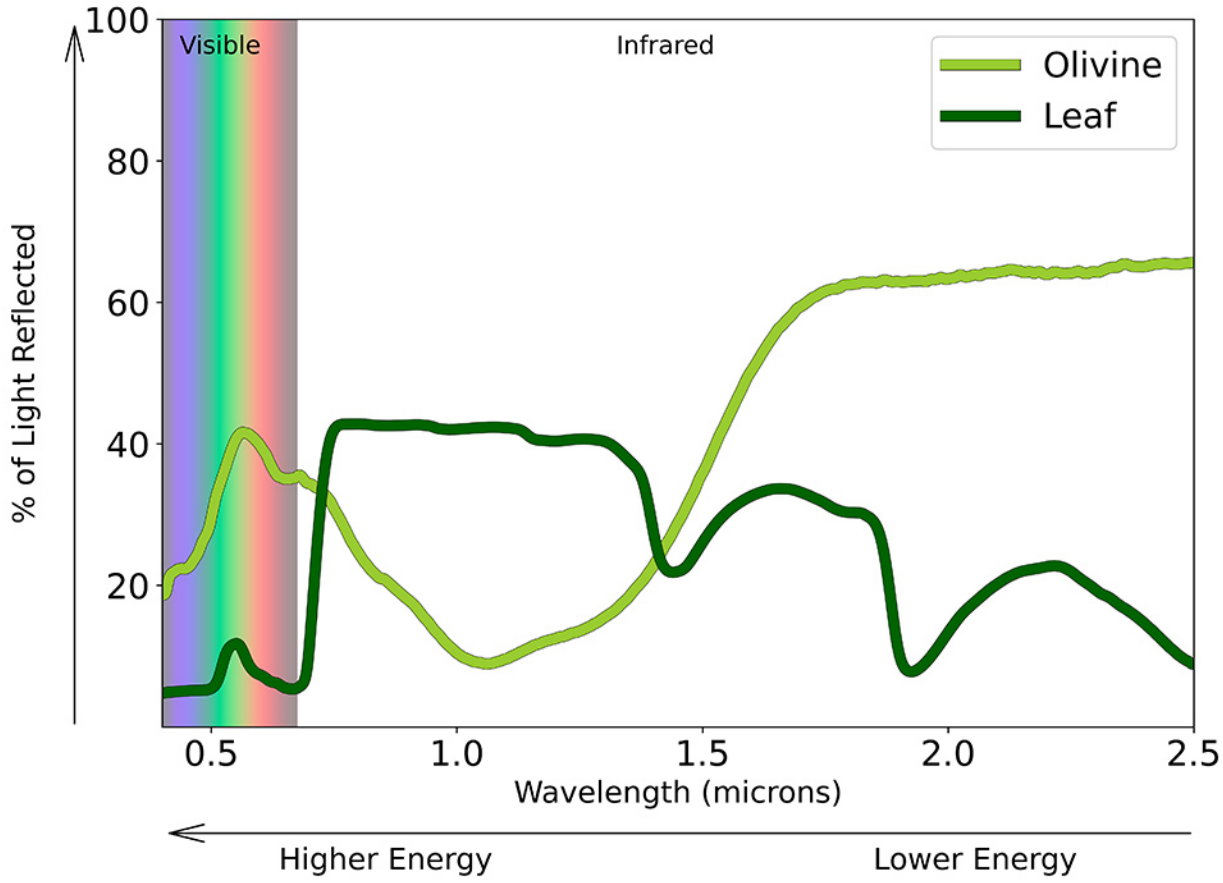
Science Activity 7: Hidden Minerals: Using Spectroscopy to Understand Mars

Comparing Green Things–Visible



A graph of the reflectance spectra of the volcanic mineral olivine and a green maple leaf. Both have similar spectra, with a peak of reflectance in the green part of the visible spectrum. If you just had spectra and no images or other information, they would be difficult to tell apart using just visible light!

Comparing Green Things–Visible and Infrared



A graph of the reflectance spectra of the volcanic mineral olivine and a green maple leaf, but now showing the amount of both visible light and invisible infrared light reflected. The spectra of olivine and a green maple leaf are very different in the infrared, even though they are similar in the visible range. Measuring the infrared light makes it easy to tell them apart!

Minerals We Notice

Review the spectra from the landing sites. Circle the minerals you find. If a mineral is evidence of water, circle the water droplet.

Gale Crater

Olivine 

Pyroxene 

Kaolinite 

Nontronite 

Kieserite 

Gypsum 

Jezero Crater

Olivine 

Pyroxene 

Kaolinite 

Nontronite 

Kieserite 

Gypsum 

Science Activity 8: Destination Mars: Choosing a Landing Site and Preparing for the Science Showcase

Make the Case for Your Site

Share the evidence you collected. Explain why NASA should send a rover to your top site. Record your response.

We think NASA should send a rover to

We have chosen this site because

(1)

(2)

(3)

NASA Career Spotlights

Photo Credit: David Tuman

Aaron Yazzie

My job at NASA is to design robotic mechanisms and tools that allow us to gather rock samples from Mars and beyond.

Humans have never been to Mars, so it's important to learn as much as we can about the planet before we go there.