

Preparing for and seeing a ● total solar or lunar eclipse!

(for 👤 people who do this sporadically)

While helping 👨 family, friends and 👤 colleagues on various projects, we have learned some things. In an attempt to keep these processes repeatable, *and keep myself organized*, I 📝 record and maintain some helps on this subject. This document contains our experience with and plans for seeing:

- **Total lunar eclipses. Easiest to see:** Visible from 🌐 **half the planet! No special gear!**
- **Planetary transits across the sun.** Very rare. But are visible from 🌐 **half the planet!** Requires some knowledge and gear.
- **Solar eclipses. Extremely moving, you should experience at least one!** But **totality** is visible from only a **narrow path**, requiring **knowledge** and **preparation**.



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For date this file last updated, please see page footer. For information on 🌲 green or </> programming subjects, please see a list of [this document's sister docs](#).

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TODO: For the upcoming total solar eclipse:

- Look into citizen science project **Dynamic Eclipse Broadcast (DEB) Initiative:**
 - <https://DEBInitiative.org>
 - <https://SkyAndTelescope.org/astronomy-news/how-citizen-scientists-can-help-broadcast-eclipses>
 - https://eclipse.AAS.org/sites/eclipse.aas.org/files/DEB_Initiative_Reflector_Mar2023.pdf
 - <https://science.NASA.gov/eclipses/future-eclipses/eclipse-2024/eclipse-2024-citizen-science>
 - <https://NASA.gov/science-research/heliophysics/nasa-funds-3-citizen-science-projects-to-study-2024-u-s-solar-eclipse>
- <https://solarsystem.NASA.gov/ssa> or <https://science.NASA.gov/engage/solar-system-ambassadors>
- Reorganize weather links.
 - Move or copy in links to weather, aurora, and air quality (e.g., ☁ ➔ smoke) from sister document <https://EricPiehl.alterVista.org/tools.pdf#page=2> page 2.

TODO: As practical:

- Add gets about as dark as 45 minutes after sunset.
- Verify all links.
 - For example, https://eclipse2017.nasa.gov/sites/default/files/Build_a_Sun_Funnel_v4.pdf became https://eclipse2017.nasa.gov/static/img/make-sun-funnel/Build_a_Sun_Funnel_v4.pdf
- Fix section "**Learn about lunar eclipses in general:**" with **4weather group**. (Notes from 2023-11-___)
- Make sure stuff I am adding to total solar eclipse makes it to other eclipse types, too.

1 Your next ● total lunar eclipse!

These happen fairly often. And are **easy to see**: **No** special gear! Visible from 🌐 **half the planet!** So you can see from your local soccer field, museum parking lot, or other site. *In 2019*, my front porch! A great way to start!

1.1 Zero or more days ahead

- **Learn** about lunar eclipses **in general**:
 - See short but informative ▶ video **Lunar Eclipse Essentials** from NASA <https://YouTu.be/wuhNZeJHeBq>.
 - See short informative ▶ video **Great American Eclipse** by PBS Space Time <https://YouTu.be/nsWhE22i4FM>.
 - See each graphic at https://wikipedia.org/wiki/Lunar_eclipse (select one graphic, and swipe to see others).
 - See *Modeling Meaningful Eclipses* <https://nightsky.JPL.NASA.gov/docs/ModelMeaningfulEclipses2016.pdf>.
- **Learn** about **your particular eclipse**:
 - While here, when you come across relevant information:
 - grab it, and **update timelines** in section "**1.2 Future lunar eclipses we are tracking**" below, and
 - print it to take with you to see the eclipse!
 - <https://EclipseWise.com/eclipse.html>.
 - <https://eclipse.gsfc.NASA.gov/lunar.html>.
 - <https://TimeAndDate.com/eclipse/list.html> > tab **Lunar**.
 - <https://Eclipsophile.com/global-cloud-cover>.
 - **Sunset, sunrise, and twilight times** (civil, nautical and astronomical), for your location <https://PlanetCalc.com/300> > scroll down to "Sunrise and sunset calculator".
- Search your local media, **astronomical associations, museums** and <https://nightsky.JPL.NASA.gov/clubs-and-events.cfm> for any eclipse-watching "**star parties**" near you.
 - *If nothing*, select a **viewing site** nearby, with lots of openspace (it will be dark outside), and minimal light pollution. We use our local middle school soccer field, a 7-minute walk away from our house.
- **Pack** (a subset of the [solar eclipse list below in section 3.2](#)):
 - clothing for **any** conceivable weather (well beyond any minimum expectation)
 - this **plan** and **timeline**
 - **soccer chairs**
 - **flashlight** or **headtorch** in your pocket on your forehead
 - electronics and chargers
 - (*if not your first eclipse*) **binoculars, camera** or video equipment
 - (*if not your first eclipse*) **telescope** with camera or [public-viewing device](#)
 - (*optional*) folding **wagon**
 - ...
- Play with all your equipment.
- *If* <https://Weather.gov> or <https://Astrospheric.com/?Latitude=42.957719&Longitude=-85.522478> says you have a chance of some clear skies, continue ...

