

**An Introduction to Solar Observing, and the Solar Eclipse of 2024:**

Good Afternoon! Today I am going to introduce you to observing our nearest star, the Sun. And we'll talk about the upcoming October 14<sup>th</sup>, 2023 Annular Eclipse, and the April 8<sup>th</sup>, 2024 Total Solar Eclipse.

For thousands of years, man has been interested in and inspired by the Sun. The Sun has held a special place in all of the early civilizations. There was the sun god "Re" of the ancient Egyptians. The rulers of the Aztecs considered themselves divine descendants of the sun. And the ancient Greeks who worshipped the Sun as 'Apollo', the Sun God. But as people became more knowledgeable of the sky, the Sun lost its religious importance. Modern Solar astronomy began in 1610 when Galileo used his telescope to observe the Sun and 'discovered' sunspots.

You can find information on the Sun in almost any basic astronomy book. It's about 864,000 miles in diameter, takes about 25 - 35 days to make one rotation, and the Sun is made up of mostly hydrogen and helium gas, with traces of other elements. Using telescopes, we can observe various features of the Sun's outer layers, what we would consider to be its atmosphere, (Chromosphere), and its surface (Photosphere). And using space based instruments; we've been able to deduce what is going on inside the Sun's interior zones.

One of the main reasons that I like to observe the Sun, is that it's one of the few astronomical objects that can have a real physical affect on us. Beyond the obvious, in which the Sun supplies us with heat, light, energy, & life, there are some lesser known but important affects caused by radiation from the Sun and solar flares hitting the Earth's atmosphere and magnetic field. These are called 'Solar-Terrestrial' effects, or 'Space Weather', and are caused by charged particles from the Sun striking the Earth's Magnetosphere and flowing around it.

The most common and beautiful effect is the Aurora or 'Northern Lights'. Aurora are shimmering, colorful curtains of light that sometimes glow in the night sky. It was only about a hundred years ago that scientists discovered that they were caused by interactions with the Sun. The solar wind carries charged particles from the Sun that excite gases in our upper atmosphere. These gases glow in different colors (like neon lights).

Other 'Solar-Terrestrial' effects include:

- Radio, TV, and cellular phone interference.
- Disruption of power systems (brownouts).
- Static electricity buildup on pipelines. (causes corrosion/leaks)
- Satellite and spacecraft electrical malfunctions.
- Radiation danger to astronauts.

Observing the Sun can be an interesting activity for amateur astronomers.

It is also one of the few areas where amateur's can still contribute scientific data to professional astronomers. (thru counting and tracking sunspots). Because of the Sun's brightness and size, even a small telescope will show plenty of detail. The solar features change from day to day, and it's exciting to observe the appearance of a giant sunspot group, or see a large loop prominence arching over the solar limb.

If you learn one thing today, that is: ***Never look at the Sun without a solar filter!***

Your body will not be able to react quick enough to turn your head. In a split second, your retina will burn, and you will go blind in that eye. There's really only one safe to observe the Sun with your telescope, that is using a solar filter on the front end of the telescope that blocks the harmful UV and IR radiation. In addition, there's also dedicated solar telescopes that can only be used to observe the Sun.

Never use an "eyepiece" type solar filter. These will shatter from the heat.

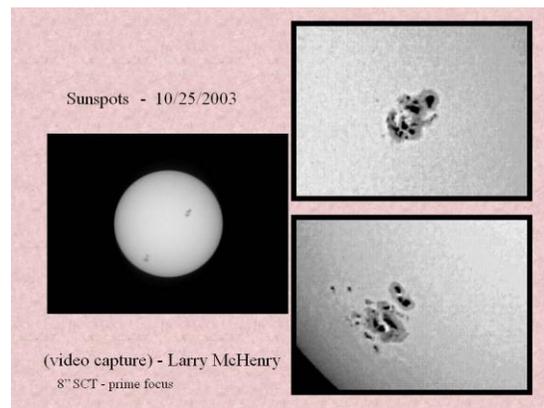
The type of solar feature that you can observe depends on the type of solar filter:

White-Light or Hydrogen-Alpha filters.

Let's talk about White-light solar filters first.

You have many options today. The filters can be made of glass, Mylar, or the Baader Solar Film. You can buy them premade or you can get a sheet of the filter material and make your own.

**White-light solar filters:** Lets you observe Sunspots, Faculae, and the Photosphere.



**Sunspots** are Slightly cooler & darker areas on the Sun's surface, caused by intense magnetic fields that partly block the flow of energy. Last anywhere from a few days to over a month. Usually form as a single small spot, but can grow to form a groups larger than the Earth. The dark center is called the Umbra; lighter outer region is the Penumbra. One way to think of Sunspots is that they are like giant bar magnets, with one spot being the north and the other being the south pole of the magnet. The Sun goes thru an 11 year cycle of high & low magnetic activity.

Another common feature visible in white-light are **Faculae**:

These are Bright clouds of hydrogen gas floating above the Sun's surface. They mark areas where sunspots may be forming, or where sunspots have decayed and disappeared. Faculae are best visible near the edge of the disk.

The last common feature visible in white-light is the **Photosphere**:

This is the Sun's visible surface. Has a grainy appearance in white-light, You can think of the Photosphere as giant convection gas bubbles, kind of like what you get when you boil water.

