OUR MOON IN A NEW LIGHT

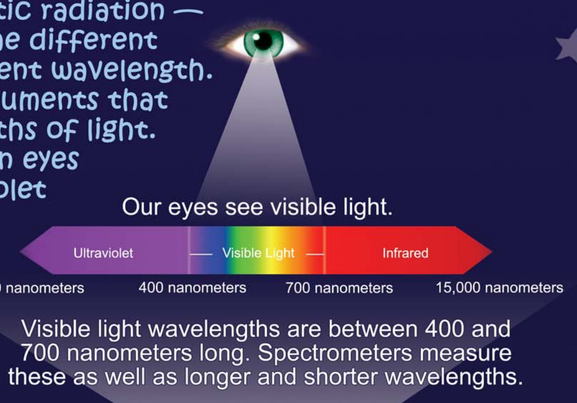
MAPPING OUR MOON!

As we plan our journey back to the Moon, it is important that we know where different types of rocks and minerals are located. Apollo astronauts visited only six places — much of our Moon still needs to be explored . . .

Seeing More

To characterize materials on the Moon, scientists use reflectance spectroscopy, a measure of the amounts of electromagnetic radiation at different wavelengths that reflect from the Moon's surface.

We can see some electromagnetic radiation — our eyes detect visible light. The different colors we see are each a different wavelength. Spectrometers are special instruments that also detect different wavelengths of light. They can measure what our own eyes see and more, including ultraviolet light, infrared radiation, and beyond!

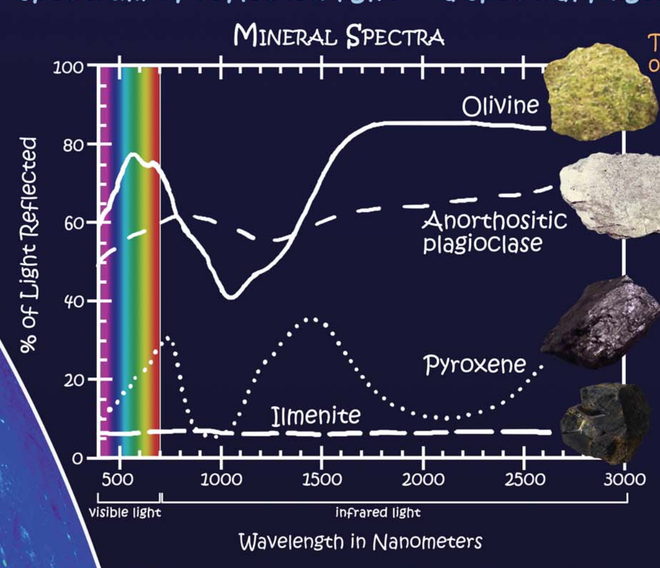


What Can You See?

When you look at the Moon, you see the big dark patches of lunar maria that are made of basalt rock. You also see the bright lunar highlands that are made of anorthosite. But spectrometers help us see even more.

Mineral Fingerprints

Many of the rocks on the surface of the Moon may *look* similar, but they contain different minerals or amounts of minerals. Each mineral reflects very specific amounts of the different wavelengths of electromagnetic radiation, so each mineral has a characteristic spectrum of reflected light — a spectral fingerprint.