TODO: Move or copy in links to weather, aurora and air quality (e.g., 🌫️ ➡️ smoke) from sister document <https://EricPiehl.alterVista.org/tools.pdf#page=2> page 2.

1.2 Lunar eclipses we plan to view

A workspace for info on all future lunar eclipses is in the [last subsection](#) below. Those visible from 🌐 our hemisphere, or are otherwise convenient for us to view, are expanded in detail in the next few subsections ...

1.2.1 Workspace for deciding which future lunar eclipses we may view

Partial. Lunar Eclipse (Penumbral), night of 2024-03-24/25. Visible from South/West Europe, East in Asia, Much of Australia, Much of Africa, North America, South America, Pacific, Atlantic, Arctic, Antarctica.

<https://eclipse.gsfc.nasa.gov/LEplot/LEplot2001/LE2024Mar25N.pdf>.

<https://EclipseWise.com/lunar/LEprime/2001-2100/LE2024Mar25Nprime.html>.

<https://Eclipsophile.com/global-cloud-cover>.

Partial. Lunar Eclipse (Partial), night of 2024-09-17/18. Visible from Europe, South/West Asia, Africa, North America, South America, Pacific, Atlantic, Indian Ocean, Arctic, Antarctica.

<https://eclipse.gsfc.nasa.gov/LEplot/LEplot2001/LE2024Sep18P.pdf>.

<https://TimeAndDate.com/eclipse/lunar/2024-september-18>.

<https://EclipseWise.com/lunar/LEprime/2001-2100/LE2024Sep18Pprime.html>.

<https://Eclipsophile.com/global-cloud-cover>.

Need to create section 1.2.5 above. Lunar Eclipse (Total), night of 2025-03-13/14. Visible from Much of Europe, Much of Asia, Much of Australia, Much of Africa, North America, South America, Pacific, Atlantic, Arctic, Antarctica.

<https://eclipse.gsfc.nasa.gov/LEplot/LEplot2001/LE2025Mar14T.pdf>.

<https://TimeAndDate.com/eclipse/lunar/2025-march-14>.

<https://EclipseWise.com/lunar/LEprime/2001-2100/LE2025Mar14Tprime.html>.

<https://Eclipsophile.com/global-cloud-cover>.

Too far. Lunar Eclipse (Total), night of 2025-09-07/08. Visible from Europe, Asia, Australia, Africa, West in North America, East in South America, Pacific, Atlantic, Indian Ocean, Arctic, Antarctica.

<https://eclipse.gsfc.nasa.gov/LEplot/LEplot2001/LE2025Sep07T.pdf>.

<https://TimeAndDate.com/eclipse/lunar/2025-september-7>.

<https://EclipseWise.com/lunar/LEprime/2001-2100/LE2025Sep07Tprime.html>.

<https://Eclipsophile.com/global-cloud-cover>.

2 Your next planetary transit across the sun!

Planetary transits are very rare. Venus transits twice every 108 years or so. Mercury once every 8 years or so. But transits are visible from **☉ half the planet!** On the third hand, observing requires some **special gear**, so try to observe with us, or with a **local star party** <https://nightsky.JPL.NASA.gov/clubs-and-events.cfm>.

2.1 Zero or more days ahead

- **Learn** about planetary transits across the sun **in general**:
 - **See short but informative ► video?** At https://YouTube.com/results?search_query=planetary+transit ?
 - See each graphic at https://wikipedia.org/wiki/Transit_of_Venus and https://wikipedia.org/wiki/Transit_of_Mercury (select one graphic, and swipe to see others).
- **Learn** about **your particular transit**:
 - While here, when you come across relevant information:
 - grab it, and **update timelines** in section "[2.2 Future planetary transits we are tracking](#)" below, and
 - print it to take with you to see the transit!
 - <https://EclipseWise.com/eclipse.html#TXlinks>.
 - <https://NASA.gov/feature/when-planets-transit> and <https://eclipse.gsfc.nasa.gov/transit/transit.html>.
 - <https://TimeAndDate.com/eclipse/list.html> > tab **Transit**.
 - <https://Eclipsophile.com/transit-of-mercury>.
 - **Sunset, sunrise, and twilight times** (civil, nautical and astronomical), for your location <https://PlanetCalc.com/300> > scroll down to "Sunrise and sunset calculator".
- Search your local media, **astronomical associations, museums** and <https://nightsky.jpl.nasa.gov/clubs-and-events.cfm> for any planetary transit sun-watching "**star parties**" near you.
 - *If nothing*, select a **viewing site** nearby, with lots of openspace. We may use our local middle school soccer field, a 7-minute walk away from our house.
- **Pack** (a subset of the [solar eclipse list below in section 3.2](#)):
 - **solar eclipse glasses** or **shade-14 welders glass**, compliant with **ISO 12312-2** and **CE**,
 - **sun hat**, and clothing for **any** conceivable weather (well beyond any minimum expectation)
 - **maps, charts**, paper copy of this **plan** and **timeline** for *each* adult. Mine on bright-colored **clipboard!**
 - **cooler** with **food** and **water** for 6 hours!
 - **soccer chairs**
 - **book** and magazine in case downtime
 - (*if view site has no shade*) **canopy tent**
 - (*optional*) folding **wagon**
 - (*if not your first transit*) **camera** and video equipment, **binoculars** with their own [solar eclipse glasses](#) meeting **ISO 12312-2**, and/or **telescope** with camera or [public-viewing device](#).
- Have team each read about eye-safety, perhaps at <https://eclipse2017.nasa.gov/safety> and <https://space.com/35555-total-solar-eclipse-safety-tips.html>.
- Play with all your equipment.
- If <https://Weather.gov> or <https://Astrospheric.com/?Latitude=42.957719&Longitude=-85.522478> says you have a chance of some clear skies, continue ...

