



Feature Story: ALPO Eclipse Section Part 3: The 21 August 2017 Total Solar Eclipse – The Great American Eclipse

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Introduction

In this, the third in a series of four articles on the 2017 total solar eclipse dealing with site selection, weather prospects, observing the eclipse, and specific observing projects, our main focus will be on equipment.

The first article in this series provided the reader with an overview of the eclipse itself, as well as some initial recommendations. The second article provided an overview of potential eclipse observing sites.

On 21 August 2017, the United States will experience its first total solar eclipse since February 26, 1979. All of the continental United States will experience at least a significant partial solar eclipse; the eclipse is being referred to as “The Great American Eclipse”. For those fortunate enough to live along the narrow track of totality or are able to travel to the path of totality, up to 2 minutes and 40 seconds under the shadow awaits observers. The partial phase of an eclipse never compares to totality; one should plan now to get to the total line!

One of the many eclipse questions I often field is, “What do I need to see the eclipse?” That answer really depends on if you are talking about the partial eclipse, the total solar eclipse, or both. It also depends on what your goal is for observing the eclipse. There are a number of options... and also aspects of the eclipse to look for beyond the partially-eclipsed sun itself.

The Partial Solar Eclipse

A warning we should all be familiar with: At all times, one should take great caution in observing the Sun. Incorrect procedures, including the wrong type of solar filter, can lead to blindness, as well as damage to your equipment. This same warning applies to all stages of a partial solar eclipse.

There are several ways to observe the partial phases of the eclipse. These include:

Naked Eye

Yes, those wonderful eclipse glasses (Figure 1). Make certain you order in advance, and get a few extra pairs. Some are prognosticating that 50 million people will view totality; imagine how many will also be viewing only the partial phases.

Pinhole Projection Devices

These allow for safe projection of the partially-eclipsed Sun (Figure 2). Many will remember the simple pinhole-in-a-box that projects a solar image on a rear screen, usually white paper. The main thing you want to focus on here is having the box — and especially the projection screen — shaded as much from sunlight as possible.

As the eclipse progresses and the Sun gets smaller, you should also try to see eclipsed “Suns” on the ground, due to leaves which crisscross, forming natural pinholes. The effect is quite delightful, and is a wonderful way to show off the eclipse to a group of people. You can also make your own pinhole devices; use a piece of black poster board and simply poke small holes in it. And you can arrange them in a pattern, if you wish. Consider using a straw hat; and



Figure 1. Two young observers enjoying the May 20, 2012 annular solar eclipse with eclipse glasses in Page, Arizona. Kieran and Quinn McCarthy observed the eclipse with their grandfather and grandmother (Mike & Debbie Reynolds). Photo credit: Dr. Mike Reynolds.



Figure 2. Pinhole projection makes for an easy partial eclipse display. *Photo credit: Dr. Mike Reynolds.*

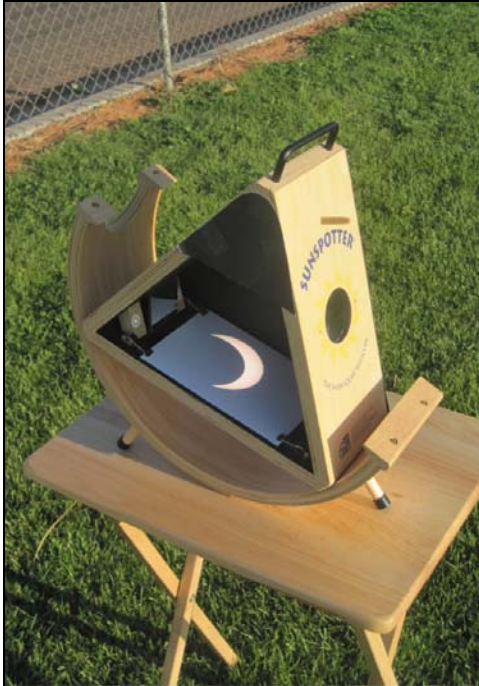


Figure 3. A great way to project a good image of the eclipse so a lot of people can view the image. *Photo credit: Dr. Mike Reynolds*

some have told me they have produced nice pinhole images using an ordinary metal kitchen colander.

Telescope and Binocular Projection

A safe way to see the eclipse; you just need to make certain no one tries to look through an eyepiece (or into an unblocked finder). There are commercial devices, such as the “Sunspotter” (Figure 3), that make for safe telescope projection systems and producing a reasonable image.

Telescope Solar Filters

Many prefer the image provided through a front-of-the-telescope (or camera) solar filter (Figure 4). They also make through-the-telescope imaging of the partial phase easier, usually with better photographic results.

There are several things you should be aware of when using telescope solar filters. First, order your filter now if you do not have one. Check your filter out to see if there are any pinholes; again do that well in advance of the eclipse, as well as the day of the eclipse. The Mylar film filters are



Figure 4. Make certain your filter is attached properly, regardless of the optical device you are using. *Photo credit: Dr. Mike Reynolds*

more-susceptible to pinholes. I have used a small square of electrical tape over a pinhole. Just affirm you cannot see any light through a pinhole.

When mounting your filter on the front of the telescope, make certain it will not easily be knocked off by a bump or the wind. And likewise, you will need to remove it quickly at 2nd contact. So practice your procedures in advance

Herschel Wedge, Special Solar White Light Telescopes

These are excellent; just make certain that you know what you observe with is safe and know how to use it, if you have borrowed someone else's equipment.

Hydrogen-Alpha (H-), Calcium, Sodium Helium Systems

Such instruments will provide an unusual view during the partial phases. The best view I have ever had of a partial solar eclipse was the May 20, 2012 annular solar eclipse through a Daystar Helium filter.