**H-Alpha solar filters:** Lets you observe Prominences, Flares, and the Chromosphere, or atmosphere of the Sun.

**H-alpha** solar filters consist of a specialized pre-filter that fits on the front of the telescope, and a specialized post-filter that goes with the eyepiece. There's also dedicated solar telescopes sold by Coronado, Lunt, and others.

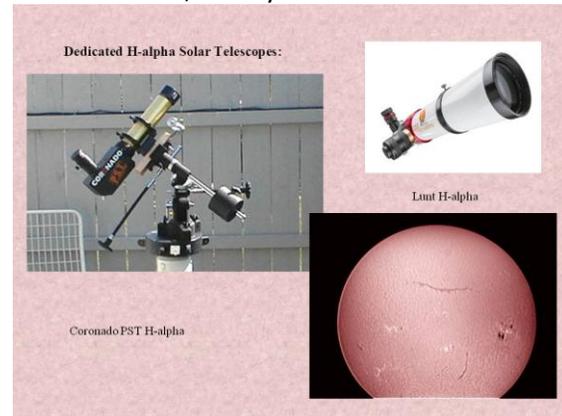
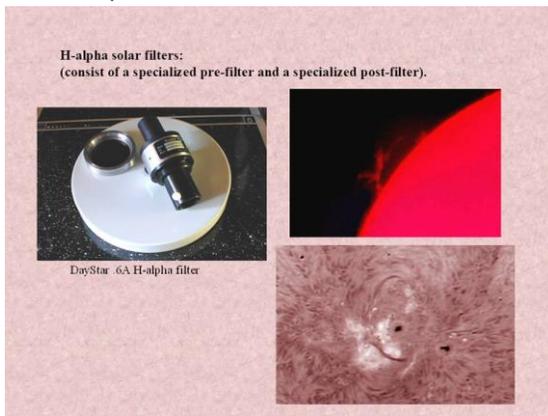
**Prominences** are giant arcs of hydrogen gas thousands of miles long, whose shapes are determined by the Sun's magnetic field in that area. When viewed on the face of the disk, are called '**Filaments**'. (*look like squiggly lines*) Back in the early days of solar astronomy, it was thought that Prominence and filaments were two different features. But, now we know that they are really the same feature, just viewed at a different angle.

A less common feature that you might be lucky to see are **Flares**:

Giant nuclear explosions of radiation, and energy caused by the magnetic field lines becoming twisted together and finally snapping, like giant rubber bands! Depending on the location of the flare on the solar disk and the geometry of the Earth's orbit around the Sun, these can cause affects on the Earth.

Finally there is the **Chromosphere**.

This is the 'atmosphere' of the Sun when viewed in H-alpha. It has a mottled, freckly look.



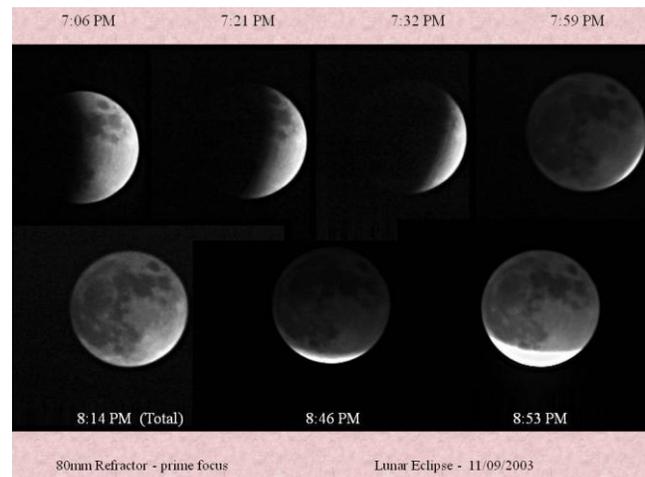
**Eclipses:** Let's first briefly talk about Lunar Eclipses, to help us understand solar eclipse.

**Lunar -**

The first thing you notice when looking at the Moon is its phases. The phases are caused by the way the Earth, Moon, and Sun line up, from new to first quarter, to full, to third quarter, and back to new.

It takes the Moon 29 days to revolve around the Earth. Occasionally, when the geometry is just right, the Sun, Earth, and Moon align so that the Earth's shadow falls on the Moon. This is what causes Lunar Eclipses.

Here's an example of a local Lunar Eclipse back in 2003.



**Eclipses: Solar -**

With Solar Eclipses, it's all about the geometry! Normally, during New Moon phase, the Moon passes either a little above or below the Sun. (a 5 degree tilt in the lunar orbit). But occasionally, when the orbital geometry is just right, the Moon aligns between the Sun and Earth so that the Moon's shadow falls on the Earth. This is what causes Solar Eclipses. The Moon is about 400 times smaller than the Sun. So how does such a small object block out the Sun? Again, it's the geometry! The Moon is also about 400 times closer to the Earth than the Sun, making it almost a perfectly sized light-shield. There's generally between two to five solar eclipses a year, with at least one being total.

The dark Lunar umbra shadow that touches the Earth is only about 70 miles wide. To see a total eclipse, you must be under that. The Moon's lighter penumbra shadow is about 4000 miles wide, and anywhere under that will produce a partial eclipse. Total Solar Eclipses generally take several hours to run thru all stages, starting with a partial eclipse by the Moon slowly blocking the Sun's disk, that last about an hour before totality occurs. Totality can last from about 7 minutes or less, depending on where the Moon's shadow path falls on the Earth.

Once those few short minutes of totality are over, the partial phases then proceed for about another hour, with the Moon slowly moving away from the Sun's disk.