3 Your next ● total or annular solar eclipse!

Solar eclipses happen a few times a year. But **totality** is visible from only a **narrow path**. But they are extremely moving, quite freaky, and way cool. A very special experience, you should enjoy at least once in your life. After which you will want another. And another.

- Someone said you may experience:
 - Awe
 - Joy
 - A connection to the Cosmos.
 - Hear changes in natural sounds, and see changes in behavior (e.g., birds nesting, insects).
 - Disorientation



If you live near the path of totality, go!

- **"A 98.5% partial eclipse is zero percent total!"** -- wrote too fast to get it verbatim, but backed up by <https://blogs.ScientificAmerican.com/observations/a-partial-eclipse-is-interesting-a-total-eclipse-is-mind-blowing> and <https://Space.com/why-99-percent-totality-does-not-exist-need-to-be-on-total-solar-eclipse-path-april-2024>.
- **"Seeing a partial eclipse bears the same relation to seeing a total eclipse as kissing a man does to marrying him."** — essay *Total Eclipse* by Annie Dillard, 1982. \$ <https://TheAtlantic.com/science/archive/2017/08/annie-dillards-total-eclipse/536148>
- **"Photos don't do it justice—it's perhaps the most spectacular natural phenomenon you'll ever see."** — article "A Partial Eclipse Is Interesting; a Total Eclipse Is Mind-Blowing" by Edwin L. Turner, *Scientific American*. August 4, 2017. <https://blogs.ScientificAmerican.com/observations/a-partial-eclipse-is-interesting-a-total-eclipse-is-mind-blowing/>

But you need knowledge, gear and preparation. A week before the Great American Eclipse of 2017, there were **no hotel rooms** anywhere within 300 km (200 miles) of the path of totality. And terrible traffic! Plan ahead as much as possible, arrive way early!

If you cannot travel to totality this time (perhaps you are in school or at work):

- If you live in **partialness**, you can still step outside for a half-hour or so:
 - If you can, [get eclipse glasses](#).
 - Ask Eric how to make:
 - A [pinhole projector](#) using a file folder or two 4x6" cards, and a pushpin.
 - A [multi-projector](#) using colander or vegetable steamer, and a sheet of white cardboard.
- For the 2024-04-08 event, **register** for the **PBS livestream** from Texas (having the best chance of **good viewing weather**, and starting **before reaching American population centers**: starting Eclipse Day at **Noon EDT**), via https://WGBH.Zoom.US/webinar/register/WN_o6hvGOMITLqTK078qMuZTA#/registration

3.1 Two years ahead

OK, so you don't have to start this early. We didn't, our first time. But it would be easier if you did!

- **Learn** about **solar eclipses in general**:
 - See first 90-seconds of ► video **The Moon's Role in a Solar Eclipse** <https://YouTu.be/jxanWTR8-yM>.
 - Good hour-long talk about the 2024 total solar eclipse <https://YouTu.be/ZjFTC5tdtLw> starting at 4m55s.
 - See each graphic at https://wikipedia.org/wiki/Solar_eclipse (select one graphic, and swipe to see others).
 - See cartoon in https://eyes.NASA.gov/apps/solar-system/#/story/total_solar_eclipse (watch it run, then, if you wish, start playing around with the controls).
 - **Look for events at your local museums and astronomical societies**, perhaps via NightSky.JPL.NASA.gov.
 - Good background, but made for the 2017 eclipse are:

