

Galileo Measures the Mountains on the Moon

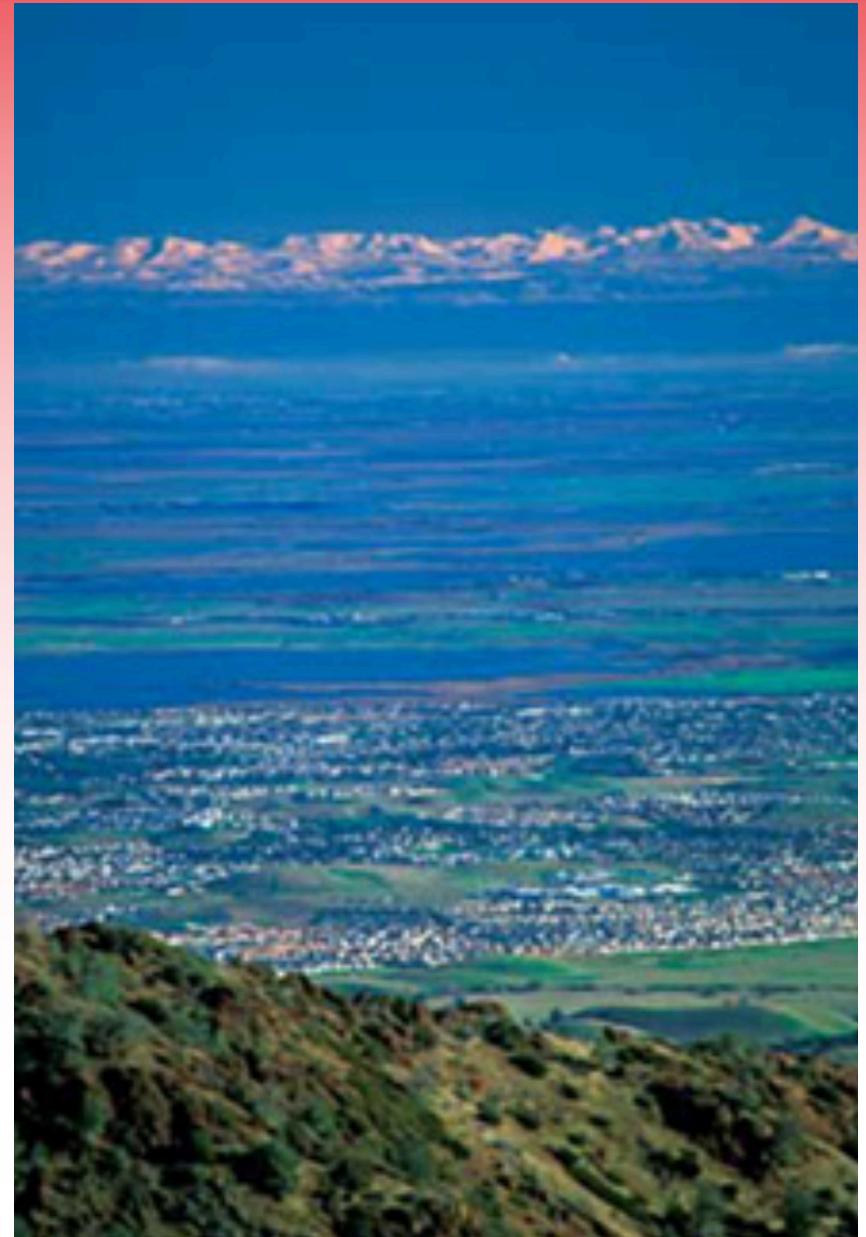
Profs. Brian Hill and Aaron Lee

Seminar Informal Curriculum

2020-04-30

Sierra-Nevada
in the Distance

Is Seeing
Believing?