Please visit the following website for diagrams on how solar eclipses work: <http://www.MrEclipse.com/>

The Moon's orbit around the Earth is not a perfect circle, but is an ellipse. Due to this orbital variance, during some eclipses, the Moon doesn't always intersect the Sun directly, but is a little higher or lower. This causes a partial eclipse, where only a portion of the Sun is blocked. And, depending on the distance from the Earth to the Moon during the eclipse, the Moon may be just not quite large enough to cover the entire solar disk. This causes what is called an annular eclipse. But, when the geometry is just right, we get a total eclipse that allows us to safely see the chromosphere, prominences, and the corona with the naked-eye.

### **Naked-eye eclipse observing:**

Throughout the partial phases of the eclipse, you **MUST** protect your eyes!

As long as even a slight sliver of the Sun's disk is visible, you must use a safe method of viewing the Sun.

There is still more than enough IR and UV radiation to cause eye damage if you stare at the Sun.

Either purchase ahead of time a pair of safe solar observing glasses, or use a pinhole projector to indirectly view the partial phases. You don't need to actually use a telescope to enjoy the total eclipse, but if you do, you will need a safe solar filter that either goes on the front of the telescope, or use a dedicated solar telescope.



### **Imaging the Eclipse:**

You can photograph a solar eclipse using any type of camera, as long as you are careful and take precautions. A solar filter must be used on the lens throughout the partial phases for photography. You can also use any lens, though the longer the focal length of the lens, the larger the images of the sun you'll be able to capture. How large you want the sun to be in the frame will determine what focal length lens to use on your camera.

The easiest way to determine exposure is to run a calibration test on the un-eclipsed sun on a clear day prior to the eclipse. Choose the best shutter speed/aperture combination and use them to photograph the partial phases of the solar eclipse. Because the sun's brightness stays the same throughout the partial phases, no exposure compensation will be needed. But, it never hurts to bracket your exposures, especially if the eclipse occurs on a hazy day. If possible, you will want to turn off the camera's built-in flash. It won't help any, and will just be distracting to others. You should attach your camera on a sturdy tripod, and manually focus the camera, setting it to infinity. If you are using a telescope on an equatorial mount, either piggybacked, or at prime focus, make sure the telescope's drive is properly polar aligned and will track the sun keeping it centered in your camera throughout the eclipse.

During totality, all solar filters must be removed. It is completely safe to photograph and view the totally eclipsed sun directly. No filters are needed, and in fact, they would completely hide the view.

The average brightness of the solar corona varies as it extends away from the disk, so no single exposure can capture its full dynamic range. The best strategy is to bracket the exposures over a range of shutter speeds from 1/1000 second to 1 second. The Full Moon (or near Full) makes a good practice object as its brightness will generally match

the brightness of the eclipsed Sun. You'll need to practice this several weeks before the eclipse date when the Moon is up with the correct phase.

Another great option is using a camcorder. Not only can you use it to zoom in when needed, but you can also record crowd noise and the reactions of your friends. Security cameras with auto shutter speeds and recording to a DVR can also be used. If possible, use multiple vidcams, one with a fisheye lens for a wide-field, and another with a long focal length for close-ups. Make sure the cameras are running a few minutes prior to totality, and then sit back in a chair and watch using eclipse glasses. Afterwards, stop the video and later back home; you can extract individual frames for still photos.

Regardless of how you plan on imaging the eclipse, you should rehearse setting up the camera and adjusting exposures before the eclipse, as it's easy to get caught up in the overhead spectacle, so much so that you forget to take pictures. You should also automate as much as possible so that you don't end up tending the cameras and missing most of the eclipse. You might want to consider just snapping a few pictures of totality and your friends with your phone camera and later buying a few eclipse photos from the professionals.

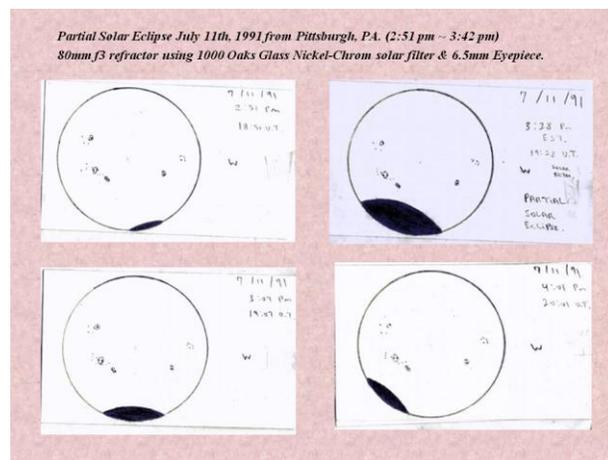
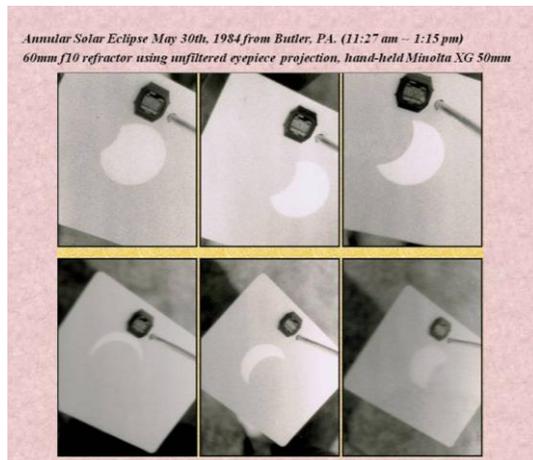
Solar Eclipse examples:

**Annular Solar Eclipse May 30th, 1984 from Butler, PA. (11:27 am ~ 1:15 pm)**

60mm f10 refractor using unfiltered eyepiece projection, hand-held Minolta XG 50mm

**Partial Solar Eclipse July 11th, 1991 from Pittsburgh, PA. (2:51 pm ~ 3:42 pm)**

80mm f3 refractor using 1000 Oaks Glass Nickel-Chrom solar filter & 6.5mm Eyepiece.