- The first 9 minutes of the short informative ► video **Great American Eclipse** by PBS Space Time <https://YouTube.be/nsWhE22i4FM>.
- Get excited with long ► video *The All-American Total Solar Eclipse of August 2017 with Alex Filippenko*.
- **PBS Life from Above** Ep1 "Moving Planet" <https://PBS.org/video/moving-planet-ahidtf/> or <https://player.PBS.org/viralplayer/3033100942> from 44m45s to 52m38s.
- See <https://NightSky.JPL.NASA.gov>, and *Modeling Meaningful Eclipses* <https://nightsky.JPL.NASA.gov/docs/ModelMeaningfulEclipses2016.pdf>.
- **Learn** about **your particular eclipse**:
 - While here, when you come across relevant information:
 - grab it, and **update timelines** in section "**3.2 Future solar eclipses we are tracking**" below, and
 - print it to take with you to see the eclipse!
 - https://YouTube.com/results?search_query=eclipse+2024 (or whatever your year is)
 - <https://EclipseWise.com/eclipse.html>.
 - <https://eclipse.gsfc.nasa.gov/solar.html>.
 - <https://TimeAndDate.com/eclipse/list.html> > tab **Solar**.
 - <https://Eclipsophile.com>.
 - <https://Space.com>.
 - https://YouTube.com/results?search_query=Fred+Espenok > on your eclipse > fullscreen > ► Play.
 - <https://SierraClub.org/sierra/august-observing-highlight-total-solar-eclipse>.
 - <https://ShadowAndSubstance.com>. Exclipses.
 - **Michel Zeiler** cartographer <https://Eclipse-Maps.com>.
 - **Sunset, sunrise, and twilight times** (civil, nautical and astronomical), for your location <https://PlanetCalc.com/300> > scroll down to "Sunrise and sunset calculator".
- See **eclipse maps**, detailed enough to decide where you are going to view:
 - **Big picture, animation, average cloudiness** * 3, past cloud pics, <http://XJubier.free.fr> > wait for determine language > your eclipse. Then bottom link **page "Google Map"** to drill down to ...
 - **Interactive eclipse maps to** (along with weather info) **select your viewing site** http://XJubier.free.fr/en/site_pages/SolarEclipsesGoogleMaps.html, > your eclipse.
 - **Create your own eclipse maps** <https://Google.com/search?q=create+own+eclipse+maps+Espenak+Meeus> or <https://Google.com/search?q=Espenak+Meeus>
 - Big-picture map <https://eclipse.gsfc.nasa.gov> > your eclipse.
- Get **paper maps** of **all conceivable** viewing areas near you: regional (multi-state), zoomed-in (states).
 - Based on best above info, mark up paper maps with thin bright pen: center-of-totality, and both edges.
- Analyze **weather**, including **clouds**:
 - **Jay Anderson** weather website <https://Eclipsophile.com>, which for the next ones near us, links to:
 - ~~annular 2021-06-10~~ <https://Eclipsophile.com/wp-content/uploads/2016/02/2017ase.png> and
 - ~~annular 2023-10-14~~ https://Eclipsophile.com/wp-content/uploads/2016/01/2023ASE_cloudtrack.png and
 - **total 2024-04-08** <https://Eclipsophile.com/wp-content/uploads/2016/02/2024TSE-cloudtrack.png>).
 - Cloud forecasts <https://SkippySky.com.au>.
 - <https://Weather.gov/source/crh/eclipse.html>.
 - <https://ncei.noaa.gov/news/ready-set-eclipse>.
 - <https://Astrospheric.com/?Latitude=40.714736512395284&Longitude=-74.00390625000001>.
- **After we get them together in file:///C:/Users/EricP/Pictures/20170818_eclipseTotalSolar**, watch pics and videos we made of Great American Eclipse of 2017.
- Search your local media, **astronomical associations, museums** and <https://nightsky.jpl.nasa.gov/clubs-and-events.cfm> for any eclipse-watching "**star parties**" along the center of "**the path of totality**" near you.
 - *If nothing*, select a draft **viewing site**, near the center of "**the path of totality**", with a mix of openspace (so you can observe the eclipse) and shade (it may be sunny and hot!).
 - One time, we stopped along a state highway and ran up a hill to where others were set up.
 - Another time, traffic kept us from a big park, and we stopped at a **cemetery** where some had already assembled. Nice mixture of **open areas** for our **telescope** to be in the sun as it swung around for 3 hours, and nearby shade of **mature oak trees** for our soccer chairs and cooler. Perfect!
 - We read that *if you can find a site with good visibility to the West* (actually, the direction the path of totality is approaching from — perhaps SW or NW), perhaps *high up on a mesa*, you might be able to see the **racing shadow** approaching you at Mach 1.5. Have not yet managed this.
- Analyze **trafficked**. **How?**
- Choose a **primary viewing site** to view the eclipse!
- Update the timeline in section "**3.7 Future solar eclipses**" below.
- Get a **hotel room** close to your primary viewing site.
 - *If you wait until a week ahead of time*, there will be nothing within 300 km (200 miles). A pain!
 - Put hotel information in the timeline in section "**3.7 Future solar eclipses**" below.
- Tell **relatives** what you are doing, and perhaps invite them to join you.

- If you have a nice **camera**, see if it has (or you can add) feature **Auto Exposure Bracketing AEB**, to shoot multiple pics with different f/stops each time you push the shutter release.
- Record video?

