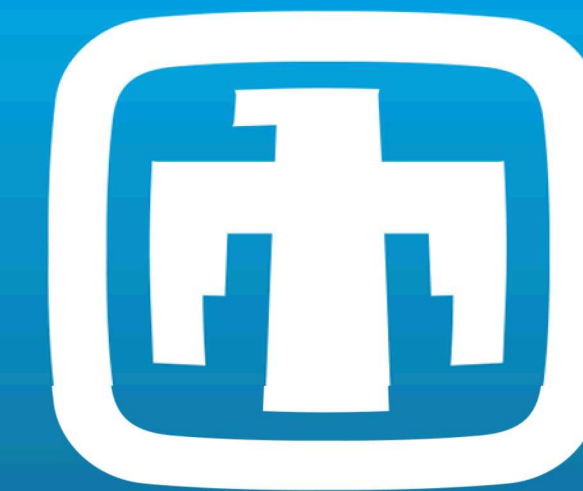




Measuring Atoms on Mars and on Earth – Compare the Data

Curtis D. Mowry

Sandia National Laboratories Albuquerque NM. Unlimited, Unclassified Release

The Periodic Table Lists All the Elements We Know [1]

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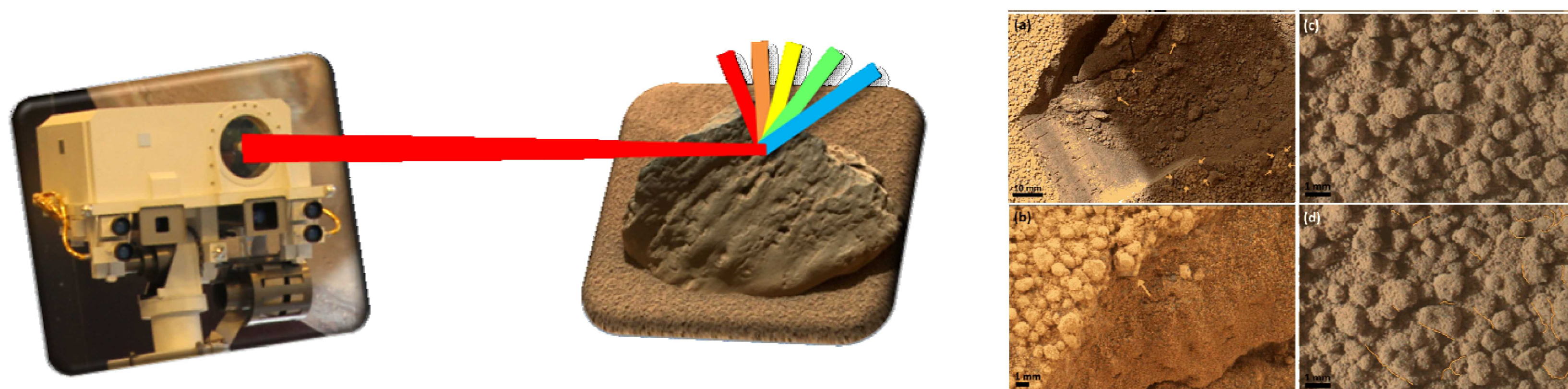
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How does Curiosity Measure Atoms on Mars?

NASA's Mars Science Laboratory (MSL) is a robotic explorer nicknamed Curiosity.[2] It has a "LIBS" analyzer, Laser Induced Breakdown Spectrometer called ChemCam, which is used for detecting chemical elements in Martian rocks and soils – without touching them!



Martian sand [3]

- The laser rapidly *melts* the rock or sand, creating a plasma that emits light.
- Most elements typically emit many different wavelengths (colors).

How do We Measure Atoms on Earth?

