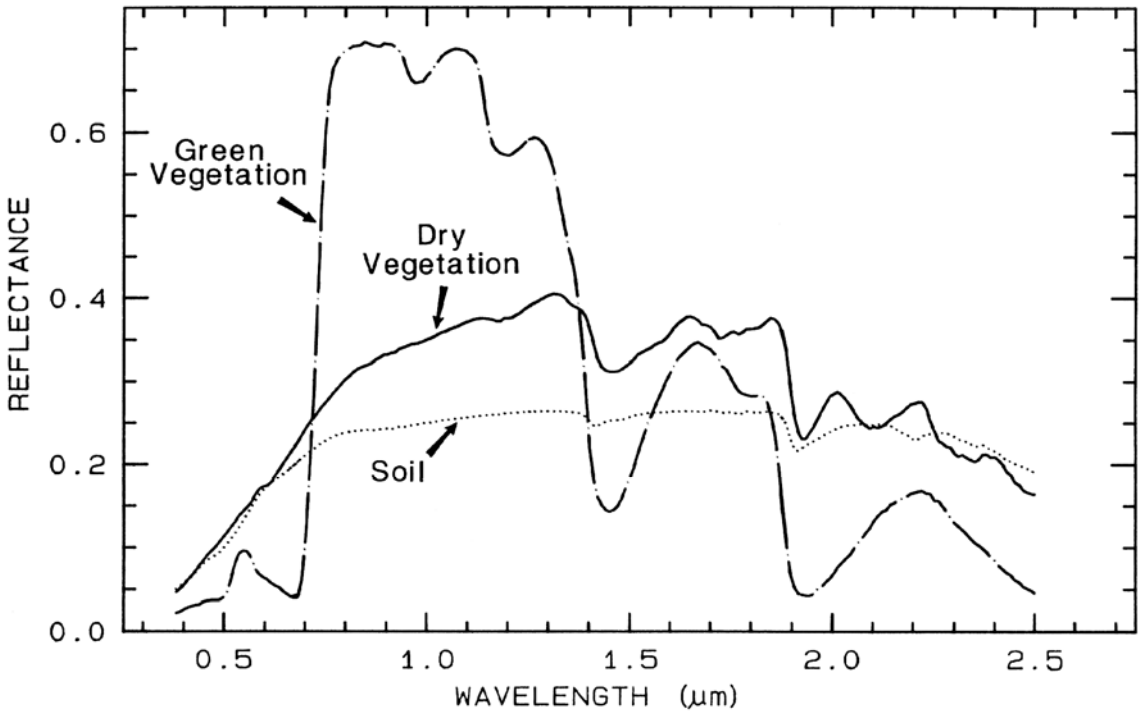

Very precise measurements can be made of the reflectivity of materials that more easily reveal their subtle differences. Above is a plot of the reflectivities of green vegetation, dry vegetation and soil between wavelengths of 0.4 and 2.5 micrometers. Scientists use graphs such as these to design instruments that help them discriminate between a variety of interesting materials and mineral deposits.

Problem 1 - An astronomer wants to map the surface of Mars with telescopes on Earth to search for plant life. What wavelength range would help her more easily discriminate between the martian soil and living vegetation?

Problem 2 - An earth scientist measures the intensity of light between two neighboring land areas at a wavelength of 2.0 microns and 0.7 microns. Spot A appears to be 5 times brighter than Spot B in the longer wavelength band, but nearly equal in brightness in the shorter-wavelength band. What may be the difference in substances between the two spots?

Problem 3 - The difference in the vegetation reflectivity between green vegetation and dry vegetation is that green vegetation still contains the molecule chlorophyll. What is the difference in absorption by chlorophyll molecules at a wavelength of 0.6 microns?

Problem 1 - An astronomer wants to map the surface of Mars with telescopes on Earth to search for plant life. What wavelength range would help her more easily discriminate between the martian soil and living vegetation?

Answer: The graph shows that the reflectivity of green vegetation is substantially brighter than soil between wavelengths of 0.7 to 1.4 microns. At 0.9 microns, the reflectivity of green vegetation is about 0.7 or 70%, while soil is only about 0.25 (25%) at the same wavelength, **so green vegetation is nearly three times as bright as soil at 0.7 microns.**

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Answer: The graph shows that at 0.7 microns, the reflectance curves for green vegetation and dry vegetation cross, which means they are of equal reflectivity at this wavelength. At 2.0 microns, the reflectivity of dry vegetation is about 0.25 or 25%, while green vegetation is much darker and only 0.05 or 5% reflective. **Spot A appears to be 5 times brighter than Spot B so that suggests that Spot B consists of green vegetation and Spot A consists of dry vegetation.**

Problem 3 - The difference in the vegetation reflectivity between green vegetation and dry vegetation is that green vegetation still contains the molecule chlorophyll. What is the difference in absorption by chlorophyll molecules at a wavelength of 0.6 microns?

Answer: From the graph, green vegetation has a reflectivity of about 5% while dry vegetation has a reflectivity of about 20%. Because %emission + %absorption = 100%, the absorption of green vegetation is 95% while dry vegetation absorbs only 80% of the light at this wavelength. **The difference in absorption is 15%**.