3.2 Three-to-six months ahead

- Order [solar eclipse glasses](#) or [shade-14 welders glass](#), complaint with [ISO 12312-2](#) and [CE](#). We got ours from our local public museum — way cheaper, too.
 - Some say to get new glasses, and **not use your old ones** from 7 years ago. Regardless, you will [test your glasses in step 3.3 below](#).
 - Get **extra glasses**, for tag-along people, or to cut up and tape over small binoculars, etc.
- If you have a **telescope**, make sun-safe, and mate with a **camera** or [public-viewing sun funnel and attenuator/filter](#).
- For our big binoculars, need to get 2X58mm screw or 70mm fuzzy solar filters.
- Tell your team to each make a [pinhole projector](#).
- Create **packing list**:
 - [solar eclipse glasses](#) or [shade-14 welders glass](#) complaint with [ISO 12312-2](#) and [CE](#)
 - [pinhole projectors](#)
 - **colander** and white cardboard *to see crescent suns*→
 - **sun hat**
 - clothing for **any** conceivable weather
 - **swimsuit** (for hotel the night before or after)
 - other **overnight-bag** stuff
 - **maps, charts**, paper copy of this **plan/timeline** for *each* adult/teen/tween [on bright-color **clipboard**]
 - **cooler** and **box** with **food** and **water** for 24 hours
 - bottle of **wine** for night *before* eclipse
 - **soccer chairs**
 - electronics and **chargers**
 - **book** and magazine in case downtime
 - **white cardboard** to see [shadow bands](#),
 - (*if view site has no shade*) **canopy tent**
 - (*optional*) folding **wagon**
 - if **not** your first eclipse:
 - **camera** and video equipment,
 - **binoculars** with their own [solar eclipse glasses ISO 12312-2](#),
 - **telescope** with camera or [public-viewing device](#),
 - little portable **table** (to hold your script, solar filters, waterbottle, etc.).
- To have **automated** 🗣️ **audio callouts** (so you don't have to read off events on [your paper chart below](#)), good recommendation, free app, \$2 each eclipse you use, photographer version ▶ **Practice demo** <https://YouTu.be/74qXw0aKUhk>, install 📱 smartphone app [Solar Eclipse Timer](#) from **Foxwood Astronomy**, and [practice with it!](#) Just practiced!
- To take **photos with your** 📱 **smartphone**, <https://EclipseGlasses.com/products/solar-snap-the-eclipse-app>.
- Collect your **music** and tchotchkes, including:
 - song "**Moonshadow**" by Cat Stevens ▶ video <https://YouTu.be/aPbuSrRfCaU> or first 17% 🗣️ audio <https://CatStevens.com/wp-content/uploads/2017/07/09-Moonshadow.mp3>,
 - song "**Total Eclipse of the Heart**" by Bonnie Tyler ▶ <https://YouTu.be/lcOxhH8N3Bo>, and
 - chewing gum "**Eclipse**" or "**Orbit**" (I won't chew, due to one of its ingredients).



3.3 Two weeks ahead

- Maintain your **car**.
- Have team each read about eye-safety, perhaps at <https://eclipse2017.NASA.gov/safety> and <https://space.com/35555-total-solar-eclipse-safety-tips.html>.
- **Lay out** all that stuff you listed in [your packing list above in section 3.2](#).
- **Test your solar glasses:**
 - Some say to get new glasses, and not use your old ones from 7 years ago. Regardless, ...
 - For **each** of your solar glasses:
 - Go to a dark-ish room, take out of their envelope or whatever, and shine your **brightest flashlight** through each lens toward your eyes, looking all over for any light coming through the lenses.
 - If you see **any** points or lines of light (pinholes or cracks?), or a faint glow (counterfeit?), **discard!**
 - If you see **nothing** — no light-leaks of any kind — put that back in the envelope or whatever, and pack.
- **Play** with all your equipment, practice using it, fix anything not right, and have other practice with it, too.
- If you installed [app Solar Eclipse Timer](#) above:
 - optionally set [gear] **Settings** > **Photographer's Mode** (not us — we are using default),
 - **Do a Device Sound Check** > all three steps.
 - **Select an Eclipse to Time** > your eclipse of interest (US\$2) > **OK**,
 - set your most-probable viewing GPS location > **Calculate Contact Times** > **Tap to Load Contact Times** > **Done**, and
 - practice the live eclipse, using lower-navigation **Home** > **Hear all Eclipse Announcements**.



3.4 One week ahead

- Check **fluids** on your car.
- If applicable, update your **satnav/GPS**.
- Get everything ready on [your packing list above in section 3.2](#).
- Again, **get excited** with long ▶ video [The All-American Total Solar Eclipse of August 2017 with Alex Filipenko](#).
- Analyze **long-term weather** (in particular **cloudcover**):
 - Jay Anderson weather website <https://Eclipsophile.com>, which for the next ones near us, links to:
 - **annular 2021-06-10** <https://Eclipsophile.com/wp-content/uploads/2016/02/2017ase.png> and
 - **annular 2023-10-14** <https://Eclipsophile.com/wp-content/uploads/2016/01/2023ASE-cloudtrack.png> and
 - **total 2024-04-08** <https://Eclipsophile.com/wp-content/uploads/2016/02/2024TSE-cloudtrack.png>.
 - https://Weather.gov/pah/April8_2024SolarEclipseClimate
 - Cloud forecasts <https://SkippySky.com.AU>.
 - <https://Weather.gov/buf/totaleclipse> and
 - <https://Weather.gov/cle/SolarEclipse2024>
- Analyze **mid- and short-term weather** (in particular **cloudcover**):
 - <https://Astrospheric.com/?Latitude=40.714736512395284&Longitude=-74.00390625000001> > navigate to possible viewing site > button **Get New Forecast**. > select time of eclipse > see forecast for that site.
 - *If in North America*, <https://Facebook.com/GeorgeLessensWZZM> > posts with weather forecast videos.
 - *If in North America*, weather app, such as **WZZM 13 Weather** from **Tegna Inc.**
 - iPhone iOS <https://apps.Apple.com/us/app/wzzm-13-weather/id391785222>
 - Android <https://play.Google.com/store/apps/details/WZZM+13+Weather>
- **Adjust your viewing site**, based on weather, etc.
- *When plan seems stable*, print paper copy of this **plan** and **timeline** for *each* adult.
- Easier if 1 camera for use during partial eclipse. Affix a solar filter (perhaps eclipse glass half), over its len(s), reflective side to **sunward**.
- Easier if 1 camera for use during totality, with **no** solar filter. Set option to **HDR**.
- *Optional*: Make a **star chart**, just major stars and planets, in case you have time to look during totality.