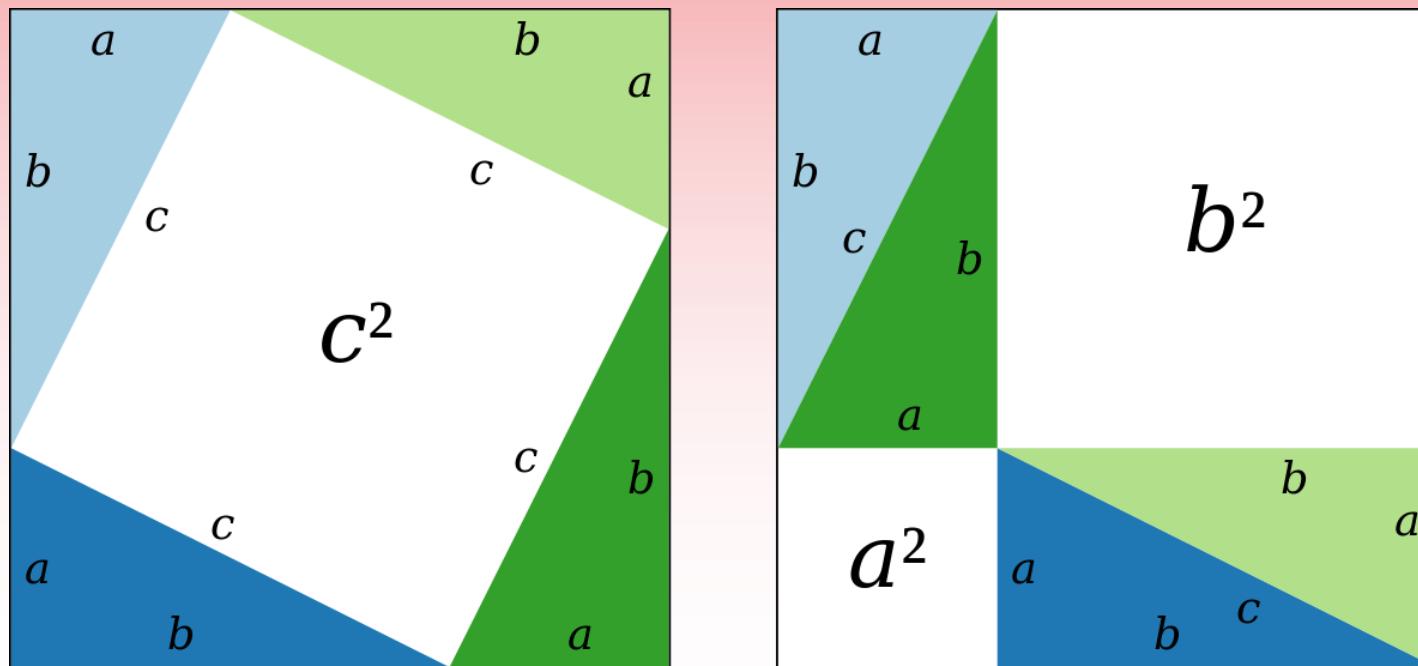
Galileo Challenges Aristotelian Understanding

By oft-repeated observations of [the spots on the moon] we have been led to the conclusion that we certainly see the surface of the Moon to be not smooth, even, and perfectly spherical, as the great crowd of philosophers have believed about this and other heavenly bodies, but, on the contrary, to be uneven, rough, and crowded with depressions and bulges. And it is like the face of the Earth itself, which is marked here and there with chains of mountains and depths of valleys.⁴

Galileo, *Siderius Nuncius (The Starry Messenger)*, 1610, as cited in "Seeing and Believing: Galileo, Aristotelians, and the Mountains on the Moon," by David Marshall Miller

