

Understanding Astronomical Filters

Part III: Special Filters



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Overview

○ Special Filters

- UV/IR Blocking
- Neutral density
- Planetary observing/imaging
- Chromatic aberration correction
- Neodymium
- Solar
 - White light
 - Extremely narrow band

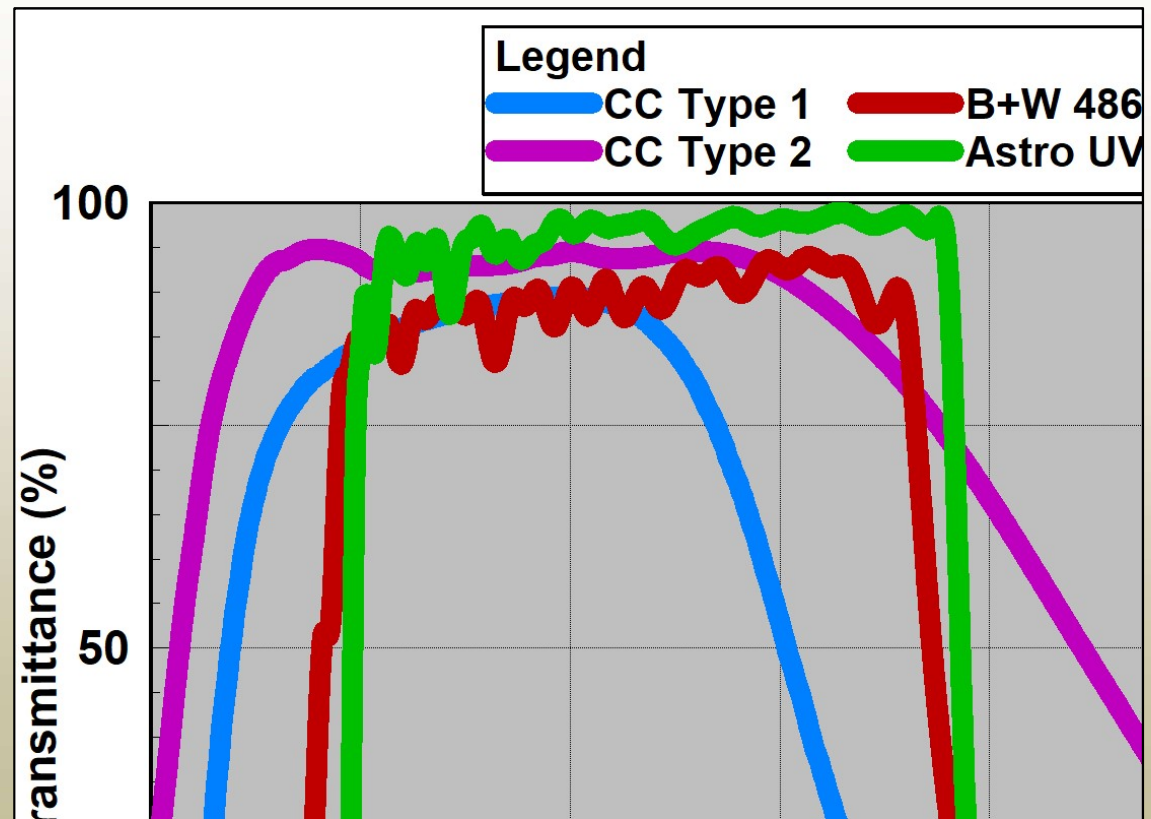
General Description

- Combination of absorption & reflection types
- Designed for very specific applications
- Often unique solutions, limited choice of suppliers
 - Can be crazy expensive



UV/IR Blocking

- For use with a camera
 - Seeing: sharpen focus, steady seeing
 - Achromat: block unfocused UV & IR (camera lens)
 - Colour correct: match sensor to human eyes
- Many choices!
- Watch for poor H α !



