

# Lunar Eclipse Photography

with data for January 20-21, 2019



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<https://photographylife.com/how-to-photograph-a-lunar-eclipse>

Lunar eclipses offer a beautiful, but challenging photo opportunity



This image took 18 exposures over a three hour period.

# Background Terms

- Lunar eclipses occur when the Moon moves through the Earth's shadow
- The shadow has an outer lighter fringe area – the Penumbra, and an inner dark core area – the Umbra
- The Penumbral stage is barely noticeable
- The Umbral stage is darker and obvious
- Most lunar eclipse photos are from the Umbral stages
- The brightness of an eclipse primarily depends on how deeply it goes into the shadow and the transparency of the Earth's atmosphere
- Reaching perigee on Jan 21, this will be a “supermoon” eclipse

# Supermoon vs Micromoon

<http://www.perseus.gr/Astro-Lunar-Scenes-Apo-Perigee.htm>

**Perigee**



2010-01-30  
356,790 km  
34.06 arc-mins  
Altitude @ 68.82°

**Apogee**



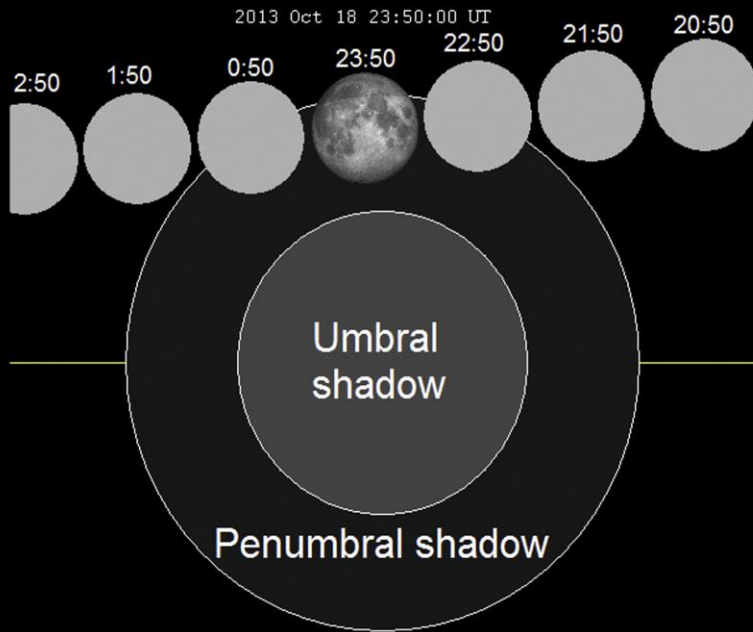
2010-08-25  
406,357 km  
29.74 arc-mins  
Altitude @ 44.87°

# Danjon Scale - Lunar Eclipse Brightness

<u>Danjon Value</u>	<u>Description</u>
L = 0	Very dark eclipse. Moon almost invisible, especially at mid-totality.
L = 1	Dark Eclipse, gray or brownish in coloration. Details distinguishable only with difficulty.
L = 2	Deep red or rust-colored eclipse. Very dark central shadow, while outer edge of umbra is relatively bright.
L = 3	Brick-red eclipse. Umbral shadow usually has a bright or yellow rim.
L = 4	Very bright copper-red or orange eclipse. Umbral shadow has a bluish, very bright rim.