3.5 One day ahead

- When you arrive at the hotel:
 - **Swim** (if they have a pool — you spent a lot of time in the car today, and will tomorrow!).
 - Fill car with **gasoline**.
 - Have a **great** hot meal (you might not tomorrow).
 - Review your **plan**.
 - [Check cloud cover forecast again as in section 3.4 above](#).
 - For new viewing site, **update times in section 3.7.x below**, based on [Solar Eclipse Timer](#) > **Calculate Contact Times**, or [interactive eclipse map](#).
 - [Practice app Solar Eclipse Timer](#).
 - Keep your cooler filled with **ice**.
 - Set **alarms** for tomorrow way early.
 - Drink your bottle of wine.
Sweet dreams!

3.6 ● Eclipse Day!

- **Wake** way early.
- [Check cloud cover forecast again as in section 3.4 above](#).
 - For new viewing site, **update times in section 3.7.x below**.
 - If you get **clouded out, or cannot travel**.
- *If practical*, eat **breakfast** at home or hotel.
- [Practice app Solar Eclipse Timer](#). One last time.
- Keep cooler filled with **ice**.
- Keep car filled with **gasoline**.
- Arrive **way** ahead of time, adjusting as needed for weather and traffic. With traffic delays, you will still be fine.
- Set up your gear.
- If you installed [app Solar Eclipse Timer above](#):
 - **Select an Eclipse to Time** > your eclipse today! > **OK**,
 - **Tap to get my GPS Location** > **Calculate Contact Times** > **Tap to Load Contact Times** > **Done**, and
 - You should be in screen **Total Eclipse Mode**.
- Put on your eclipse glasses! Educate! Execute the plan! Have fun!

3.7 Solar eclipses we plan to view

A workspace for info on all future solar eclipses is in the [last subsection](#) below. Those visible from 🌐 our hemisphere, or are otherwise convenient for us to view, are expanded in detail in the next few subsections ...



3.7.1 Solar Eclipse (Total), 2024-04-08, Texas-Arkansas-Missouri-Illinois-Indiana-Ohio-NY-Maine-New Brunswick

Visible from West in Europe, North America, North in South America, Pacific, Atlantic, Arctic.

Info from [section 3.1 above](#) and their links to:

- o **Big picture, animation, average cloudiness** * 3, past cloud pics, http://XJubier.free.fr/en/site_pages/solar_eclipses/TSE_20240408_pg01.html. Then bottom link **page "Google Map"** to drill down to ...
- o **Interactive eclipse maps to** (along with weather info) **select your viewing site** http://XJubier.free.fr/en/site_pages/solar_eclipses/TSE_2024_GoogleMapFull.html
- o <https://Facebook.com/GeorgeLessensWZZM> > posts with **weather forecast videos**.
- o Not as good as above https://eclipse2024.org/eclipse_cities/statemap.html
- o Big-picture map <https://eclipse.gsfc.nasa.gov/SEplot/SEplot2001/SE2024Apr08T.GIF>
- o <https://TimeAndDate.com/eclipse/solar/2024-april-8> great animation at 500X and 10X.
- o <https://EclipseWise.com/solar/SEprime/2001-2100/SE2024Apr08Tprime.html> red where totality visible.
- o <https://EclipseWise.com/solar/SEgmap/2001-2100/SE2024Apr08Tgmap.html#map>.
- o <https://EclipseWise.com/solar/SEanimate/SEanimate2001/SE2024Apr08T.gif> animated map: gray area shows where a partial eclipse will be visible; red dot shows where totality will be visible.
- o <https://Eclipsophile.com/2024tse> .
- o <https://PBS.org/wgbh/nova/article/2024-eclipse-resources-and-events>
- o <https://space.com/41552-total-solar-eclipse-2024-guide.html>.
- o https://images.squarespace-cdn.com/content/v1/53c358b6e4b01b8adb4d5870/1679586941648-ZN3WG0LYTQ8GEAVO9807/TSE2024_Ohio.jpg paper map marked-up.
- o https://images.squarespace-cdn.com/content/v1/53c358b6e4b01b8adb4d5870/f0838169-446f-4bf0-9754-4e56a389a22d/TSE2024_Illinois.jpg paper map marked-up.
- o https://images.squarespace-cdn.com/content/v1/53c358b6e4b01b8adb4d5870/1679586918674-X44UWQOLVDDRIC9CYTBJ/TSE2024_Indiana.jpg paper map marked-up.
- o https://images.squarespace-cdn.com/content/v1/53c358b6e4b01b8adb4d5870/1679586952995-UE44DPFD8Z4IWB9S2F89/TSE2024_Pennsylvania.jpg paper map marked-up.
- o https://images.squarespace-cdn.com/content/v1/53c358b6e4b01b8adb4d5870/1679586930749-AUKWJHXXVD3KAK1DCESX/TSE2024_Missouri.jpg **need paper map!**
- o https://images.squarespace-cdn.com/content/v1/53c358b6e4b01b8adb4d5870/1679586909556-UKGNMKGHDEZW6VDANOC/TSE2024_Arkansas.jpg **need paper map!**
- o https://images.squarespace-cdn.com/content/v1/53c358b6e4b01b8adb4d5870/1679586958504-LZP7G7AMLLD6B7BQAZ2Y/TSE2024_Texas.jpg paper map marked-up.