**Partial Solar Eclipse October 23rd, 2014 from Pittsburgh, PA. (~ 5:45 pm)**

Coronado PST refractor & 24mm Eyepiece. Nikon Coolpix point-n-shoot camera



## August 21<sup>st</sup>, 2017 Total Solar Eclipse:

Here's a map of North America showing the path of Great American Eclipse of 2017 eclipse.  
(from the Eclipse2017.org website)

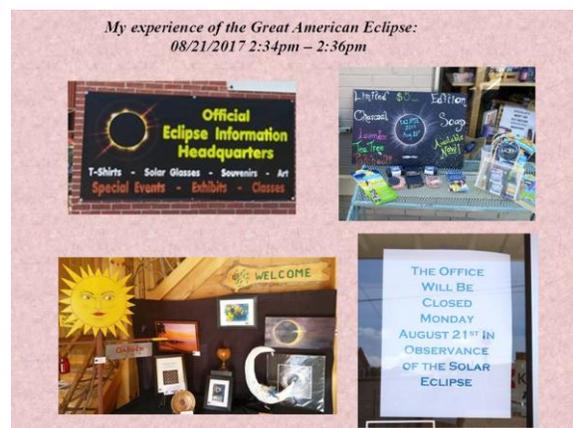
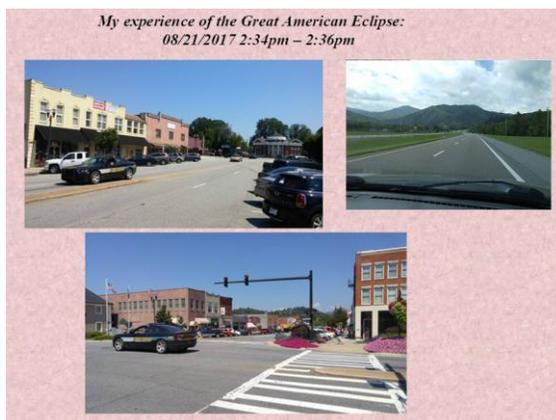
The eclipse shadow starts off in the state of Oregon, crossing over parts of Idaho, Wyoming, Nebraska, Kansas, Missouri, Illinois, Kentucky, Tennessee, North Carolina, Georgia, and exiting the continent off the coast of South Carolina.



My location for the 2017 total eclipse – Murphy, North Carolina, in the Smokey Mountains.

Town of Murphy, avg population ~ 1600 people. (probably tripled on eclipse day)

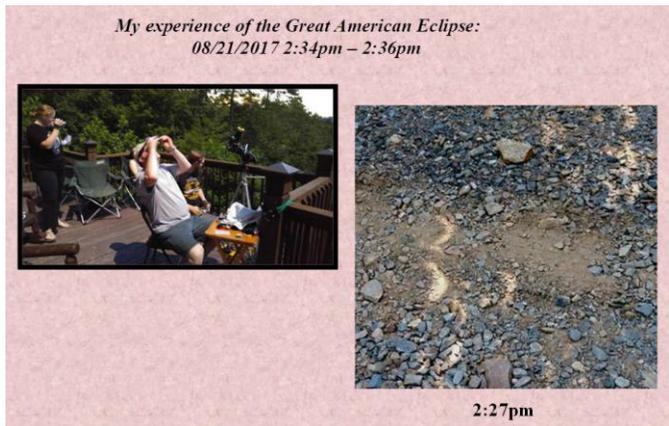
Embraced the eclipse, 'official' eclipse headquarters on every corner, 'sun/moon' swag for sale at stores, restaurants and bars with eclipse parties planned. Camp here, or view the eclipse here signs everywhere.



Main eclipse imaging setup: a Canon T3 & 200mm f8 lens, and an analog astronomical videocam with 55mm lens, both on a small telescope mount to track the Sun. For secondary cameras: an old security camera with a fisheye lens on a tripod hooked up to a DVR, hand-held DVD-camcorder, cell phone cameras, and a Coronado PST Ha telescope. Used a solar eclipse timer app on my cellphone that counted down the minutes to totality and told you when it was safe to remove your glasses, and a mercury thermometer for monitoring the outdoor temperature.

At 1:05pm, with the Sun overhead in a clear blue sky, we all rushed out on the cabin deck to see to the official start of the eclipse. At first nothing was visible using the eclipse glasses and hand-held filters. Only using the solar telescope that we had setup could you see the first bite taken by the Moon. Then within another couple of minutes, it was plain to see even with the glasses. After the initial wave of excitement that the solar eclipse had started, (and that we had clear skies), nothing much was noticeable until the Moon had covered more than half of the Sun. Everyone kept taking turns observing the partial phase of the eclipse through the solar telescope and their glasses.

