Website for"All About the Moon" class

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Biographical information about the instructor: I am an Emerita Professor of Astronomy at Mount Holyoke College and am now employed by NASA as the Deputy Principal Investigator of the VERITAS mission to Venus, scheduled to launch in 2032. I have studied the Moon and worked on Apollo samples for nearly 50 years.

Logistics: Class meets for 6 weeks starting Monday, November 2 from 1:00-2:30 pm. It meets in the Merrymeeting Room in the Main Lodge of the Highlands Retirement Community in Topsham.

Summary: This course is part of a series of classes about our solar system and how it teaches us about the past, present, and future of planet Earth. The course begins with a review of the history of the Apollo program, then moves on to discuss how the Moon formed, how its surface was shaped by volcanism and impacts, and what we have learned from orbital missions since Apollo. It concludes with a discussion of the ARTEMIS program and the potential for humans to live on the Moon.

Curriculum and Reading Materials

No books will need to be purchased. Optional readings are posted at the links below.

Week 1: This course will begin with introductions by participants and the instructor. I'll ask each of you to reflect on where you were when the Apollo landings happened, and how they made you feel! After break, we will then move on to review the history and politics of unmanned and manned lunar exploration in the 1960's and 1970's by both the US and the Soviet Union.

Week 1 Optional reading or listening:
I love this "Political History of Apollo" from the Planetary Society
https://www.planetary.org/planetary-radio/political-history-of-apollo-ep-3
This is a nice summary in words:
https://www.nasa.gov/history/SP-4219/Chapter8.html
Transcripts of everything that was said during the missions are here:
https://curator.jsc.nasa.gov/lunar/lsc/index.cfm
This is a compilation of real-time images and audio from Apollo 11. It gives me the chills:
https://apolloinrealtime.org/11/

Week 2: How did the Moon form, and what is it made of? Despite the many samples brought back by the Apollo missions, controversy remains in the planetary science community regarding how the Moon was formed. This week we will talk about the samples returned by the US and Soviet space programs, and consider what they tell us about the structure of the Moon's interior. We'll look at the chemistry and mineralogy of the highlands (light-colored crust) and mare (the

dark circular areas easily seen from Earth), based upon lunar samples, lunar meteorites, and orbital and Earth-based measurements.
Great pictures of all the lunar samples are posted here:
https://guides.mtholyoke.edu/az/databases?a=w
Detailed descriptions of all the samples are here:
https://curator.jsc.nasa.gov/lunar/lsc/index.cfm

Week 3: Impacts! The surface of the Moon is shaped by impact cratering, which is the most common geological process in the Solar System after volcanism. This week we will learn all about the bombardment history of the Moon and how that has shaped its surface. We will include a discussion of the biggest crater on the lunar surface at the south pole (Aiken), and expectations for U.S. and Chinese missions there.
We just found a massive new impact crater on the Moon:
https://www.science.org/doi/10.1126/sciadv.aeh7812?referrer=https%3A%2F%2Fwww.google.com%2F
https://www.youtube.com/watch?v=wgWFNPqYm5s
Scientists for Chinese missions have conducted an inventory of lunar impact craters using AI:
https://www.nature.com/articles/s41467-020-20215-y
Historyical review of mapping craters on the Moon:
https://www.sciencedirect.com/science/article/pii/S1110982324000292

Week 4: Volcanism of the Moon. Volcanic fire fountains like those seen in Hawaii give rise to millions of glass beads that make up 20% of the lunar regolith (soil). Those explosive eruptions contrast with the smooth flows that fill in impact craters all over the lunar surface. We will discuss the many different types of volcanic landforms that occur on the Moon, and what they can tell us about the evolution of the Moon.
NASA has its own web page about lunar volcanism:
https://science.nasa.gov/moon/lunar-volcanism/
This is a nice review paper about volcanism on the Moon
https://spj.science.org/doi/10.34133/space.0076?referrer=https%3A%2F%2Fwww.google.com%2F

Week 5: Remote Sensing of the Moon. This week, we will think about what we have learned from the orbiting missions that have made up much of lunar exploration since the end of the Apollo program. We will look at how scientists use reflected light spectroscopy and other tools to interpret those data.
A slightly technical explanation about remote sensing:
https://pubs.usgs.gov/pp/1046b/report.pdf
A thoughtful review:
https://www.researchgate.net/publication/234515250_Remote_Sensing_of_the_Moon_The_Past_Present_and_Future
You can also explore images of the lunar surface by using Google Earth. Instructions are here:
https://www.ukri.org/wp-content/uploads/2022/02/STFC-180118-Explore-the-Moon-in-Google-Earth-teachers-guide.pdf

Week 6: Water on the Moon (or not!). Long-term human occupancy of the Moon depends on the existence of water to sustain settlements. Where will it come from? This week we'll consider the sources of lunar water, both from its interior and from space (comets and the solar wind). We examine how water moves across the surface to the lunar poles. We will conclude by discussing the pros and cons of lunar habitation.

This is a great review paper on this topic:
https://www.pnas.org/doi/epdf/10.1073/pnas.2421996121

This is clearly written overview – be sure to read parts 2 and 3 – their links are at the bottom
https://astrobites.org/2012/05/28/water-on-the-moon-a-historical-perspective/

A recent paper in Scientific American:
https://www.scientificamerican.com/article/there-might-be-less-water-on-the-moon-than-wed-hoped/

A good easy-to-read overview in three parts:
https://arxiv.org/pdf/1205.5597
https://arxiv.org/pdf/1205.5598
https://arxiv.org/pdf/1205.5599