Galileo Doesn't Just Observe the Mountains

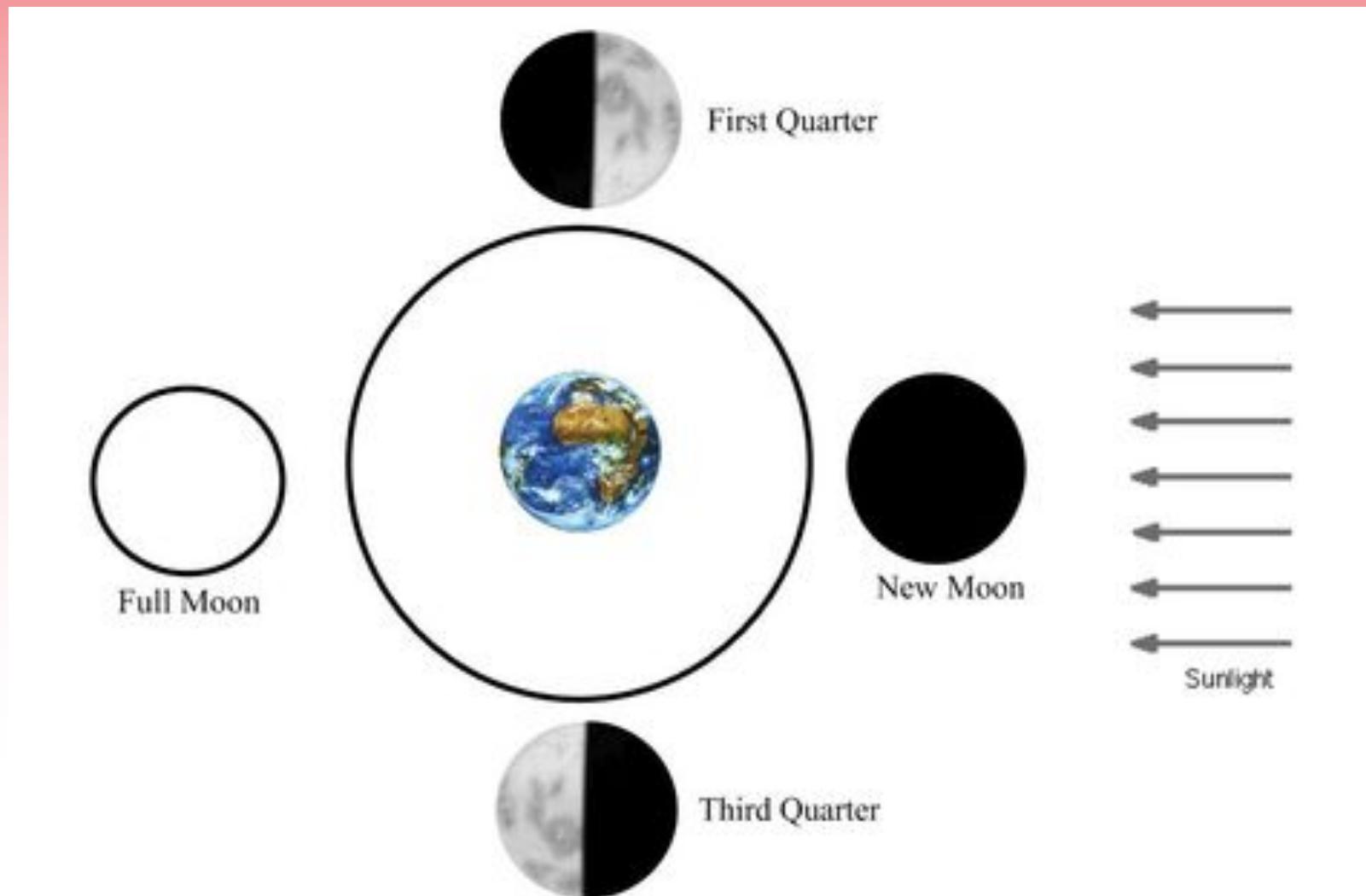
He calculates their height!



$$c^2 = a^2 + b^2$$

Requires Pythagorean Theorem

Best Time is First-Quarter Moon — Tonight



Looking West

8:50pm,
tonight

Things to Notice

High to low:

- The Sickle of Leo
- The Moon (study details, orientation)
- Castor and Pollux (the Twins of Gemini)
- Venus!
- Orion Sinking into the Horizon