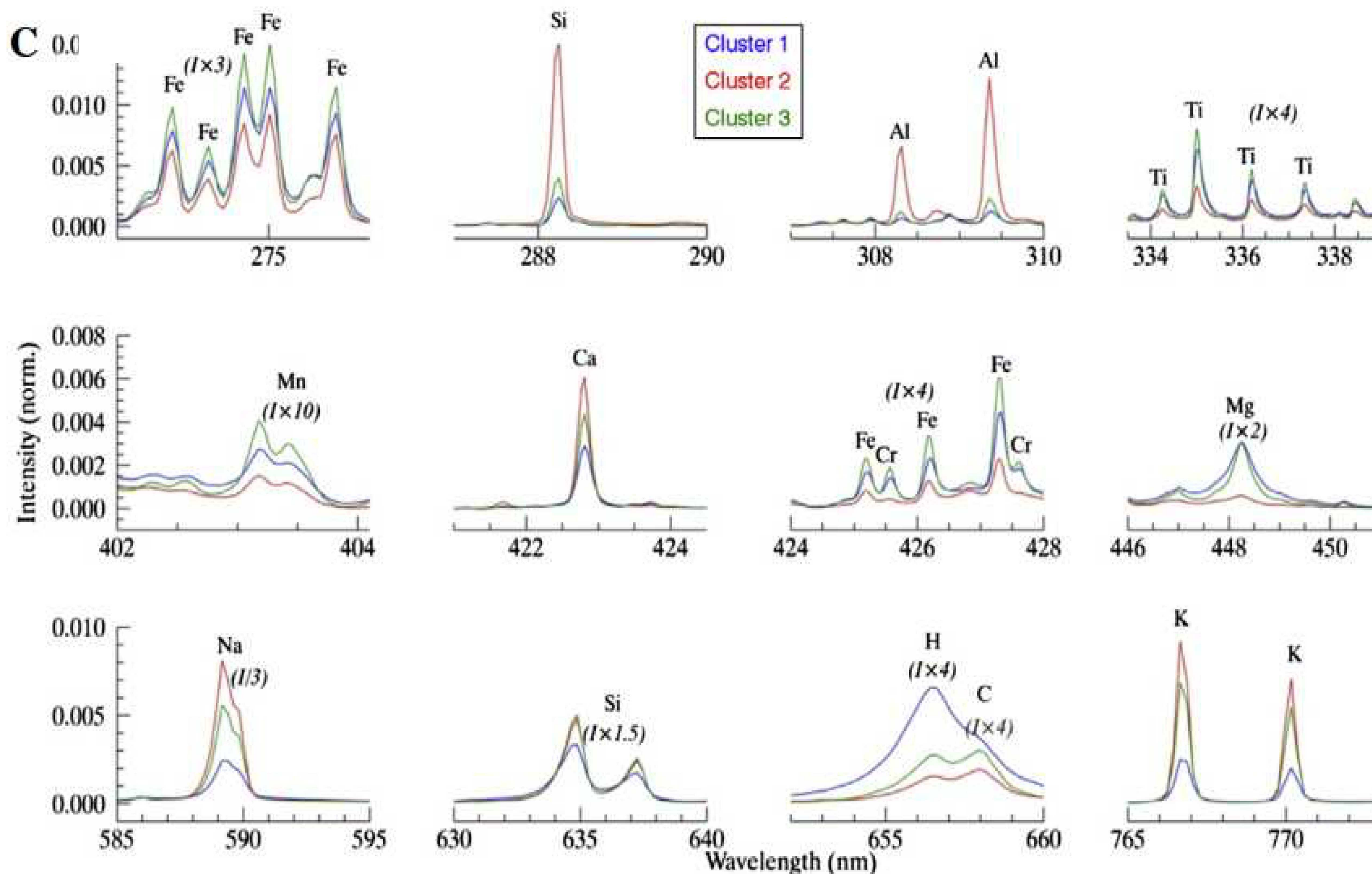
On Earth, we can use the same laser as Curiosity to provide energy to a rock or dirt



- The laser rapidly *melts* the rock or sand, creating a plasma that emits light.
- Most elements typically emit many different wavelengths (colors).

