

# Moon Polarization Imaging

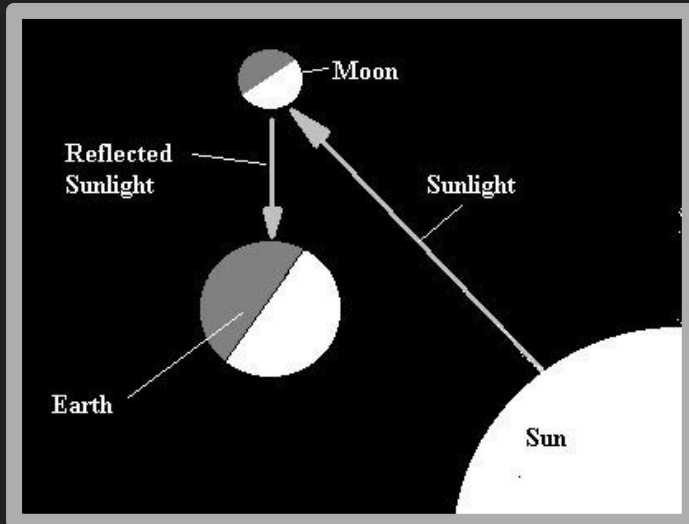
Elyse Duley

# Project Background: Polarization

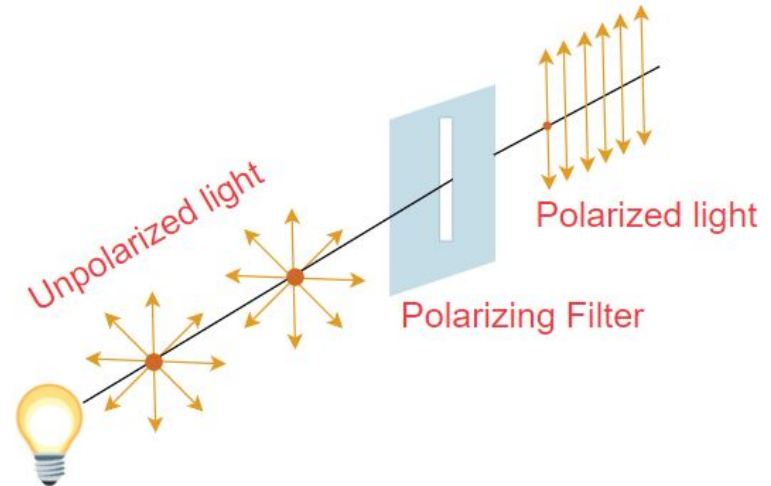
- Moon reflects sunlight: Polarized
- We can see this with polarized camera lens

$$\vec{S} = \begin{pmatrix} S_0 \\ S_1 \\ S_2 \\ S_3 \end{pmatrix} = \begin{pmatrix} I \\ Q \\ U \\ V \end{pmatrix}$$

[https://en.wikipedia.org/wiki/Stokes\\_parameters](https://en.wikipedia.org/wiki/Stokes_parameters)



<https://qph.cf2.quoracdn.net/main-qimg-b6977525fc7ac5d738f931b73c29a205-lq>



# Research Question

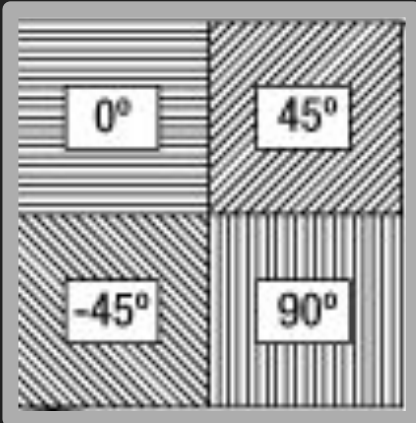
How can we refine the measurements of broadband data from Moon polarization imaging by using spectral filters in the visible and near infrared regimes?