# Penumbral eclipse

Oct 18, 2013

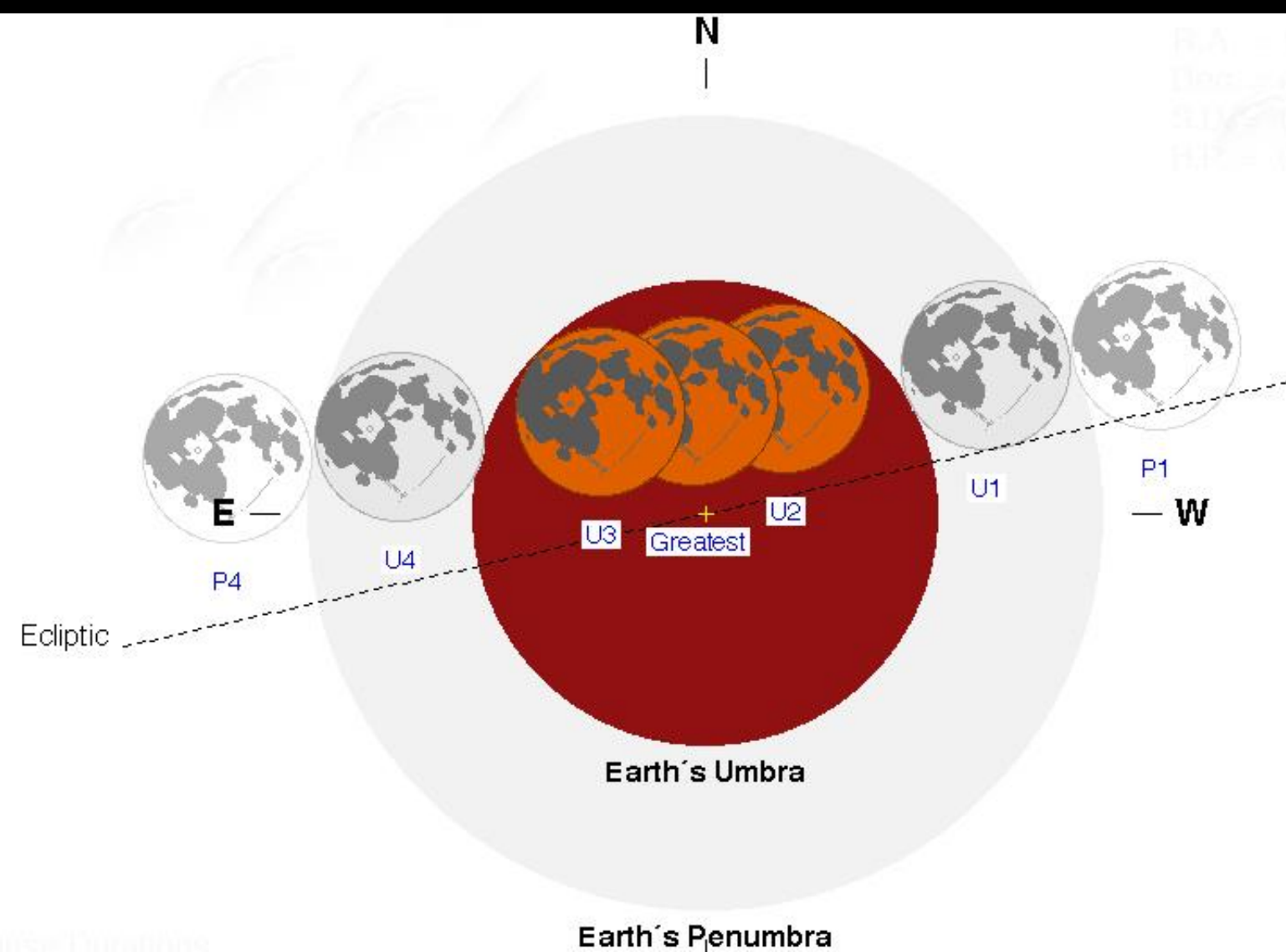


Dan Ward photo  
1000mm f/8.3 (telescope) 1/400 ISO 100

[https://en.wikipedia.org/wiki/October\\_2013\\_lunar\\_eclipse](https://en.wikipedia.org/wiki/October_2013_lunar_eclipse)

The Penumbral phase is subtle and hard to detect visually.  
The Umbral phase offers more striking exposures.

RA = 0  
Dec = 0  
SID = 0  
HRS = 0



# Moon Altitude/Azimuth Table

January 20-21 2019

EST	Altitude	Azimuth	Stage
21:37	51	106	P1
22:35	61	122	U1
<b>23:42</b>	<b>69</b>	<b>153</b>	<b>U2</b>
<b>00:13</b>	<b>71</b>	<b>173</b>	<b>Mid</b>
<b>00:44</b>	<b>70</b>	<b>195</b>	<b>U3</b>
01:52	63	230	U4
02:49	54	248	P4

Altitude = apparent degrees above the horizon.

0 = horizon. 90 = overhead. A closed fist at arms length is 10 degrees

Azimuth = Compass Directions.

0 = North, 90 = East, 135 = Southeast, 180 = South

Calculated from the US Naval Observatory site:

<http://aa.usno.navy.mil/data/docs/AltAz.php>



# Dan Ward - partial eclipse Oct 8, 2014

## Image Scale

Lens	Format	Horizontal	Vertical	Diagonal
24 mm	FX	73.7	53.1	84.1
	DX	52.0	36.0	60.7
120 mm	FX	17.1	11.4	20.4
	DX	11.1	7.4	13.4
300 mm	FX	6.9	4.6	8.2
	DX	4.5	3.0	5.4