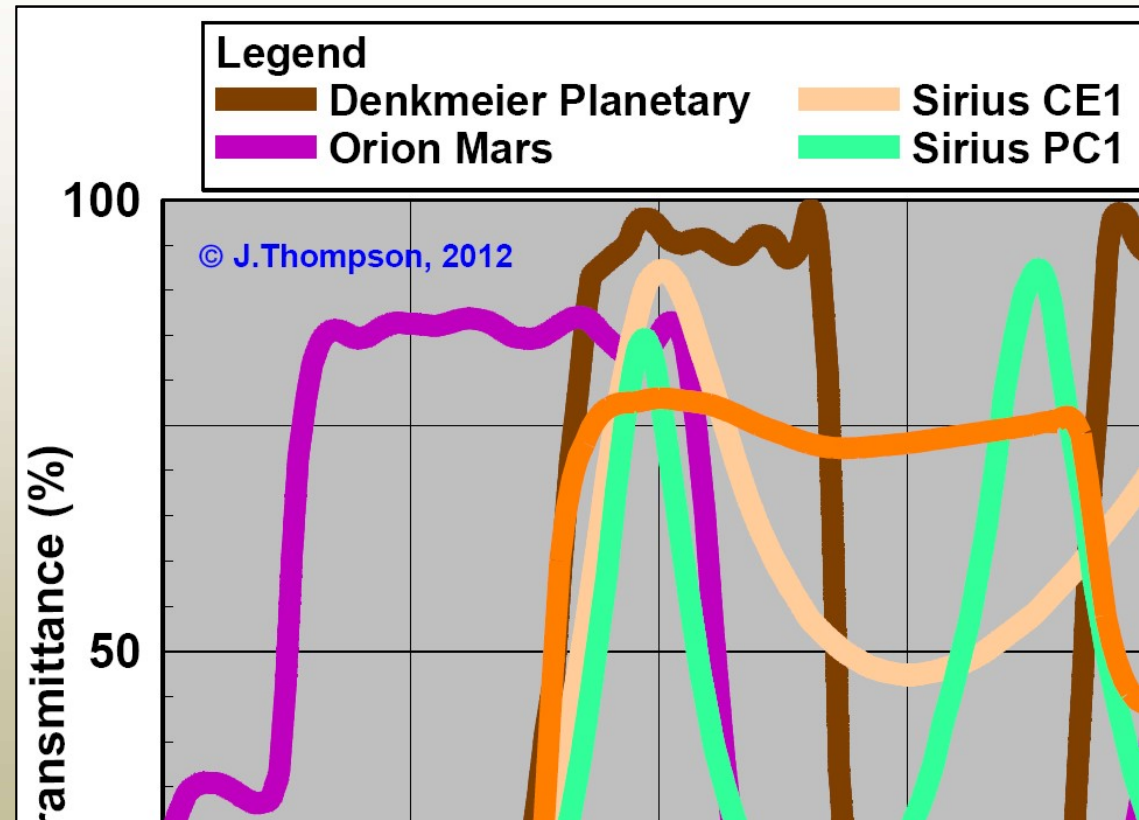
Neutral Density



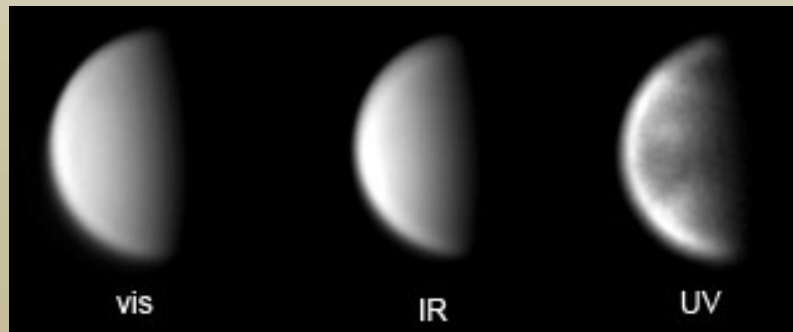
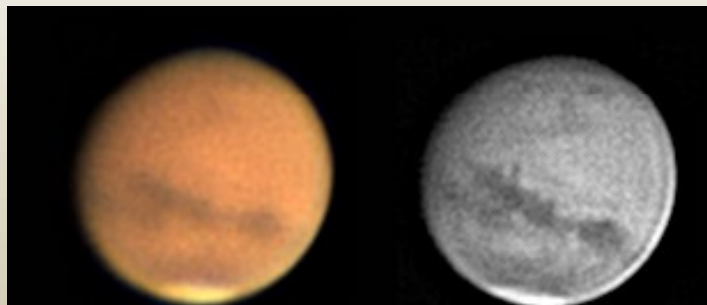
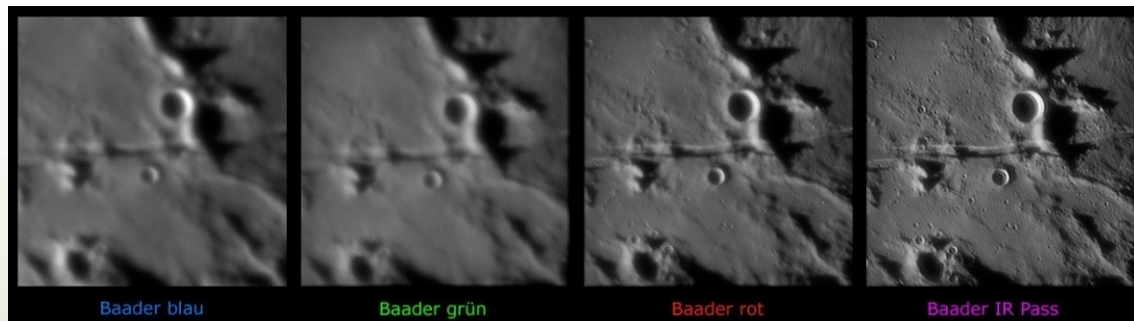
- Reduce brightness of all wavelengths uniformly
- Different optical densities (darkness) available
 - $\%LT = 10^{-OD} \times 100$ (eg. ND0.6 = 25%)
- Variable ND: stack two linear polarizing filters & rotate