By 2pm, the quality of sunlight had changed, with the cabin and surrounding trees taking on a yellowed, late-afternoon look. We also noticed that the air temp had begun to drop. Within the last 10 minutes leading up to totality, the light and everything took on a brownish tint, like it would look if you were wearing sunglasses. The hot and humid temp had definitely become more comfortable, and the air was no longer calm, with an occasional light breeze being felt. Under the trees along the gravel driveway, we could see tiny crescents made by the leaves acting as pinhole projectors.



The view through the PST Ha telescope was interesting right before totality occurred, as you could visually see detached sections of the limb using the telescope, but the detached sections weren't noticeable with the naked eye using solar glasses. That was the closest we came to seeing Bailey's Beads. In the last few minutes, with only a thin crescent of the Sun's disk remaining visible, the sky took on a deep blue color, and the forest around us began to darken with the crickets beginning to chirp. Then at the moment of totality, it was as if a giant dimmer switch was being turned down, as within seconds the last remaining bit of sunlight winked out, the sky went a dark grey, and the cabin deck that we were on was plunged into an eerily darkness.

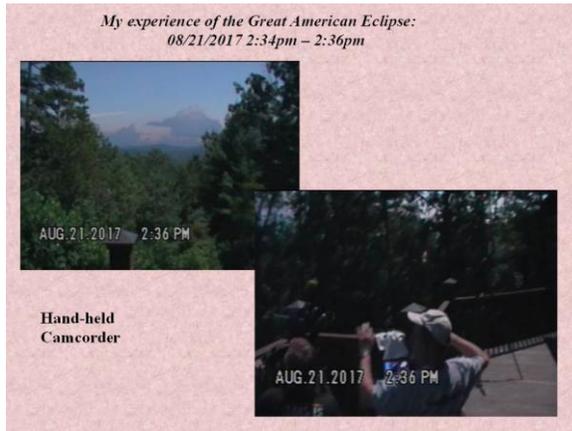


In the place where the Sun used to be, there was now what looked like a deep-black disk encircled by a thin, bright-white diffused ring of light with tints of pink. Extending out in parallel from either side of the disk were what looked like pearly white gossamer wings! The entire object had a 3 dimensional look to it, something I've never seen in any photograph of a total solar eclipse. (The black disk was the dark side of the Moon, and the ring of light was the solar corona, the pink tint were caused by prominences extending out from the solar disk, and the gossamer wings being magnetic plumes from the solar corona). Only by sketching afterwards could I capture the look.

During totality, the mountains to the southeast remained brightly illuminated, the horizon various shades of light-red, with further off in the distance white thunderclouds towering over it. Being in the forest, this was our only good view of the horizon. And because of the forest, we couldn't see the Moon's shadow as it approached us from the northwest, and only to the southeast could we see the 'sunset' band of colors.

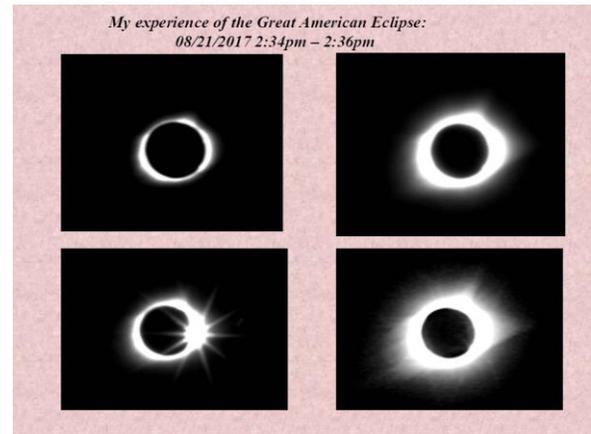
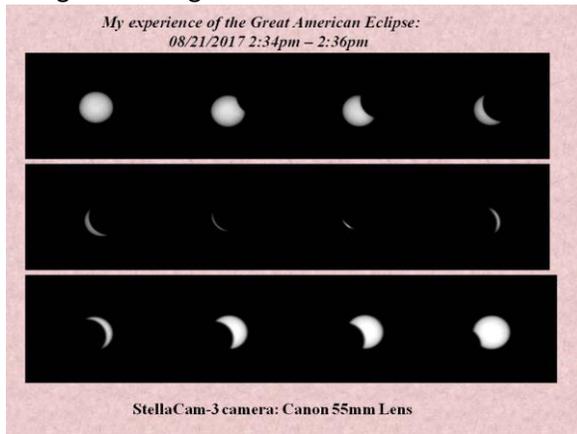
Didn't see any sign of shadow bands either, but we didn't really have a good size white object on the ground to look for them on. Those 2+ minutes went so quickly! I had binoculars handy to look at the eclipsed sun, but completely forgot about them until after third contact and it was too late. Bright stars were now visible overhead..

Amid everyone saying how crazy the sky looked, along with numerous "OMG's", a few tree frogs began to croak. But before the nightly frog chorus could really get started, a brilliant flare of light appeared on the western edge of the black disk, it was the 'Diamond Ring' effect. Within seconds the sky turned blue, the solar corona and plumes disappeared, and daylight began to return.