2024-04-05 Friday

When update view site update times!

Time local	Time UTC	Activity	Where
noon-ish		<input type="checkbox"/> Do another weather analysis and site selection . <i>If in North America, https://Facebook.com/GeorgeLessensWZZM > posts with weather forecast videos.</i>	Home
evening?		<input type="checkbox"/> Get grandchild?	Home

2024-04-06 Saturday

When update view site update times!

Time local	Time UTC	Activity	Where
morning		<input type="checkbox"/> Do another weather analysis and site selection . <i>If in North America, https://Facebook.com/GeorgeLessensWZZM > posts with weather forecast videos.</i>	home
		<input type="checkbox"/> Pack car with your packing list above in section 3.2 .	home

2024-04-07 Sunday

When update view site update times!

Time local	Time UTC	Activity	Where
morning		<input type="checkbox"/> Alarm, shower, breakfast. <input type="checkbox"/> Do another weather analysis and site selection . <input type="checkbox"/> Do another weather analysis and site selection. <i>If in North America, https://Facebook.com/GeorgeLessensWZZM > posts with weather forecast videos.</i>	home
9 am-Noon		<input type="checkbox"/> <i>Optional: Leave home, drive 324 miles in 1 days. 6 hr?</i>	home
3-6 pm		<input type="checkbox"/> Arrive at hotel, do One Day Ahead list section 3.5 above .	?

2024-04-08 Monday

[When update view site](#), [update times!](#)

Time EDT	Time UTC	Activity Call out!	Where
4:30 am	08:30	<input type="checkbox"/> Wake, do Eclipse Day list section 3.6 above .	?
6 am	10:00	<input type="checkbox"/> Lv hotel/home, drive 324 miles: 5 hr + 3 traffic = 8 hr?	?
11 am-2 pm	15:00-18:00	<input type="checkbox"/> Arrive at viewing site. <input type="checkbox"/> Set up telescope (sun funnel+atten on, scope off!), cameras, chairs, shadow bands sheet, binocs (solar filter on!), eclipse glasses!	Spencer Indiana (39.28448,-86.76540) (38.961,-86.820)
Noon	16:00	<input type="checkbox"/> If you cannot travel , or are clouded out , join PBS livestream from Texas, for which you previously registered https://WGBH.Zoom.US/webinar/register/WN_o6hvGomITLqTK078qMuZTA#/registration	Home
1:48 pm U1 C1	17:48:24 U1 C1	<input type="checkbox"/> Partial Eclipse begins U1 C1 <input type="checkbox"/> Start recording, <i>if shooting video</i> . <input type="checkbox"/> Eye-safety speech! <input type="checkbox"/> See bite-out-of-sun using solar eclipse glasses , tree leaves, colander, pinhole projector, binocs (filters!), our telescope with sun-safe public-viewing device.	S 180°, up 59°.
+20 min		<input type="checkbox"/> Note your surroundings: getting darker, shadows crisper, cooler, quieter (birds, bugs, frogs?), low fluffy cumulus clouds disappearing(?). <input type="checkbox"/> Go to the bathroom, now! <input type="checkbox"/> Play song <i>Moonshadow</i> by Cat Stevens. <input type="checkbox"/> See crescent-sun using solar eclipse glasses , tree leaves, colander, pinhole projector, binoc (filters!), our telescope with sun-safe public-viewing device. <input type="checkbox"/> Eye-safety speech!	
-2 min -50 sec -20 sec -15 sec -1 sec	U2 C2	<i>Quick:</i> <input type="checkbox"/> Racing shadow if flat view to West. <input type="checkbox"/> Shadow bands on white sheet. <input type="checkbox"/> Telescope solar attenuator off . <input type="checkbox"/> Diamond Ring (last big sunlight) <input type="checkbox"/> Solar eclipse glasses off, for 4 min! <input type="checkbox"/> Baileys Beads (through a valley)	
3:04 pm +10 sec	19:04:11 U2 C2	<input type="checkbox"/> Totality! Total Eclipse begins for 4m02s U2 C2 <input type="checkbox"/> Chromosphere (reddish-pink layer). <input type="checkbox"/> Corona (wispy fluff, 20 X hotter than surface). <input type="checkbox"/> Solar prominences (giant flames leaping). <input type="checkbox"/> Stars. Planets. Jupiter Sun/Moon Venus Saturn/Mars. <input type="checkbox"/> Weird surroundings: look around 360°.	SW 213°, up 54°.
3:06 pm -10 sec	19:06:13 U3 C3	<input type="checkbox"/> Maximum Eclipse <input type="checkbox"/> Weird surroundings: look around 360°. <input type="checkbox"/> Stars. Planets. Jupiter Sun/Moon Venus Saturn/Mars. <input type="checkbox"/> Solar prominences (giant flames leaping). <input type="checkbox"/> Corona (wispy fluff, 20 X hotter than surface). <input type="checkbox"/> Chromosphere (reddish-pink layer).	SW 214°, up 54°.
3:08 pm +1 sec +2 sec +10 sec +50 sec +1 min	19:08:13 U3 C3	<input type="checkbox"/> Total Eclipse ends U3 C3 <i>Quick:</i> <input type="checkbox"/> Baileys Beads (through a valley) <input type="checkbox"/> Diamond Ring (last big sunlight) <input type="checkbox"/> Solar eclipse glasses on, until next eclipse! <input type="checkbox"/> Shadow bands on white sheet. <input type="checkbox"/> Racing shadow if flat view to East. <input type="checkbox"/> Telescope solar attenuator on . <input type="checkbox"/> Note your surroundings: getting lighter, shadows fuzzier, warmer, noisier (birds, bugs, frogs?), low fluffy cumulus clouds reappearing? <input type="checkbox"/> See crescent-sun/bite-out-of-sun using solar eclipse glasses , tree leaves, colander, pinhole projector, binoc (filters!), our telescope with sun-safe public-viewing device. <input type="checkbox"/> Eat lunch while crowds and traffic thins out.	SW 214°, up 54°.
4:22 pm Done with	20:21:58 sandwich	<input type="checkbox"/> Partial Eclipse ends U4 C4 <input type="checkbox"/> Pack car and leave viewing site for home.	SW 238°, up 43°.

