

Appendix:

References Cited

Web Sites for Further Exploration

Resources about student misconceptions of light and the electromagnetic spectrum

1. Guesne, E. (1985). Light. In R. Driver, E. Guesne, & A. Tiberghien (Eds.), *Children's ideas in science* (pp. 10-32). Milton Keynes, UK: Open University Press.
Fetherstonhaugh and Treagust (1992)
2. Watts, D.M. 1985. Students' conceptions of light-a case study. *Physics Education* 20: 183-187
3. Zylbersztajn, A. and Watts, D.m. (1982) *Throwing Some Light on Colour* Mimeograph, University of Surrey
4. Driver, R., A. Squires, P. Rushworth, and V. Wood-Robinson. 1994. *Making sense of secondary science: Research into children's ideas*. London and New York: RoutledgeFalmer.
5. Anderson, C. and Smith E. (1986) Children's Conceptions of Light and Color: Understanding the Role of Unseen Rays. Research Series No. 166.
6. Eaton, J., Harding, T., and Anderson, C.W. (1985) *Light: A teaching module*. East Lansing, MI: Institute for Research on Teaching, Michigan State University.
7. Plait, P. (2007). <http://www.badastronomy.com/bad/misc/apollohoax.html>
8. The "Minds of Our Own" DVD: <http://www.learner.org/resources/series26.html>

Web Sites for Further Exploration

Moon Mineralogy Mapper Education Web site

NEED THE FULL WEB SITE

A suite of hands-on inquiry based activities engage middle-school students in understanding and interpreting reflectance spectra from Earth and Moon rocks. These activities are part of a suite of educational resources that investigate the geologic history of our Moon, the Chandrayaan-1 Mission, spectrometry, and future lunar exploration.

The Electromagnetic Spectrum

http://imagine.gsfc.nasa.gov/docs/science/known_1/emspectrum.html

Imagine the Universe investigates the spectrum and offers lesson plans for exploring emission spectra from supernovas for grades 9-12.

Cool Cosmos

<http://coolcosmos.ipac.caltech.edu/>

What does a cat look like in the infrared? Tour Yellowstone in the infrared and learn more about this portion of the electromagnetic spectrum through discussion, activities, images, and games at this rich site.

Northwestern University Reflectance Spectroscopy Lab

<http://ser.sese.asu.edu/SPECTRA/>

Explore reflectance spectroscopy and perform online analysis of lunar and Martian rocks in this undergraduate laboratory exercise.

Active Astronomy

<http://www.sofia.usra.edu/Edu/materials/activeAstronomy/activeAstronomy.html>

Infrared activities (geared for 7th grade through high school)

ALTA II Reflectance Spectrometer for the Classroom

<http://www.vernier.com/labequipment/altaspectrometer.html>

The ALTA is a rugged, simple classroom instrument designed to help students in grades 5 to undergraduate learn about light, color, and spectroscopy. Using the spectrometer, students can collect spectral data on the proportions of colored light (including infrared) that reflect from real-world objects. Lesson plans are included.

Rock Around the World

<http://ratw.asu.edu/>

Send a rock for spectral analysis! Scientists studying Mars are collecting spectra from Earth rocks so that they can compare the spectral data collected by Martian spacecraft.

Mars Student Imaging Project

<http://msip.asu.edu/index.html>

DRAFT ALTA Spectroscopy Activities for the Moon Mineralogy Mapper

Students in grades 5-12 analyze THEMIS visible spectrum camera aboard NASA's Mars Odyssey spacecraft.

Missions

The **Moon Mineralogy Mapper** (<http://moonmineralogymapper.jpl.nasa.gov/>) is one of NASA's instruments aboard the Indian Space Research Organization's Chandrayaan spacecraft (<http://www.chandrayaan-1.com/index.htm>). It will map the entire lunar surface, and reveal the minerals of which it is made. Extensive educator content and classroom resources are available on the education pages.

NASA's **Lunar Reconnaissance Orbiter** mission (<http://lunar.gsfc.nasa.gov/>) will return detailed information about the surface of the Moon and the lunar environment. Explore the Outreach pages for links to more activities and resources.

The Japan Aerospace Exploration Agency's **SELENE** mission (http://www.jaxa.jp/projects/sat/selene/index_e.html) will gather gravity, magnetic, and compositional data from the Moon to help scientists better understand how the Moon formed and has changed through time and to support future exploration.

European Space Agency's **SMART-1** spacecraft (<http://www.esa.int/SPECIALS/SMART-1/index.html>) orbited the Moon for three years, collecting spectra to characterize the composition of the lunar surface and provide chemical data that would help scientists understand how our Moon formed.

The **Clementine Mission** (<http://nssdc.gsfc.nasa.gov/planetary/clementine.html>) was a joint venture between the Department of Defense and NASA to test instruments in long-term space environment and to acquire a global multispectral map of the Moon's surface.

NASA's **Lunar Prospector** (<http://lunar.arc.nasa.gov/>) spacecraft orbited the Moon, acquiring a global map of lunar resources, gravity, and magnetic fields. The education section offers a teachers guide, lesson plans and a multitude of other resources.

NASA's **Galileo Mission** (<http://galileo.jpl.nasa.gov/gallery/earthmoon.cfm>) made two passes by the Moon, providing the first multispectral images