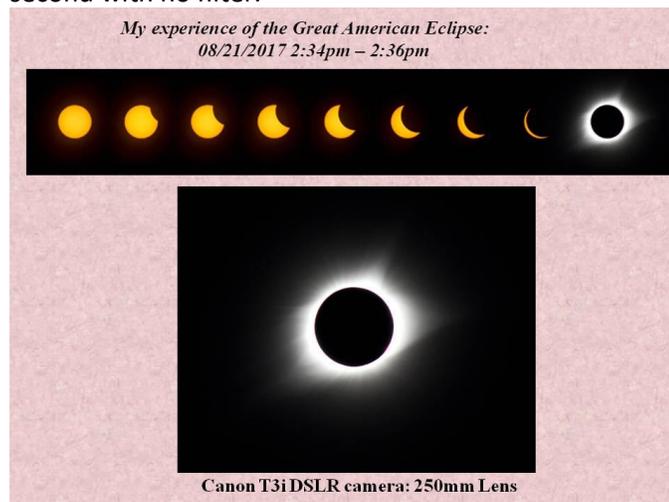


Totality was over!!! Everyone jumped up and shouted. It had been an awesome, incredible sight to see, and the fastest 2 minutes & 21 seconds ever! We celebrated successfully seeing totality with Corona beers, while continuing to monitor the partial eclipse phase with our eclipse glasses.  
(also had Blue Moon beers to drown our sorrows if we were clouded-out, LOL)

Totality using the analog astronomical videocam with 55mm lens



totality using a Canon T3i DSLR & 200mm lens. Partial phases had a shutter speed of 1/350 second using a solar filter. Totality shutter speed was 1/45 second with no filter.



Our experiment with the mercury thermometer was fun! In addition to the air temp, (we recorded a good 11 degree drop on the outdoor mercury thermometer that we were monitoring, from 92 deg down to 81 deg, eventually recovering back to 86), the humidity also changed. It started off at 36% and went up as the air temp dropped during the eclipse to a high of 46%, and then gradually went back down afterwards to the low 40's.

The 2017 Total Solar Eclipse was an awesome, incredible sight to see live. Pictures or video can't begin to capture was an amazing spectacle it was!

### Upcoming Solar Eclipses: **October 14th, 2023 Annular Solar Eclipse.**

What can you expect and where can you go see the Great American Annular Eclipse of 2023.

Here's a map of North America showing the path of the October 14th, 2023 eclipse path eclipse.

(from [eclipse2023.org](https://eclipse2023.org) website). The eclipse shadow starts off in the state of Oregon, crossing over parts of Nevada, Utah, Arizona, and exiting the continent off the coast of Texas.



Pittsburgh and Western Pennsylvania are located far to the North East of the eclipse path.

From the Pittsburgh, PA region, we will see about a 44% partial eclipse, fairly deep and quite interesting with a properly solar filter shielded telescope. But if at all possible, don't settle for this!!!!

Try to plan a trip out west. You want to see the annular ring of the eclipsed sun!

Except for Oregon, and the Texas coast, weather and cloud cover shouldn't be a problem for most of the eclipse path.

(See [Eclipseophile.com](https://Eclipseophile.com) for specific state details). A vacation to the 'Four Corners' area, where you could combine the eclipse with a visit to Glen Canyon, Monument Valley, or Mesa Verde could make for a very scenic view. Or central New Mexico around the Albuquerque area or further south to see the Aliens in Roswell could also be fun. Or, you could fly in to San Antonio Texas and explore West Texas, or down to the Gulf of Mexico at Corpus Christi.

### April 8th, 2024 Total Solar Eclipse.

What can you expect and where can you go to see the Great American Total Eclipse of 2024.

Here's a map of North America showing the path of the April 8th, 2024 eclipse. (from [Eclipse2024](https://Eclipse2024.org) websites).



The eclipse shadow starts off in the country of Mexico, then crosses into the United States at the border of Texas, then on thru the states, crossing over parts Oklahoma, Arkansas, Missouri, a sliver of Tennessee, Illinois, Kentucky, Indiana, Ohio, Western Pennsylvania, upstate New York, Vermont, New Hampshire, Maine, and Canada. South Eastern Ohio and most of Western Pennsylvania will be outside the path of totality.

From the Pittsburgh, PA region, we will see about a 97% partial eclipse.

It will be a very deep and quite interesting sight with a properly solar filter shielded telescope, and we'll be standing under a twilight sky, but it won't be dark.

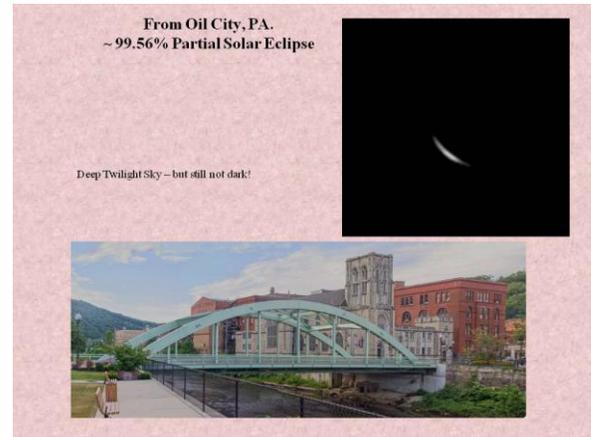
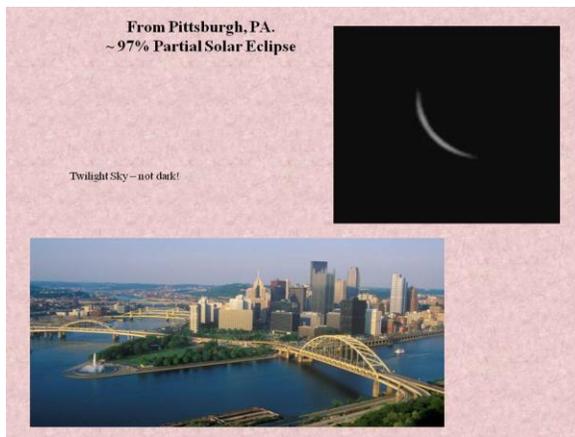
From the Western PA region near Oil City or the ORAS observatory, we will see about a 99.5% partial eclipse. A very, very, deep eclipse and quite interesting with a properly solar filter shielded telescope. The sky will be a deep twilight, you'll feel the air grow chill, and you may be able to even see a few bright stars,,,,,

But if at all possible, don't settle for either of these locations!!!!