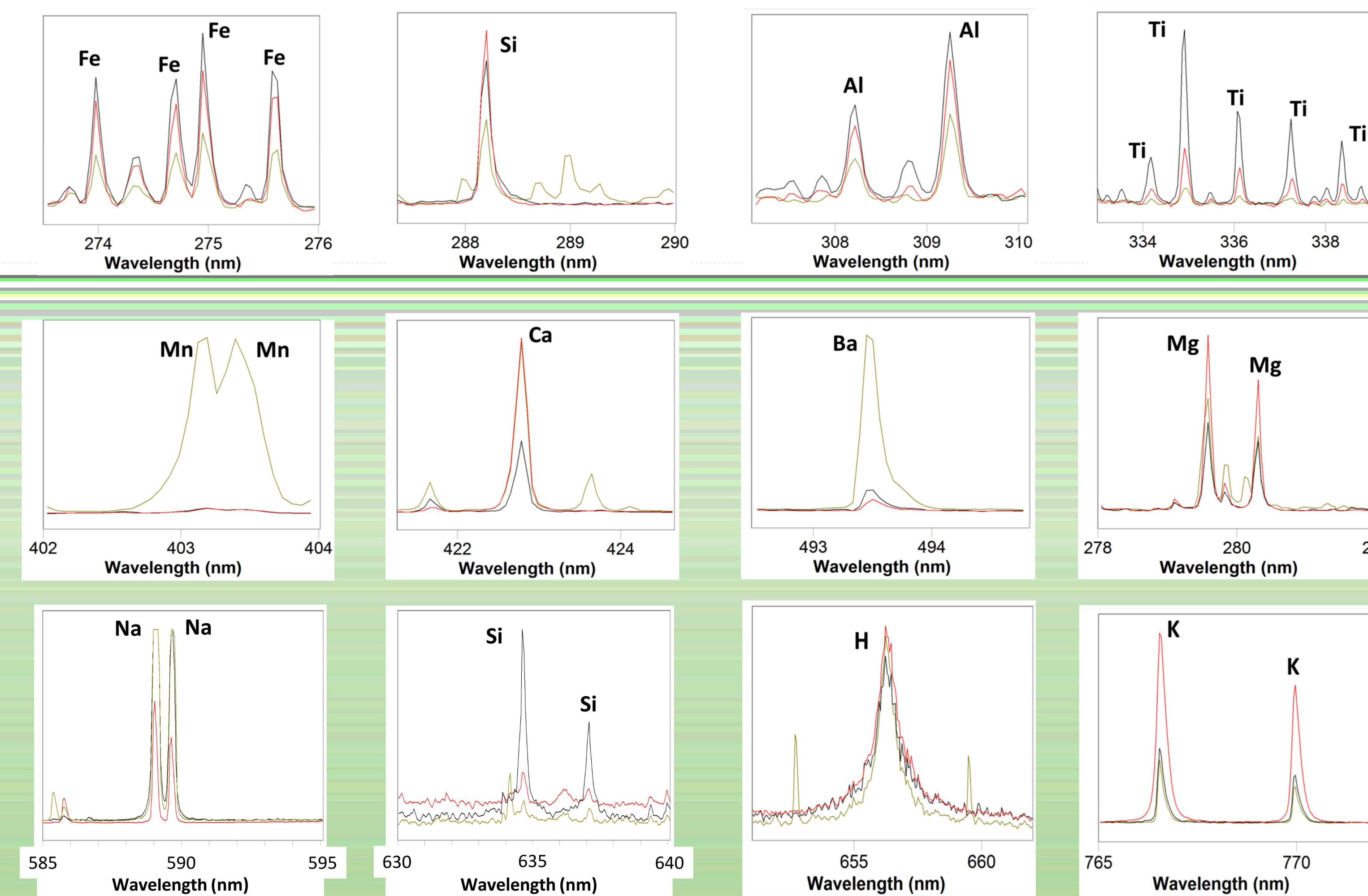
Over 175 Martian days, Curiosity tested about 24 sands.

Clusters 1, 2, and 3 are general sand types found at different locations on Mars. [4]