[https://www.rp-photonics.com/optical\\_filters.html](https://www.rp-photonics.com/optical_filters.html)

# My Research

- Filters
  - 3 visible
  - 2 near infrared
- 300mm Camera Lens
- Observing



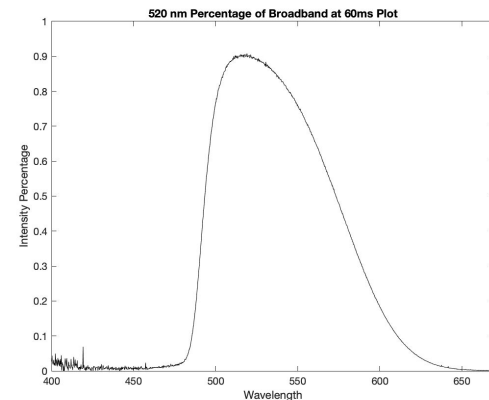
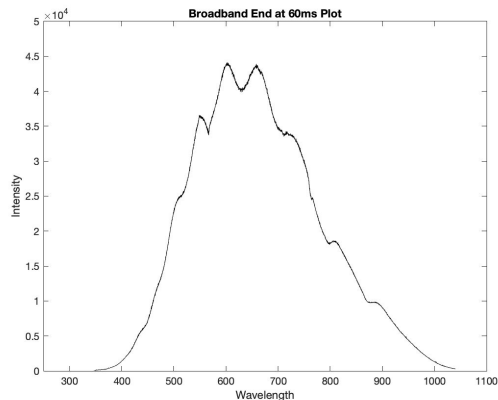
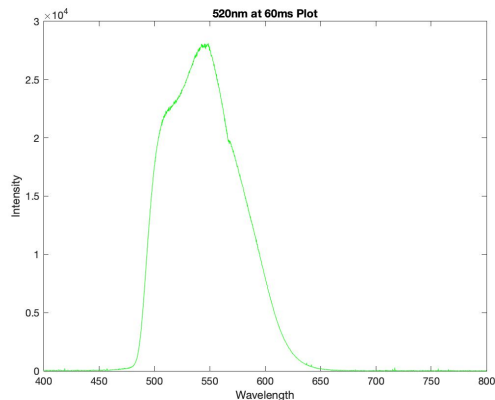
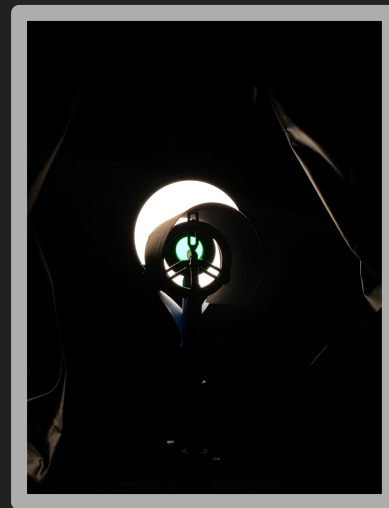
[https://www.thorlabs.com/newgrouppage9.cfm?objectgroup\\_id=13033](https://www.thorlabs.com/newgrouppage9.cfm?objectgroup_id=13033)