What you really want to see is the Diamond ring effect! You want to see Bailey's Beads flickering around the Moon!

You want to see the pearly-white solar corona streaming away from the eclipsed disk of the Sun!!!

This is what you want to see!!!!!! You want Totality!!!! You want to stand under the shadow of the Moon!



So, what will it be like?

During the early stages of the eclipse, unless you are using a safe solar filter to observe the Sun, there will be no indication of what's going on, as the Sun stays bright. Once the partial phase gets well past 75%, then there will be a noticeable drop in brightness, with the sky taking on the appearance of a late afternoon day.

The outdoor temperature will start to cool.

In the last couple of minutes before totality, there is a noticeable darkening in the direction that the Moon's shadow is approaching your location from, appearing like a darkening storm front. The quality of the sunlight rapidly begins to weaken and everything around you appears washed-out and lacking color. Insects and birds become quiet, as if settling in for the evening. Even farm animals and pets have been reported to act strangely at this time.

Then, a few seconds before the Moon completely covers the Sun, what appears to be a dark mass rises over the western horizon rushing towards you. This is the Moon's umbra shadow approaching!!

The sight of this has been known to cause a deep sense of dread or fear in some people.

If you are standing near a light colored building or car, you might see flickering bands of shadow rapidly crossing over the structure. These are a light effect called shadow bands.

Then the thin crescent of remaining solar disk suddenly begins to break-up into brilliant blobs of sunlight which rapidly disappears. These are called Bailey's Beads after the 19th century astronomer who realized they were caused by sunlight shining over the lunar mountain peaks and valleys.

Then the beads quickly vanish, leaving one last ray of visible sunlight, the Diamond Ring effect!

And then,,,,,,, Totality!!!! You ARE standing under the shadow of the Moon!

It's now safe to take off your eclipse glasses or remove your telescope filters. In a matter of seconds, a thin red band of light appears around the blackened lunar disk, this is the Sun's chromosphere or inner atmosphere. You may also see small red flickering flames; these are large prominences on the Sun's limb, reaching high into the chromosphere past the occulting disk of the Moon. Finally, the ghostly glow of the Sun's outer atmosphere, the Solar Corona will extend for several diameters around the eclipsed Sun, looking like a large diffuse glowing ring of light, with possible streamers extending outwards.

The sky above you is a deep shade of twilight, with the brighter stars and planets visible overhead. The entire horizon around you will glow with the deep oranges and reds of sunset. It may grow dark enough that you will need a flashlight. The air temperature can drop 10 to 15 degrees and you may feel a slight chilly breeze.

Then, after about 3 and a half minutes of celestial glory, it will suddenly come to an end. The Corona will vanish as a reverse Diamond Ring and Bailey's Beads effects appear on the opposite side of the eclipsed solar disk as the Moon begins to slowly move away. At this point safe solar filters and glasses must be used to continue viewing.

The sky will rapidly brighten with daylight as the partial eclipse phase begins. In about an hour, the Moon will finally glide off of the Sun's disk. The Eclipse will be over, but not forgotten.

### So, Where to go for the 2024 eclipse?

The eclipse duration varies depending on your geographic location along the shadow path and how close you are to the center-line. (See Eclipse2024 website for details).

Mexico has the longest eclipse duration at 4 minutes and 28 seconds, while Newfoundland has the shortest – 2 minutes and 53 seconds. In the Ohio and Pennsylvania region, we'll average around 3 and half minutes. So, where to go? It all depends on how far you want to drive, or fly, and if you want to stay overnight.

We're well outside of the eclipse path; need to get in the car and drive! Easiest may be to head for North-central Ohio, above Columbus, or over to Indiana and the Indianapolis area. But, that may not be the best weather choice as I did a 10 year weather comparison for April 8th for a number of locations down into west-central Ohio, Indiana, and Illinois. The cloudy 'odds' was anywhere from 60-70%. The only way to really increase the odds of clear weather to 50/50 was to go all the way to Texas! Or across the border into Mexico.

So, instead of heading westward, I plan to head north to the Lake! Get as close to the shore as I can. Wait a minute! Lake Erie in April! That's crazy talk!! Maybe,,,,,, Maybe Not! Let me explain.



From reviewing Eclipseophile.com for specific state details, it's going to be 'luck of the draw' regarding weather. The southern and mid-west states from Texas to Kentucky will have already started their spring severe thunderstorm season, along with the possibility of late lingering stormy winter weather in the northern states from Ohio eastwards. So unlike the 2017 total eclipse, there's really no 'safe, guaranteed' cloud-free location for 2024. Cloud cover generally increases the further north you go along the eclipse path.