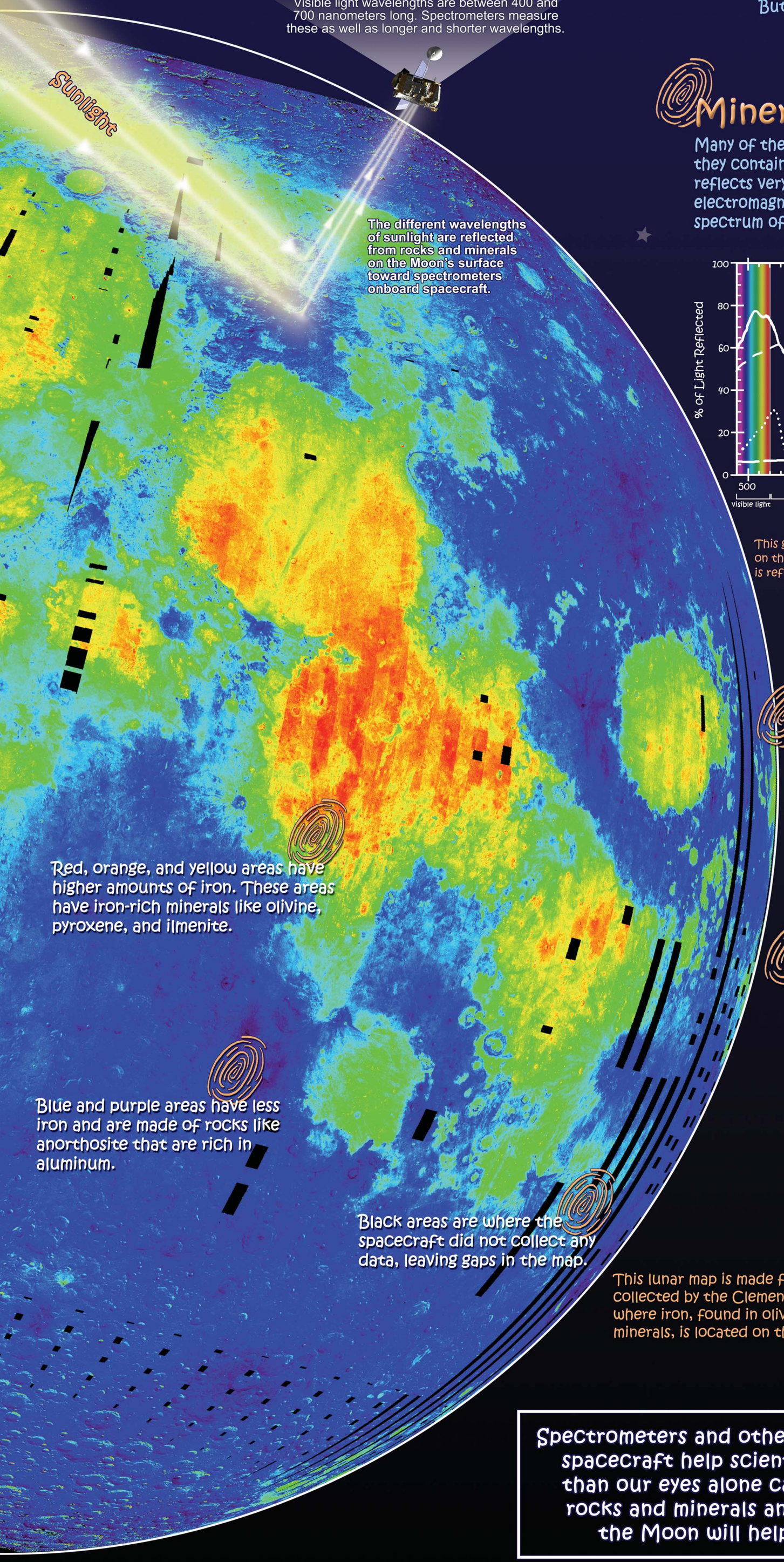
This rock contains olivine, a beautiful, often green, iron-bearing mineral.

The light-colored anorthosite of the lunar highlands is made almost entirely of anorthositic plagioclase, a mineral rich in aluminum and calcium.

Pyroxene is a dark mineral containing iron and magnesium. Basalts of the lunar maria are rich in pyroxene.

Ilmenite contains iron and titanium. It is a dark mineral that reflects little light.

This graph shows spectral fingerprints of different minerals that make up the rocks on the Moon. The shape of each curve — or spectrum — represents how much light is reflected for different wavelengths. Each mineral has a unique spectrum.



Exploring the Whole Moon

Spectrometers onboard spacecraft in orbit around the Moon collect reflectance measurements as they pass over different areas, allowing scientists to gather spectral data from the entire Moon.

Matching Fingerprints

Scientists examine the spectral data collected from the Moon's surface and compare these measurements to spectral curves gathered from known Earth and Apollo rock and mineral samples. This comparison allows scientists to determine how much of each mineral is present at a location on the Moon's surface. Using spectral measurements, scientists can make a very detailed map of the mineral and chemical composition of the entire Moon — without collecting more rocks from the surface!

This lunar map is made from spectral measurements collected by the Clementine spacecraft. It shows where iron, found in olivine, pyroxene, and other minerals, is located on the Moon's surface.

Spectrometers and other special instruments onboard orbiting spacecraft help scientists discover more about our Moon than our eyes alone can detect. Knowing where different rocks and minerals and chemical elements are located on the Moon will help us plan our future exploration.

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