Planetary Observing

- Designed to improve contrast between features
- Most popular for Mars observing
- Improvement is subjective, not much better than colour filter
- Many are rather dark



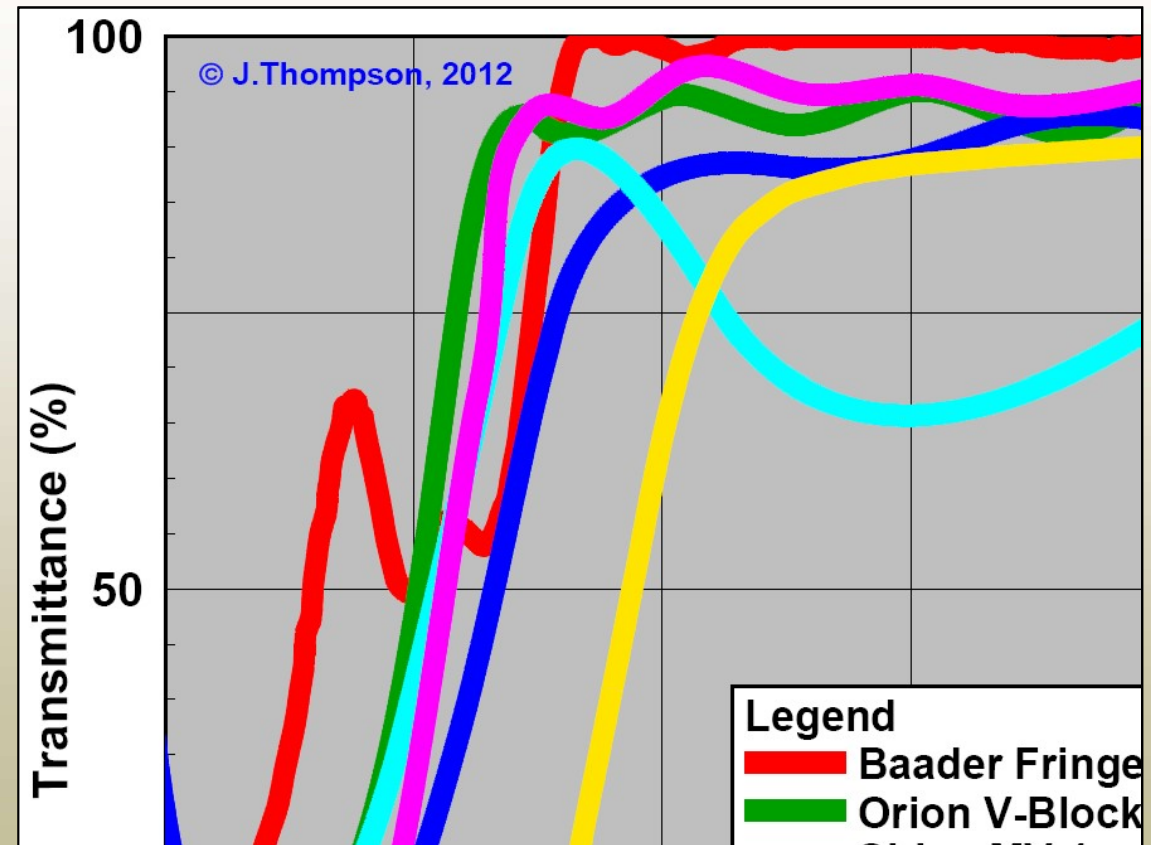
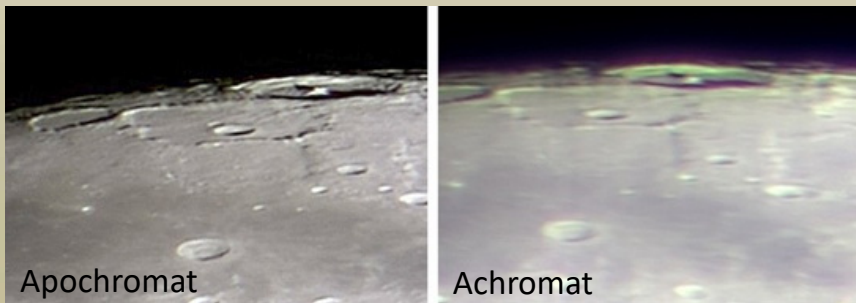
Planetary Imaging