DO NOT USE: Smoked glass, polarizers, sunglasses, or welders' glass less than #14.

Before Totality

As totality approaches, or even for those experiencing a deep partial solar eclipse, you will begin to notice several changes in your environment (Figure 5). As the size of the Sun decreases, shadows become sharper. This is due to the fact the disk of the Sun is smaller. The temperature will begin to drop, and those along or near the path of totality will feel a slight breeze. Venus will become visible about 10 minutes before 2nd contact; be sure to look for it and other stars and planets. I use a pair of binoculars at this point. I also look for the shadow itself, and the sunset-sunrise effect; colors around the horizon. And perhaps you'll see those elusive shadow bands; a white sheet on the ground or a sandy area works great.

Totality

Before you know it, the Moon's shadow will have reached your location and you are cast into darkness (Figure 6). A low-power telescopic view will provide you a stunning look at the Sun's corona and its fine details (Figure 7). Prominences should also be visible. A pair of binoculars also works well. Don't forget to just stop, look around, and take it all in. Perhaps the best written description of totality was penned by Mabel Loomis Todd:

“Then an instantaneous darkness leaped upon the world. Unearthly night enveloped all.

“With an indescribable out-flashing at the same instant the corona burst forth in mysterious radiance. But dimly seen through thin cloud, it was nevertheless beautiful beyond description, a celestial flame from some unimaginable heaven. Simultaneously the whole northwestern sky, nearly to the zenith, was flooded with lurid and startlingly brilliant orange, across which drifted clouds slightly darker, like flecks of liquid flame, or huge ejecta from some vast volcanic Hades. The west and southwest

gleamed in shining lemon yellow.

“Least like a sunset, it was too somber and terrible. The pale,

broken circle of coronal light still glowed on with thrilling peacefulness, while nature held her breath for another stage in this majestic spectacle.



Figure 5. The horizon colors after totality can be a show unto itself! *Photo credit: Dr. Mike Reynolds.*



Figure 6. The Moon's shadow - and Sun's corona; the July 22, 2009 total solar eclipse. *Photo credit: Dr. Mike Reynolds.*

The Strolling Astronomer

“Well might it have been a prelude to the shriveling and disappearance of the whole world - weird to horror, and beautiful to heartbreak, heaven and hell in the same sky.

“Absolute silence reigned. No human being spoke. No bird twittered. Even sighing of the surf breathed into utter repose, and not a ripple stirred the leaden sea.

“One human being seemed so small, so helpless, so slight a part of all this strangeness and mystery! It was as if the hand of Deity had been visibly laid upon space and worlds, to allow one momentary glimpse of the awfulness of creation.

“Hours might have passed - time was annihilated; and yet when the tiniest globule of sunlight, a drop, a needle-shaft, a pinhole,

reappeared, even before it had become the slenderest possible crescent, the fair corona and all color in sky and cloud withdrew, and a natural aspect of stormy twilight returned. Then the two minutes and a half in memory seemed but a few seconds - a breath, the briefest tale ever told.”

Corona and Coronet: Being a narrative of the Amherst Eclipse Expedition to Japan, in Mr. James's schooner-yacht Coronet, to observe the Sun's total obscuration 9th August, 1896. Chapter 29 “The Eclipse”

But alas, totality will end with the appearance of the 3rd contact diamond ring. Be prepared to put the solar filter back on your observing device and enjoy what you have just seen as the Moon begins its exit from the face of the Sun. Know that some folks will include celebratory beverages or even cigars in

their list of equipment they brought along.

In Closing...

The best advice is decide on your equipment, make certain you have everything, check it out, recheck it, and then check it again. And bring along some tools: screwdrivers, pliers, wrenches, even some extra hardware. It's amazing what duct tape will do in an emergency. And if you are fortunate enough to not need any of your tools or supplies, most likely someone will be looking for something that you have.

Are you planning on photographing the eclipse? What type of equipment will that require? How do I set my camera? What can I expect to photograph? That will be our last article in the JALPO August 21, 2017 Solar Eclipse series. The last and fifth article in the series will be the eclipse itself.



Figure 7. Totality in all of its glory; the March 29, 2006. Photo credit: Dr. Mike Reynolds.

Dr. Reynolds' Sample Equipment Checklist (Not All Inclusive)

Out	Item	Packed in	Notes
	Batteries	Equipment Bag 2	AAA AA C D 9V
	Binoculars, Canon 10x30 IS	Equipment Bag 1	In case; check for solar filter
	Camera; Canon DSLR 5D Mark II	Camera Suitcase	
	Camera; Canon DSLR 80D	Camera Suitcase	
	Camera Batteries; Canon DSLRs	Camera Suitcase	
	Camera Battery Chargers	Camera Suitcase	Canon DSLR's
	Duct Tape	Equipment Bag 2	
	Eclipse specification	Camera Suitcase	Maps, data, contacts
	Flashlight, red	Equipment Bag 1	
	Memory Cards; Canon 5D MII	Camera Suitcase	Compact Flash
	Memory Cards; Canon 80D	Camera Suitcase	
	Mount	Tripod case	For Explore APO
	Solar Filter	Equipment Bag 1	For Explore APO
	Solar Filter	Equipment Bag 1	For Canon 300mm lens
	Solar Glasses	Equipment Bag 1	25 pairs
	T-Mount	Camera Suitcase	2-inch, for Canon DSLRs
	Telescope; Explore 102mm APO	Explore telescope box	With diagonal, finderscope
	Tool Kit	Equipment Bag 2	Check list inside bag, confirm
	Tripod; Bogen with Kirk Ballhead	Tripod case	Check for hex wrench
	Tripod; Slik	Tripod case	