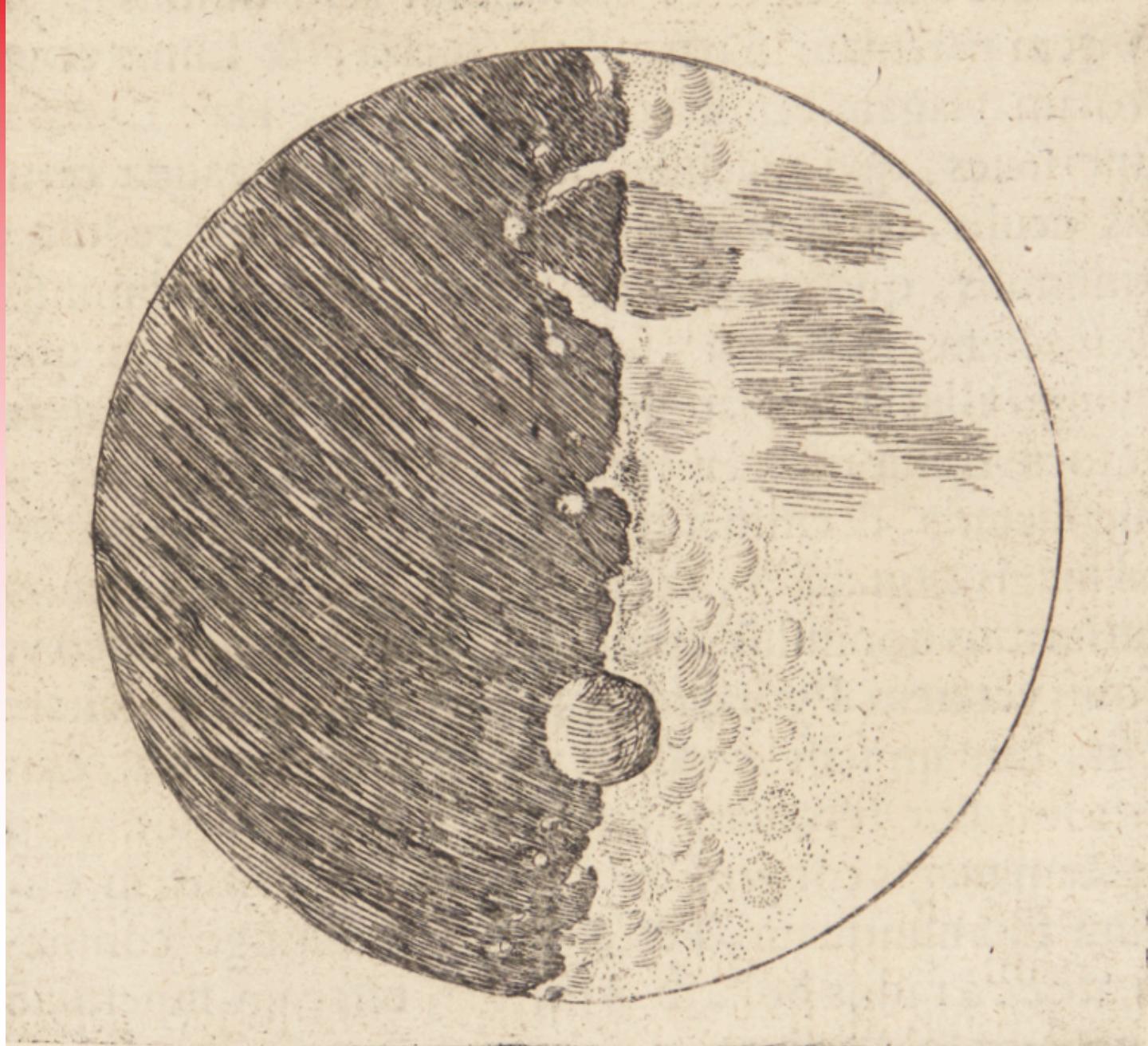


Ginger Wentcek

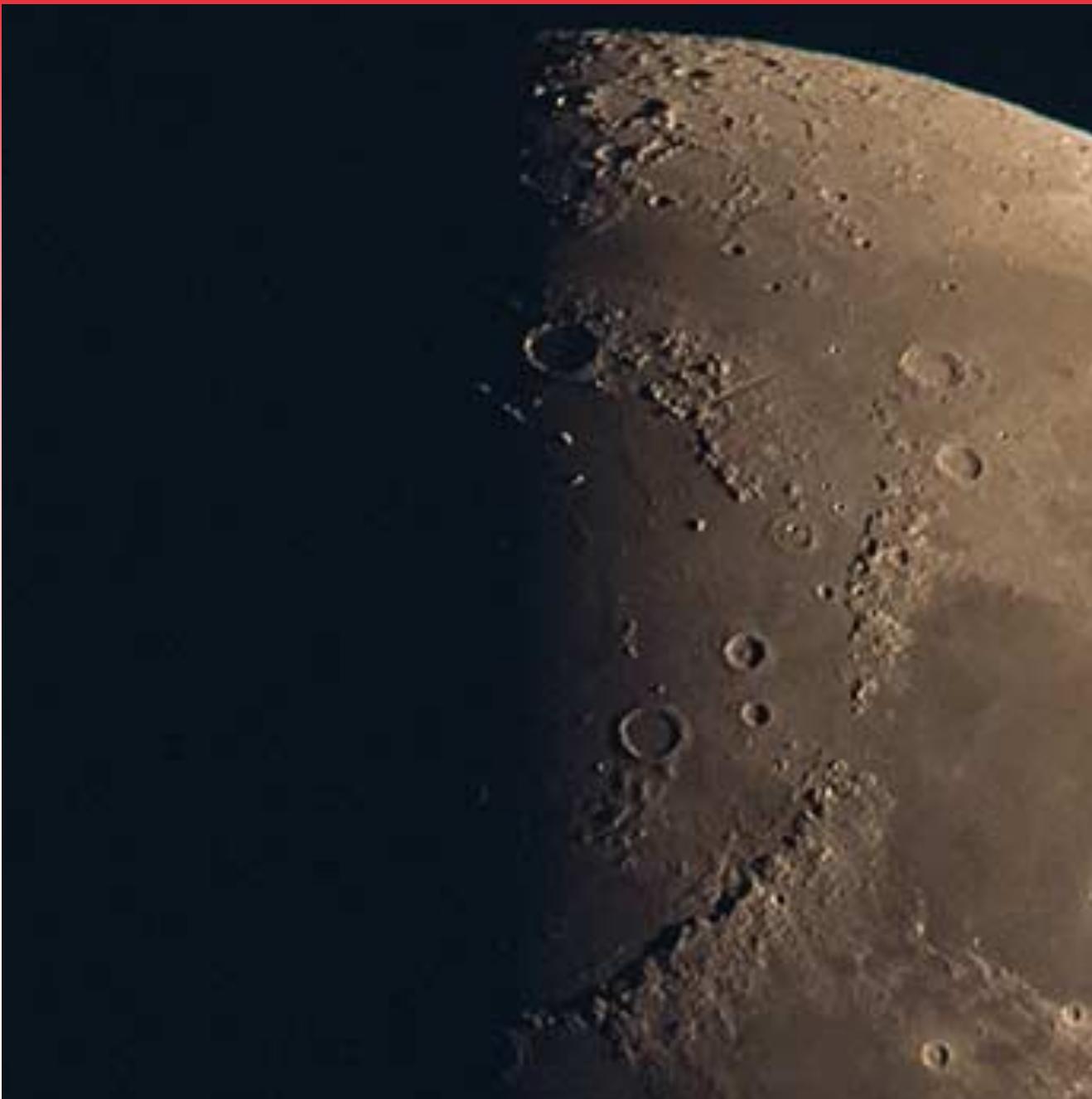
Moon Day 7, Nov. 26, 2017. Illumination 53.3%. Ginger Wentcek. Used with Permission.

For this and other photos by Ginger Wentcek of the Brazos Valley Astronomy Club, go to:

<https://brazosvalleyastronomyclub.org/moon-phases.html>



Engraving By Galileo, reproduced in "Seeing and Believing: Galileo, Aristotelians, and the Mountains on the Moon," by David Marshall Miller