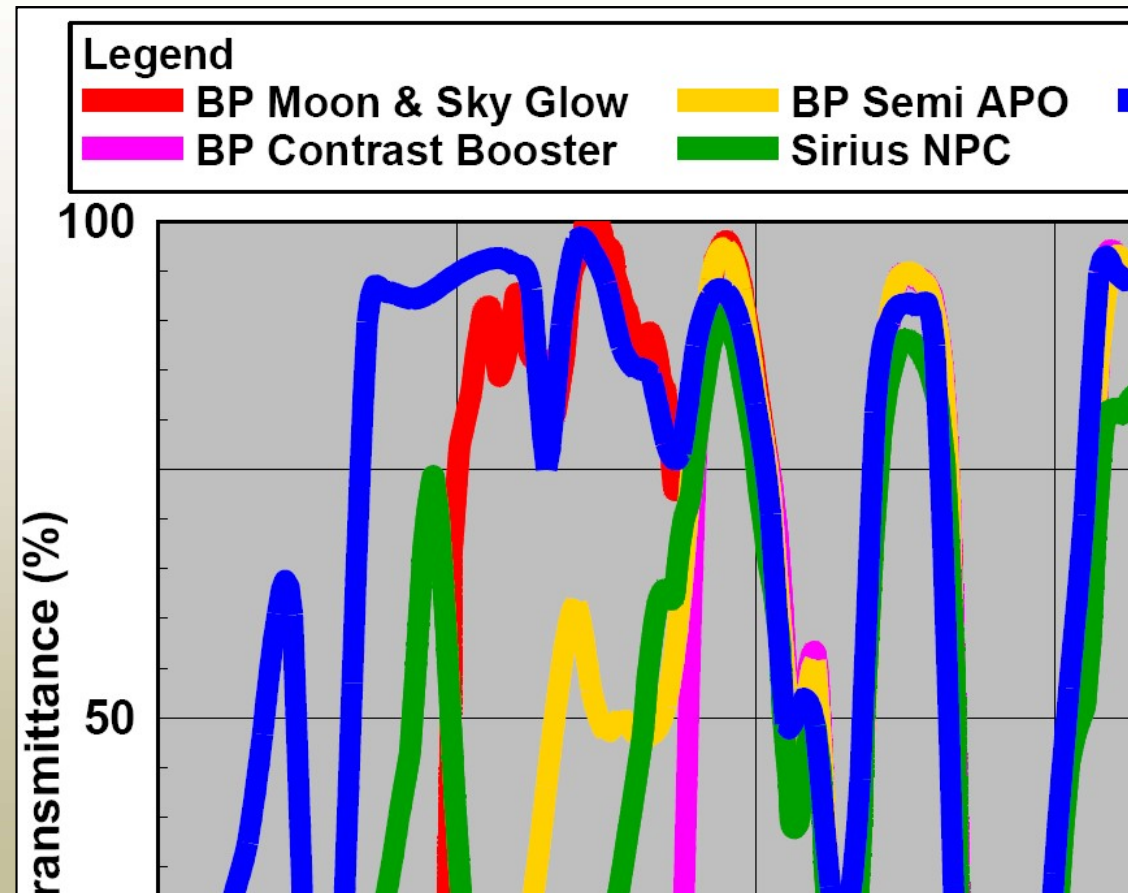
- Using a camera allows wavelengths outside visible range
- IR High Pass: reduce “seeing”
 - very good for lunar
 - interesting features on planets
- UV Band Pass:
 - features in Venus atmos.
 - gas & ice giants

