

Lunar Eclipse Photography for September 27, 2015

MITRE Photo Club
September 22, 2015

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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
- The September 27 eclipse occurs while the moon is at perigee in its orbit and is a “Supermoon”

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



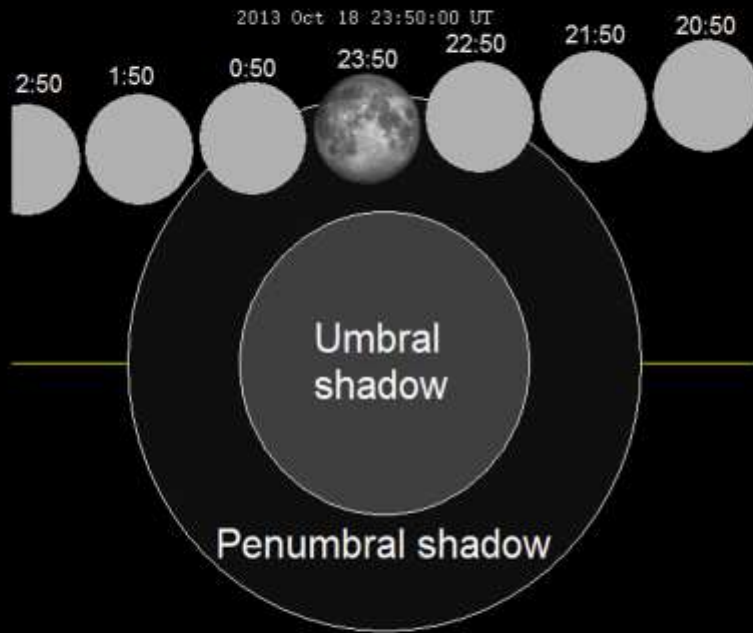
2010-08-25
406,357 km
29.74 arc-mins
Altitude @ 44.87°

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

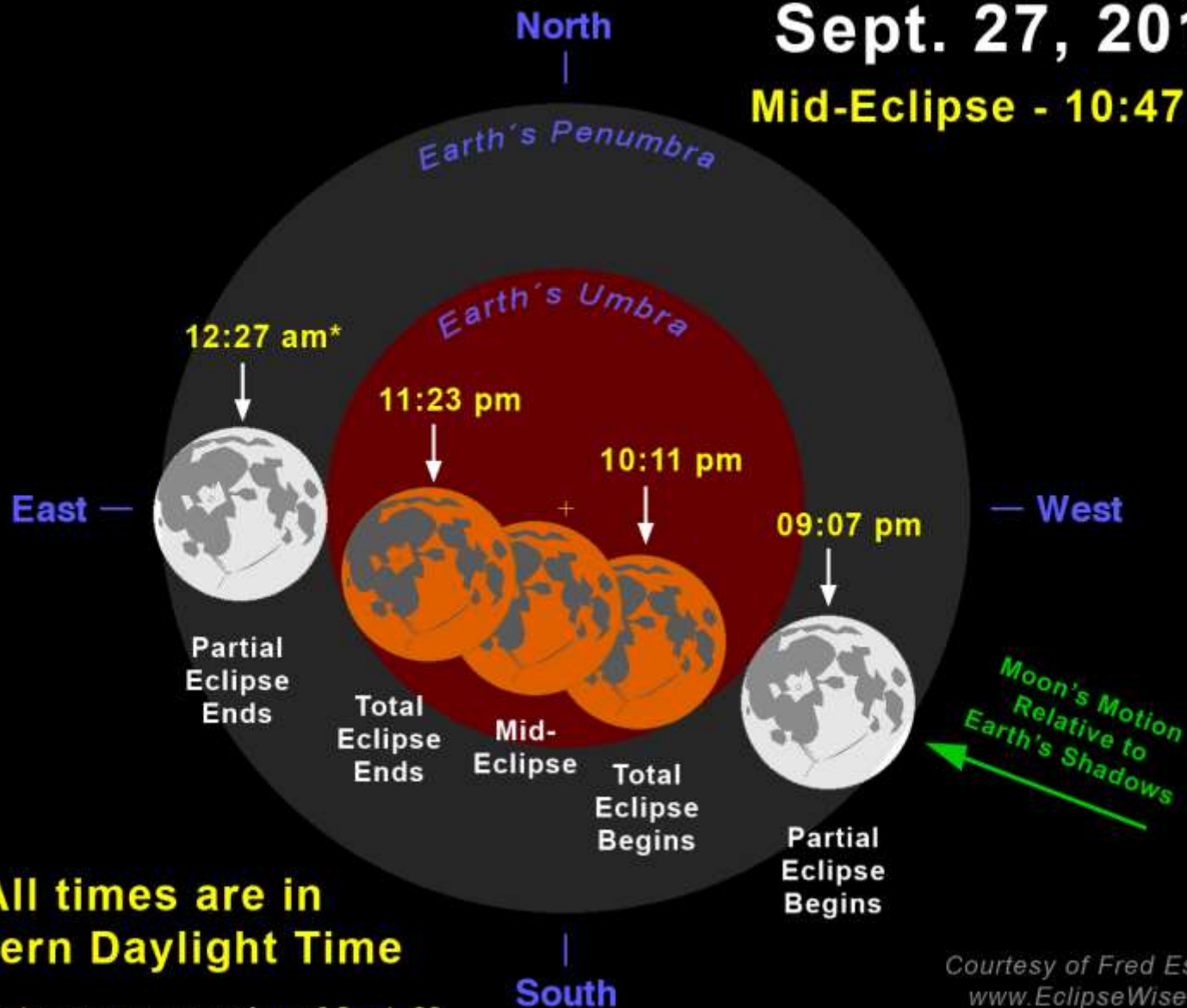
https://en.wikipedia.org/wiki/October_2013_lunar_eclipse