<https://www.astronomy.com/observing/the-best-filters-for-observing-the-moon/>

# Calibration Techniques: Integrating Sphere and Monochromator

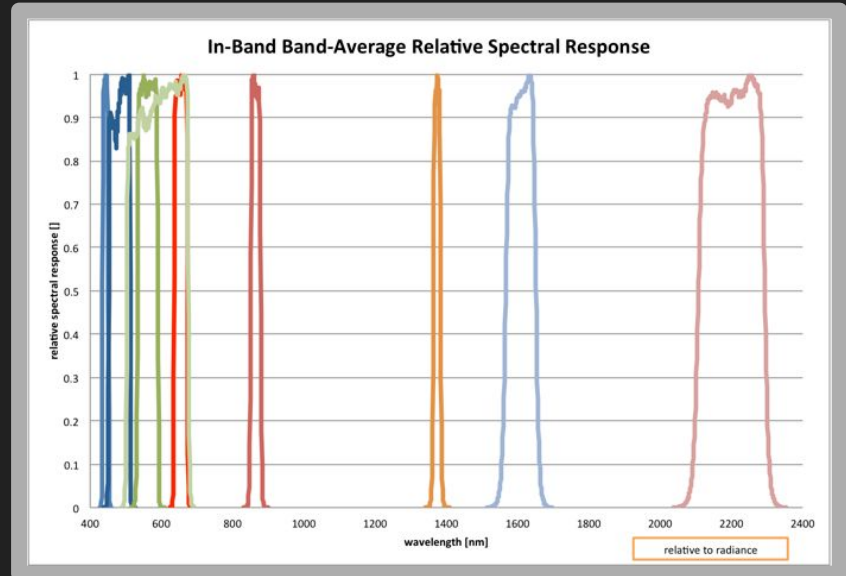
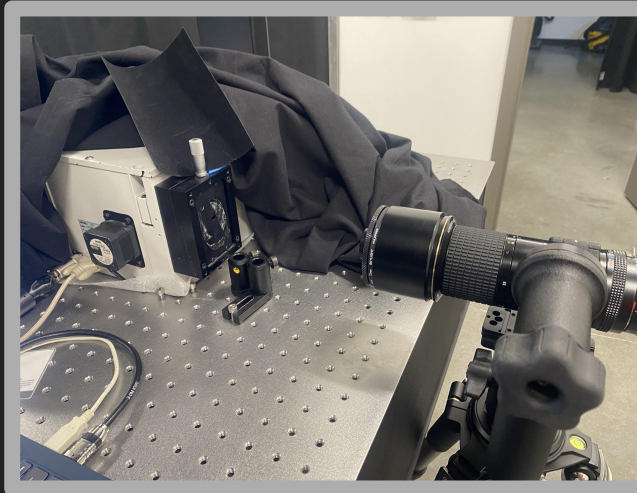
- Unpolarized light sent through the filter and to a spectrometer
- Measurements to be used on Monochromator



# RSR Curve

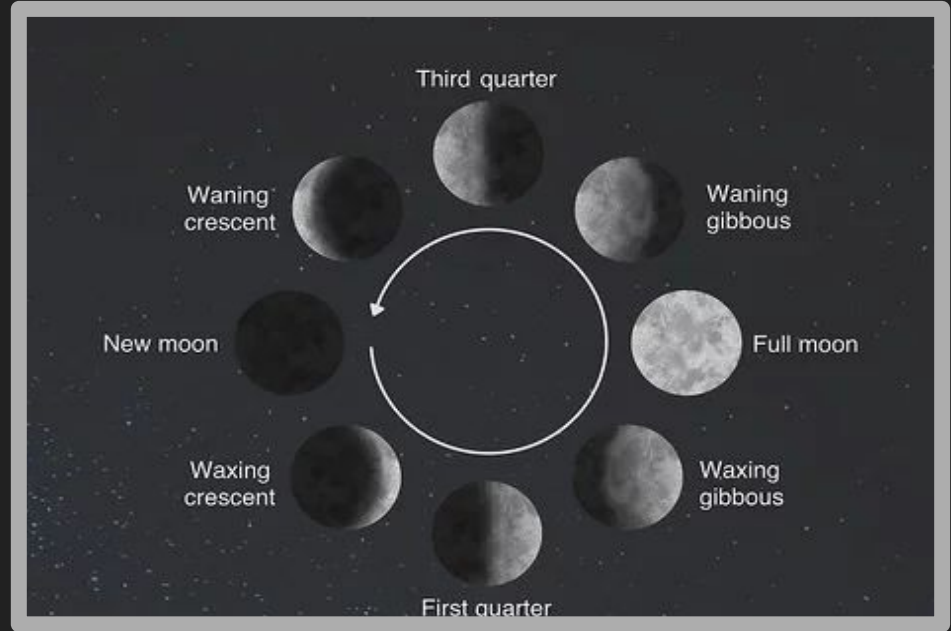
- Relative Spectral Response
- Filter's transmission as a function of wavelength

<https://landsat.gsfc.nasa.gov/satellites/landsat-8/spacecraft-instruments/operational-land-imager/spectral-response-of-the-operational-land-imager-in-band-band-average-relative-spectral-response/>



# Next Steps

- Begin imaging the moon
  - Moon 10 degrees above horizon
  - Sun 10 degrees below horizon
- It is entering the waxing phase
- We will image it at different phase angles!
- Finish the RSR curve using monochromator data



<https://www.timeanddate.com/astronomy/moon/phases.html>