Close-Up from Moon Day 7, Nov. 26, 2017. Ginger Wentcek. Used with Permission.

<https://brazosvalleyastronomyclub.org/moon-phases.html>



<https://www.outtherecolorado.com/wp-content/uploads/2017/04/Guanella-Pass-Sunrise-on-the-Ridge-OutThere-Colorado-1100x734.jpg>



Photo Credit: Sophia Swinscoe

What are these Dots?



Photo Credit: Sophia Swinscoe

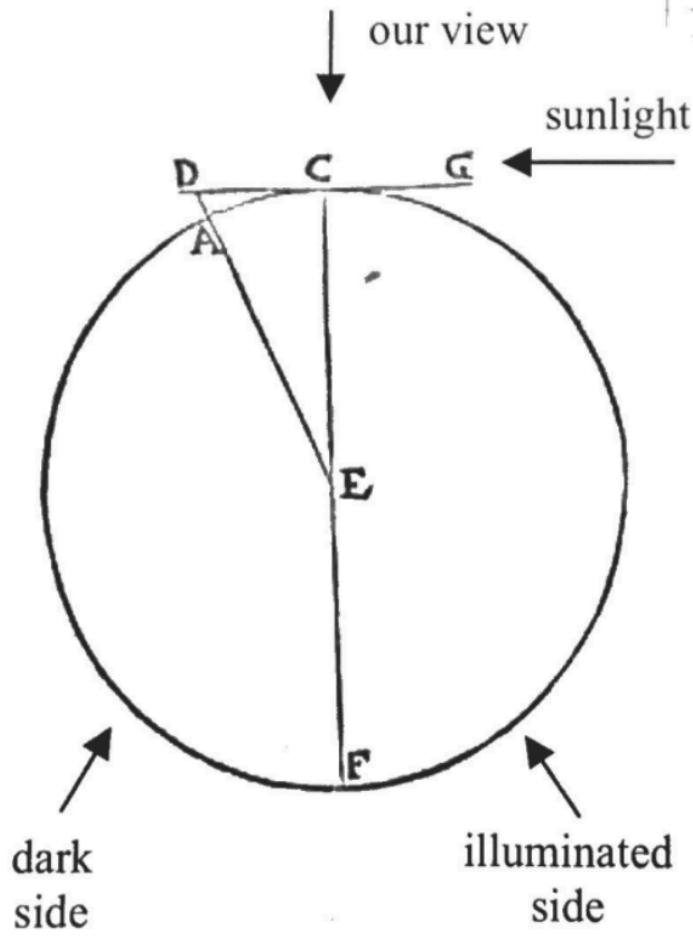
How long a shadow does this peak cast?