Chromatic Aberration Correction

- Optics can't focus all colours at same point
- Violet fringe on bright objects (Moon)
- Blocking blue helps – yellow image



Neodymium



- Glass infused with element neodymium has a characteristic spectrum
- Very good at enhancing colours & contrast on planets
 - Only filter I use, visual & imaging
- Baader combines with violet fringe killer
- Some vendors say reduces LP, but not really true

Solar – White Light

- Reduce Sun's brightness to safe level
- Several options available
 - Herschel safety wedge – **refract** - \$\$\$
 - Full or part aperture glass – **absorb** - \$\$
 - Baader Solar Film – **reflect** - \$
- Can add band pass filters to expand capability

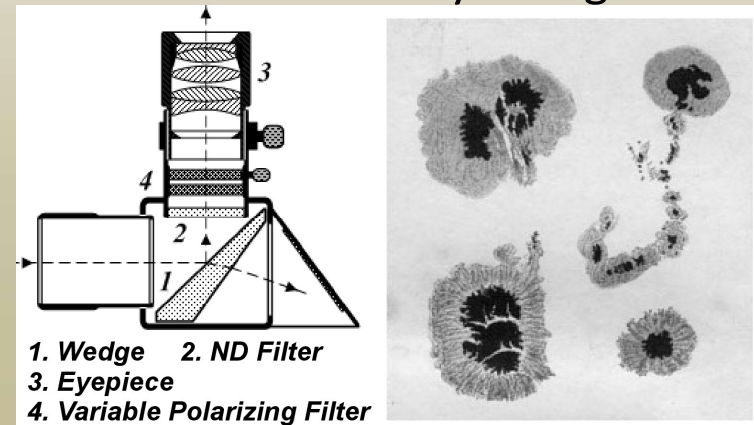
Solar film



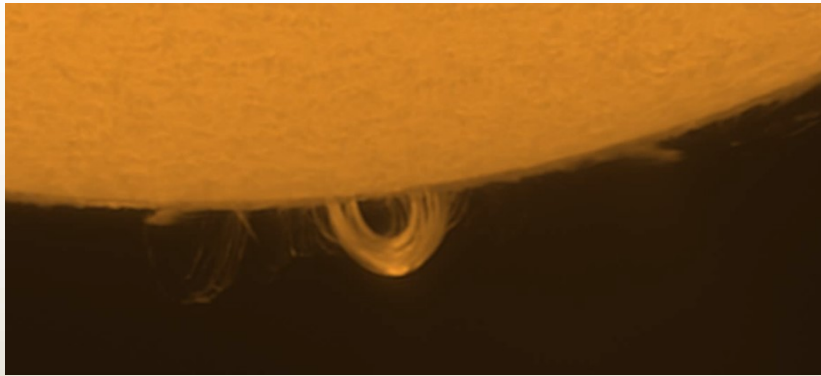
Glass filter



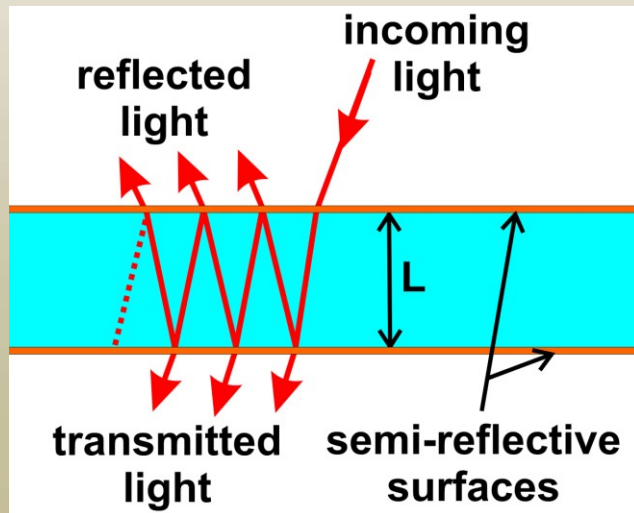
Herschel Safety Wedge



Solar – Extremely Narrow Band



Schematic view of an etalon



- Combine energy rejection filter (ERF) w/ extremely narrow band pass
- Employ some sort of tunable etalon
 - Tilt tuned
 - Temperature tuned
- Amongst the most expensive of astronomy gear!
- Allows observation of a very specific wavelength, giving large increase in visible detail

Last words

- This concludes 3-part series on filters.
- Copies of presentations & other material on filters available on my website.
 - <http://karmalimbo.com/aro/>
- Feel free to contact me if you have any questions.
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