# Adjusting for Exposure

- The range of “correct” exposure settings will vary
- Daylight white balance (or shoot raw)
- Depth of field is irrelevant at 240,000 miles
- Sharpest moon images typically are f/5.6, f/8 or f/11
- ISO 100, *f/11*, 1/250 is a typical full moon setting
- Manually Focus, verify, then lock it (use tape)
- Blur is caused by focus, camera movement, mount vibration, shutter vibration, mirror slap, dew, relative moon motion, etc.
- Variations in eclipse brightness
  - Measured using the Danjon scale (0 – 4)
  - Depth of Umbra is key
  - Earth’s atmospheric conditions contribute
  - Orbital position (apogee, perigee) contributes
- Eclipse exposure typically vary from 8 to 12 stops

# Nasim Mansurov



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<https://photographylife.com/how-to-photograph-a-lunar-eclipse>

# Eclipse with Milky Way

50mm f/1.8 10 min ISO400



# Getting the Best Moon Focus

- Use the optimal F/stop for your lens
- Typically – f/5.6, f/8 or f/11
- Depth of field is irrelevant at 248,000 miles!
- Focusing Technique Suggestion
  - Auto Focus first on edge (optional)
  - Switch to manual focus
  - A focusing mask can help fine tune
  - Use a focusing lever for micro tweaking
  - At best focus, lock in place with tape
  - Recheck focus periodically
  - Use the lowest ISO with an acceptable shutter speed

# Camera Focusing Options



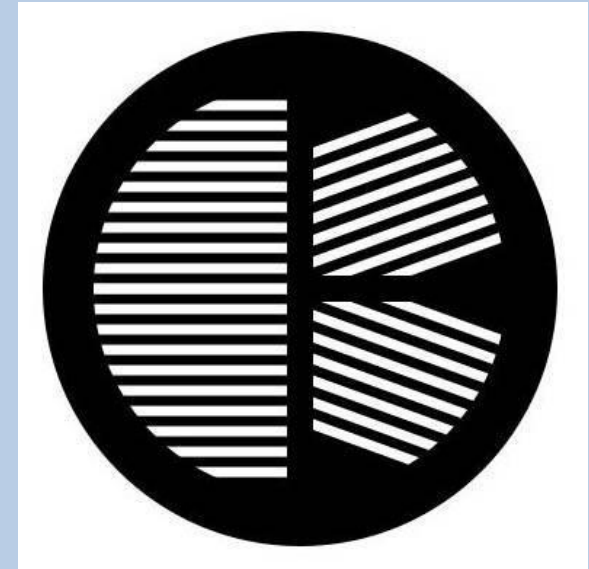
# Optional Focusing – DSLR

- Use 'Live View'
- Aim camera at the moon
- Manual focus
- Use 'magnify' button to enlarge image on screen
  - Fine tune focus
  - Apply masking tape carefully

# Focusing Masks

The Hartmann Mask is simply a set of holes in an opaque material. The one in the photo is made out of cardboard.

Like a split level focuser on rangefinders, you adjust the focus until the images merge into one. Two hole versions, called Scheiner discs, are the most common, but there are variations in the number of holes and shapes.



The Bahtinov mask is a more sophisticated version of this type of mask. They use a series of slots to create unique diffraction patterns and you achieve focus by centering the spikes. This type of mask is very popular with ccd imagers.