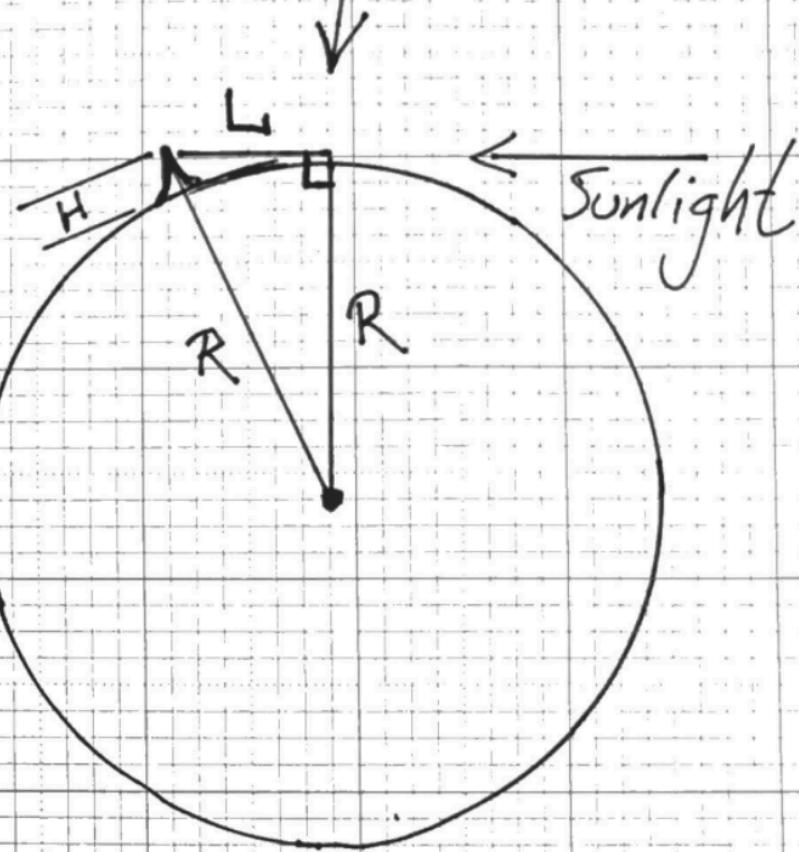
Photo Credit: Sophia Swinscoe

Do Galileo's Calculation

Galileo's
Diagram:



Modern
Diagram:



Pythagorean Theorem

$$R^2 + L^2 = (R+H)^2$$

$$\Rightarrow L^2 = 2RH + H^2 \quad \text{NEGLECT } H^2$$

$$\Rightarrow H = \frac{L^2}{2R}$$

Plugging in Your Numbers

QUESTION 12. The Moon's radius is 1080 miles and its diameter is 2160 miles. Using the percentage you found in the previous question and multiplying the percentage by the Moon's diameter, how many miles is the furthest light spot from the terminator?

The distance you found in Question 12 is labeled L in Figure 5. R is the radius of the moon, 1080 miles. The formula you need to put these into is:

$$H = \frac{L^2}{2R}$$

QUESTION 13. Plug L and R in to the formula to get H . What is the height of the highest peak you found?

Apollo 11 Moon Landing Site



Photo Credit: Sophia Swinscoe