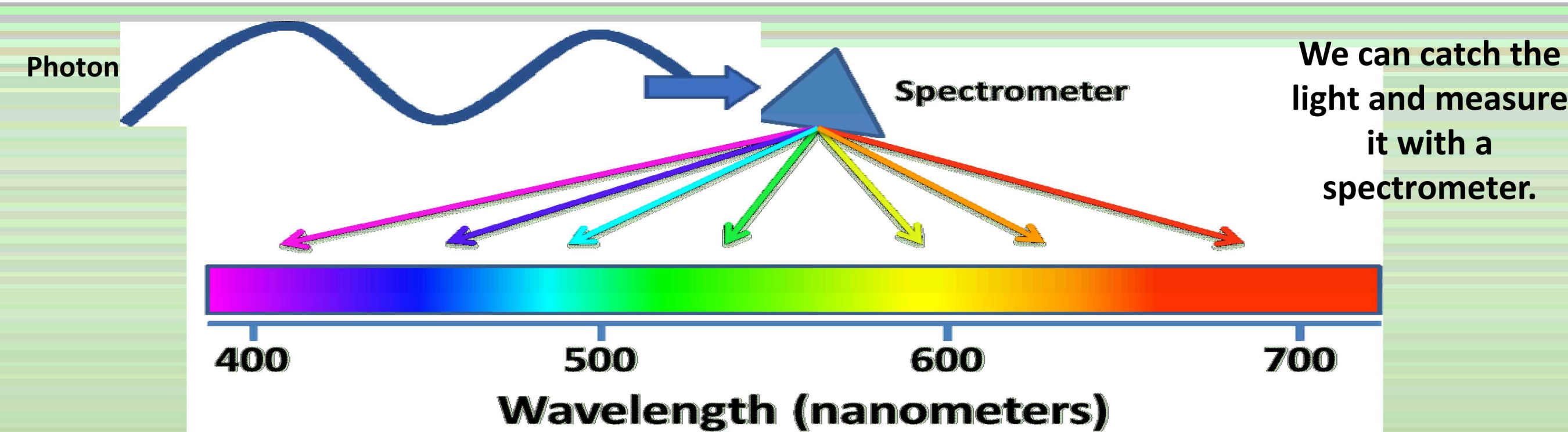
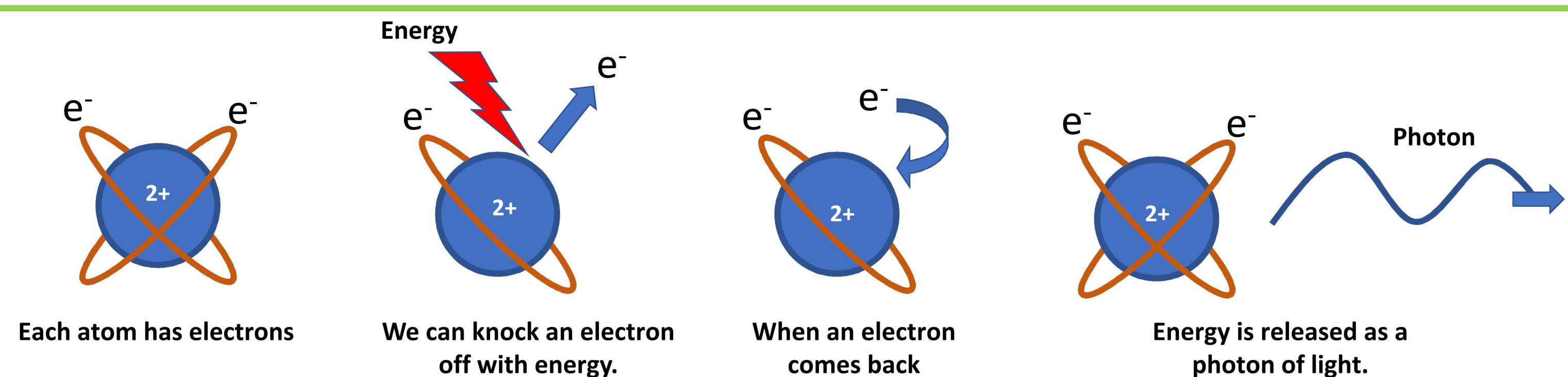


Earth sand - compare to the elements in Martian sand.

In our earth lab we have measured earth sand of different colors: **RED**, **BLACK**, and **YELLOW** shown here. We can detect many elements, and the amount varies in each sand [5]. Can you see any differences? How is this dirt different than Mars dirt?



One way to measure an atom is to detect it's emission.



References

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- Mowry, C.; Milofsky, R.; Collins, W.; Pimentel, A. S., Laser-Induced Breakdown Spectroscopy for Qualitative Analysis of Metals in Simulated Martian Soils. *J Chem Educ* 2017, 94 (10), 1507-1511.

Look to the periodic table to figure out the abbreviations.

Use the spectrum at left to determine the colors of the light.