<http://www.kendrickastro.com/kwikfocus.html>



# Reducing Moon Photo Blur

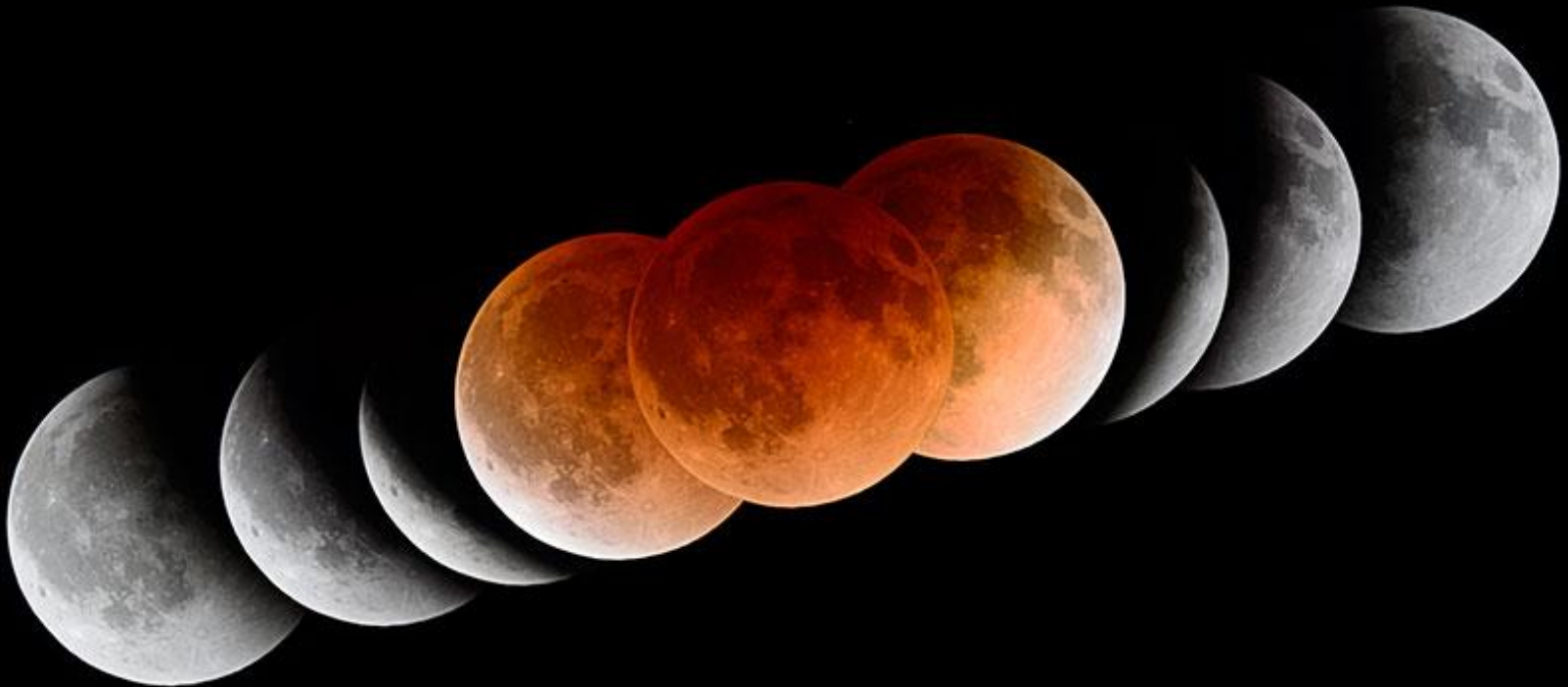
- Use a Sturdy tripod
- Hang extra Weight on the tripod
- Use Vibration Pads (mouse pads work)
- Use a wireless or wired Remote Shutter or Timer
- Use Mirror Lock if your camera has it
- Check for Dewing on the lens periodically

## To Avoid Blur from the Moon's Motion

- Divide focal length into 400 for fastest shutter speed  
(e.g.  $400/200\text{mm} = 2$  seconds,  $400/300\text{mm} = 1.3$  seconds)
- For longer exposures, use a tracking motor
- Use lunar rate, not sidereal
- Lunar movement is also 12% faster at Perigee

# Eclipse Nonet – April 15, 2014

2 X 770mm f/12 1/400 to 8 seconds, ISO 400  
<http://www.mreclipse.com/LEphoto/TLE2014Apr/TLE2014Apr-nonet1.html>



# Getting the Right Exposure

Lunar eclipses may vary 12+ stops in brightness

Have a strategy for adjusting your exposures

- Trade off between Shutter, Aperture and ISO
- Bracket exposures for insurance
- Suggested Priorities:
  - Fix focus early in the eclipse
  - Limit the aperture range changes
  - Change the ISO as required for dimness
  - Know the shutter minimums for moon motion

# Useful Website Links:

Nasim Mansurov: <https://photographylife.com/how-to-photograph-a-lunar-eclipse>

Nasim Mansurov: <https://photographylife.com/how-to-photograph-moon>

Marie Joabar: <http://capitalphotographycenter.com/blog/article/how-to-shoot-the-moon>

Peter West Carey: <http://photography.tutsplus.com/articles/the-basics-of-better-moon-photography--photo-10455>

Matt Quinn: <http://petapixel.com/2014/10/15/part-1-how-to-photograph-the-moon/>

Fred Espenak: <http://www.mreclipse.com/>

US Naval Observatory: <http://aa.usno.navy.mil/data/docs/AltAz.php>

## Astronomy Clubs:

NOVAC: <http://www.novac.com/wp/> (Northern Virginia)

ATMOB: <http://www.atmob.org/> (Boston area)

# Phillip Cruden – Blood Moon Mosaic

[http://optas.net/april-14th-15th-2014-lunar-eclipse-blood-moon-mosaic/#.VfTst7TN\\_M4](http://optas.net/april-14th-15th-2014-lunar-eclipse-blood-moon-mosaic/#.VfTst7TN_M4)

APRIL 14TH AND 15TH 2014 LUNAR ECLIPSE



Good luck &  
avoid clouds!

# Ken Butler's Eclipse Sequence

Lunar Eclipse - 14-April-2014  
Camera: Canon 7D  
Telescope: 700mm F/7 Refractor  
Mount: CGEM