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

Total Eclipse of the Moon

Sept. 27, 2015

Mid-Eclipse - 10:47 pm



**All times are in
Eastern Daylight Time**

* Event occurs on morning of Sept. 28

Courtesy of Fred Espenak
www.EclipseWise.com

Moon Altitude/Azimuth Table

September 27-28, 2015

	McLean	McLean	Bedford	Bedford	
EDT Time	Altitude	Azimuth	Altitude	Azimuth	Stage
20:10	14	101	18	107	P1
21:07	25	111	27	117	U1
22:11	36	124	37	132	U2
22:47	41	132	42	142	Mid
23:23	46	143	45	153	U3
0:27	51	165	48	175	U4
1:34	52	189	47	197	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

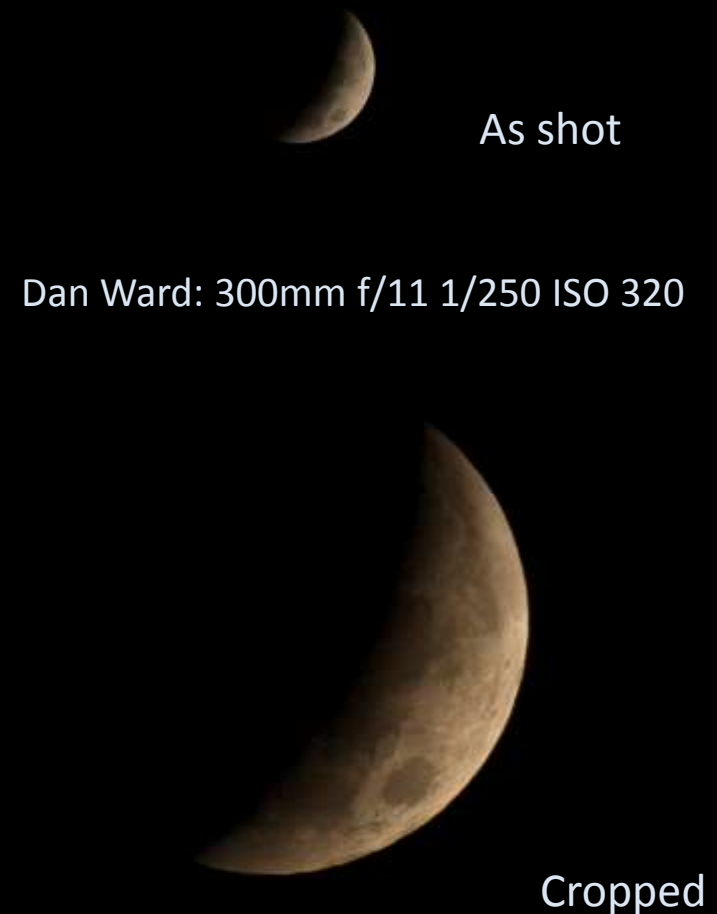
Calculated from the US Naval Observatory site:

