Total Lunar Eclipse Photography

May 15, 2022

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Bonus - The International Space Station will be very bright tonight (-3.9) and will pass nearly overhead. It will first appear about 8:11p in the SW (219 deg) and be at maximum brightness at 8:14p. It will disappear at 8:17p in the NE (50 deg)

Welcome to the Flower Blood Moon total lunar eclipse. Moonrise tonight is at 7:40p at 113 deg. Because of the hills to the East, it will probably not be visible much before 8:00p or 8:15p when it will already be partially eclipsed. Totality begins at 8:29p with maximum at 9:11p and totality ending at 9:53p. Sunset isn't until 7:48p, so the Moon will be very faint when we first see it. The darker it becomes, the better the chance for a good image.

Although types of equipment and imaging strategies for lunar eclipses are almost limitless, these notes focus on using DSLRs or Mirrorless cameras to capture the Moon during totality. Telescopes are an option, but not discussed here. Because the Moon is dim and moving, the challenge is finding the right combination of aperture (f/stop), ISO, focal length and exposure time to keep the Moon from appearing blurry. Optimum aperture is generally the smallest f/number which allows the maximum light gathering capability. Maximum exposure time is determined by the 500 rule (see under Moon Moving).

- Suggested Equipment List and Suggestions;
    - Headlamp with a red lens
    - DSLR Camera
    - Sturdy tripod
    - Fully charged battery and back-ups
    - Spare SD card
    - Cable release or camera self-timer
    - Remove any filters from your lens
    - Tracking mount a bonus – allows extended exposure times with no blurring of the Moon. However extended exposure times will cause the landscape to blur if in the field of view.
    - Lens choice depends on type of image desired
        - Wide Angle lens. 11mm – 16mm recommended for including landscape. The Moon will begin at about 15 deg altitude, so a wide angle lens allows

you to capture both the Moon and a large portion of landscape. Also allows maximum exposure time before the Moon blurs.

- Intermediate lens. 18mm – 135mm. Most practical choice without a tracking mount, unless you can push your ISO very high without introducing noise (grain), <50mm focal length is recommended.
- Telephoto lens. 70mm – 300mm. Not recommended unless using a tracking mount because of limited exposure time before the Moon blurs.

- **<u>Challenges;(suggestions below)</u>**
  - Focusing.
  - The Moon moves, affecting the clarity of your image with long exposures.
  - Initially the Moon will appear dim and appear brighter as the sky darkens. There is no way ahead of time to determine how bright it will appear, hence no way to predetermine camera settings. During totality, the Moon is in the Earth's shadow (umbra) and only receives indirect sunlight which is refracted through and modified by the Earth's atmosphere. Varying amounts of water and solids affect the brightness and hence camera settings.
  - Camera shake can create blur.
  - Good news is that totality lasts about 1 hour 20 minutes. Plenty of time to find best settings.
- **<u>Focusing;</u>**
  - You'll need to focus at infinity. Doing this at twilight or at night using autofocus can be difficult because even if there is a light source where we'll be, it may be too small or faint for your camera to detect and autofocus will just continue to search. This is particularly relevant to wide angle lenses. An option to not have to deal with this is to prefocus before you come. During daylight hours, focus on an object at infinity using autofocus. Then switch to manual focus and tape the focal ring so it won't move during transport. **Be careful** with this approach. It's easy to move the focal ring.
  - The other option is to use Live View and first try using autofocus on site. There may be enough light, but no way to tell beforehand. If autofocus works, be sure to switch to manual focusing before imaging. If autofocus doesn't work, magnify an image at infinity in Live View to the maximum your camera allows and adjust the focal ring manually.
  - Changing focal length on most lenses also changes the focus. So recheck focus if changing focal length.

- Many newer DSLRs manually focus “beyond” infinity, so just adjusting until ring stops may be too far.
- Highly suggest practicing beforehand to see what works best for you.

- **Moon moving;**
  - Without a tracking mount, follow the **500 rule**. The 500 rule means dividing 500 by your focal length, which approximates the maximum exposure time before blurring occurs. E.g. 18mm = 28 secs, 35mm = 14 secs, 70mm = 7 secs. For 1.6x cropped frame cameras, multiply time by 0.625 (e.g. 35mm = 9 secs for cropped frame)
- **Moon is dim;**
  - As mentioned at the beginning, balance the 4 variables: Focal length, ISO, Exposure time and f/stop. Constraints are **high ISO** – more noise (grain), **long exposure time** – blur, **max aperture (smallest f/stop)** - limited by lens.
- **Camera Shaking;**
  - You’ll need a sturdy tripod
  - Use mirror lock-up if available
  - Use a cable release or in-camera self-timer
  - Activate from cell phone
- **Suggested Camera Settings;**
  - Focus: Manual
  - Image Stabilization: Off
  - Flash control: Disable
  - Long Exposure Noise Reduction: Off
  - Auto Power Off: Disable
  - White Balance: Daylight
  - Image quality: highest resolution (jpeg or raw – or both).
  - Set the Mode Dial to Manual to allow control of shutter speed. A cable release or in-camera self-timer allows you to take an image without introducing camera shake.

- **Work Flow;**
  - Set your lens to its widest aperture (smallest f/number).
  - Suggest starting at ISO 800.

- For shutter speed, suggest starting at 3 or 4 seconds and increasing in approximately even time increments, up to maximum time as indicated by the 500 rule (e.g. for 35mm, try 4, 8, 12, 15 secs – or whatever your camera allows).
- Check exposure and focus by pressing image review button.
- If image is too light at shortest shutter speed, incrementally decrease ISO at that speed.
- If image is too dark at longest shutter speed, incrementally increase ISO at that speed.
- If out of focus at the shortest shutter speed, try adjusting focus ring.

- **Hints;**
  - Be familiar with how to operate your camera at night with only the light from your headlamp. Buttons that are easy to find in daylight can be difficult at night.
  - If you don't have a headlamp, a small flashlight is okay as long as it has several layers of red cellophane attached. Stray bright lights can not only interfere with your night vision, but can interfere with your (or your neighbors) exposure as well.
  - Highly Recommended: Assemble your set-up in your backyard prior to the event and take practice shots of the Moon particularly if you have a low horizon view to the East, when it's at approximately the same elevation (~15 deg) as during totality. Although settings during the eclipse will be far different than a bright Moon, this is a useful exercise to become familiar with the process.
  - Hopefully you will not have a problem with lens condensation; however dew forming on your lens can be a problem on a cold night with high relative humidity and no breeze. Use a lens hood if you have one. Otherwise, intermittently check your lens and dry with an appropriate cloth, being careful to not move the focus ring. Another option is to attach a hand warmer to the lens objective with a rubber band, again being careful to not move the focus ring!
  - Don't be concerned if the Moon looks small in your image, you can increase its size in post processing.
  - Take a lot of images. You can sort out the best ones later.