If we're unlucky enough to get a large Nor'easter develop on April 8<sup>th</sup>, the usual extensive cloud fronts associated with these storms can almost entirely obscure the mid-western and eastern United States and Canadian portions of the track. That would be a bad day for eclipse viewing! ☹️

As detailed on [Eclipseophile.com](http://Eclipseophile.com), In April, the Lake Erie temperatures are generally just above freezing (there may even be ice on the lakes). The afternoon can often be cloudy and sometimes thunderstorms can develop. But, those storms and their clouds need heat energy rising up from below to sustain them, and the cold air over Lake Erie or Lake Ontario and the nearby shore suppresses that heating and can actually keep skies cloud free over the lake and for a short distance inland. The lakes may be completely surrounded by a band of clear skies while a few miles away from the lake it's cloudy. The climate data shows that there is a band of lower cloudiness along the south shore of Lake Erie as far East as Dunkirk, but this tapers off toward the narrow end of the lake towards Buffalo. It's like a "Reverse Lake Effect"! But instead of clouds, rain or snow, we get clear skies.

While I'm no weather expert, I think we actually do have a good chance of reverse lake effect along the southern shore of Lake Erie and Lake Ontario too. In addition to the climatic data detailed on [Eclipseophile.com](http://Eclipseophile.com), Myself, and several other people that I know have actually experienced the reverse lake effect for the 2012 Venus Transit along the southern shoreline of Lake Erie and Ontario, and I've experienced it a number of times sitting out at my favorite winery near Westfield, NY, (about a mile from Lake Erie), while 6 miles back inland at our B&B in Mayville it was cloudy. And I've talked with a few local residents in the area about the effect, and they say that as long as the lake isn't frozen over, it's likely to happen. (But I would avoid the narrow end of the lake towards Buffalo; it's always cloudy and rainy there!)

So I think the key to successfully observing the eclipse is to try and get within a mile of Lake Erie to take advantage of the reverse lake effect clearing that occurs along the shoreline. While I'm not sure if the city of Erie, PA is the best spot along the lake, I do think that it being along the lake shore will be a sweet-spot. So I'm going to roll the dice like I did for 2017 and take a chance along the lake shore. Again, if you go to the lake, try to get within a mile or less of the lake shoreline for the reverse lake effect clearing that only occurs there.

Hopefully, my luck with the 'reverse lake effect' holds and the sky will be clear for that crucial 4 minutes on the afternoon of April 8<sup>th</sup>, 2024. While I may have to endure cold winds coming in off the lake, at least this time, there shouldn't be scorpions in the basement,,, ☺️

Finally, if you haven't already figured-out your 2024 total eclipse plans, better get on the ball!! It may be very hard to find a rental. A lot of overnight B&B's and VRBO locations are already taken! You want to look for a place that will have enough beds for your family and guests, that's not on a wooded lot or has the southwest sight-lines blocked by large trees on or close to the property. A deck or a large private fenced-in backyard for setting up a telescope would also be nice.

The Interstate Highway system.

One last note - With all the expected news coverage leading up to the eclipse, the morning of Monday, April 8<sup>th</sup>, 10's of thousands or more people are going to be on the roads trying to drive to the eclipse path. "Car-mageddon"! The interstate freeways and major local highways are likely to be clogged with slow moving or stalled traffic. Really should try to get to your observing site either the night before, or leave very early the morning of the eclipse. Remember to take plenty of water, snacks, warm clothing, and a paper roadmap as local cellphone coverage could be overloaded. (you might also want to take a roll of TP in the car, just in case you have to pull over along the road).

### **Conclusion:**

This concludes my introduction to Solar Observing and Eclipses.

Hopefully, you've learned a little about our closest star – the Sun! And the upcoming Solar Eclipse's!

I encourage everyone to get out on October 14<sup>th</sup>, 2023 and April 8<sup>th</sup>, 2024 and participate and observe the historic celestial event overhead.

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**Recommended Readings:**

“How to Observe the Sun”	Astronomical League
“Observing the Sun”	Peter Taylor
“Solar Astronomy Handbook”	Rainer Beck
“AstroPhysics of the Sun”	Harold Zirin
“Road Atlas for the Total Solar Eclipse of 2024”	Fred Espenak

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**Favorite websites:**

<b>SOHO:</b> <i>Solar and Heliospheric Observatory</i>	<a href="https://sohowww.nascom.nasa.gov/home.html">https://sohowww.nascom.nasa.gov/home.html</a>
<b>SDO:</b> <i>Solar Dynamic Observatory</i>	<a href="https://sdo.gsfc.nasa.gov/">https://sdo.gsfc.nasa.gov/</a>
<b>BBSO:</b> <i>Big Bear Solar Observatory</i>	<a href="http://www.bbso.njit.edu/">http://www.bbso.njit.edu/</a>
<b>Space Weather:</b>	<a href="http://spaceweather.com/">http://spaceweather.com/</a>
<b>Great American Eclipse:</b> (eclipse maps & info)	<a href="https://www.greatamericaneclipse.com/">https://www.greatamericaneclipse.com/</a>
<b>Eclipse2024.org:</b> (eclipse path simulator)	<a href="https://eclipse2024.org/">https://eclipse2024.org/</a>
<b>Eclipseophile.com:</b> (climate & weather)	<a href="https://eclipseophile.com/2024tse/">https://eclipseophile.com/2024tse/</a>

Thank You!

Larry McHenry

<http://stellar-journeys.org/>