<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



Eclipse with Milky Way

50mm f/1.8 10 min ISO400



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>

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

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

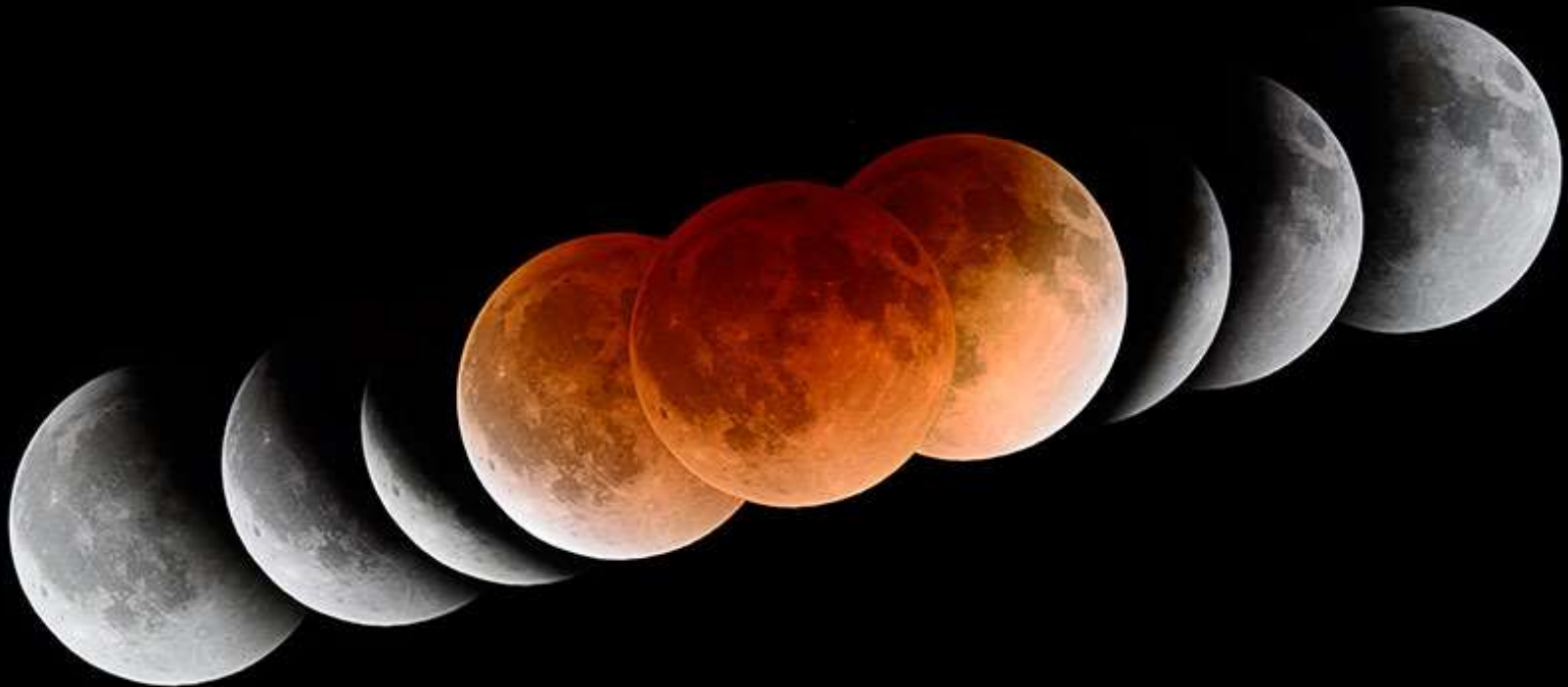
To Avoid Blur from the Moon's Motion

- 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?utm_source=Summer+Reading&utm_campaign=Summer+Reading&utm_medium=email

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/>

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

Phillip Cruden – Blood Moon Mosaic

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!