3.7.2 Workspace for deciding which future solar eclipses we may view

See section 3.7.1 above. Solar Eclipse (Total), 2024-04-08. Visible from West in Europe, North America, North in South America, Pacific, Atlantic, Arctic.

<https://eclipse.gsfc.nasa.gov/SEplot/SEplot2001/SE2024Apr08T.GIF>.

<https://TimeAndDate.com/eclipse/solar/2024-april-8>.

<https://EclipseWise.com/solar/SEprime/2001-2100/SE2024Apr08Tprime.html>.

<https://EclipseWise.com/solar/SEgmap/2001-2100/SE2024Apr08Tgmap.html#map>.

<https://Eclipsophile.com>.

Annular, too remote, wet. Solar Eclipse (Annular), 2024-10-02. Visible from Much of South America, Pacific, Atlantic, Antarctica.

<https://eclipse.gsfc.nasa.gov/SEplot/SEplot2001/SE2024Oct02A.GIF>.

<https://TimeAndDate.com/eclipse/solar/2024-october-2>.

<https://EclipseWise.com/solar/SEprime/2001-2100/SE2024Oct02Aprime.html>.

<https://EclipseWise.com/solar/SEgmap/2001-2100/SE2024Oct02Agmap.html#map>.

<https://Eclipsophile.com>.

New Brunswick? Solar Eclipse (Partial), 2025-03-29. Visible from Much of Europe, North in Asia, North/West Africa, Much of North America, Atlantic, Arctic.

<https://eclipse.gsfc.nasa.gov/SEplot/SEplot2001/SE2025Mar29P.GIF>.

<https://TimeAndDate.com/eclipse/solar/2025-march-29>.

<https://EclipseWise.com/solar/SEprime/2001-2100/SE2025Mar29Pprime.html>.

<https://EclipseWise.com/solar/SEgmap/2001-2100/SE2025Mar29Pgmap.html#map>.

<https://Eclipsophile.com>.

Partial, too remote, wet. Solar Eclipse (Partial), 2025-09-21. Visible from South in Australia, Pacific, Atlantic, Antarctica.

<https://eclipse.gsfc.nasa.gov/SEplot/SEplot2001/SE2025Mar29P.GIF>.

<https://TimeAndDate.com/eclipse/solar/2025-september-21>.

<https://EclipseWise.com/solar/SEprime/2001-2100/SE2025Sep21Pprime.html>.

<https://EclipseWise.com/solar/SEgmap/2001-2100/SE2025Sep21Pgmap.html#map>.

<https://Eclipsophile.com>.

4 Appendices

4.1 Measuring angles, the easy way

width of <i>object</i> held at arm's length:	subtends this angle:	equivalent to size of:
	12'	smallest feature resolvable by human with good eyesight
little-fingernail , or $\frac{1}{2}$ your little finger	$\frac{1}{2}^\circ$ or 30' 32'	full moon , new moon sun , and eclipses and transits thereof
little finger	1°	
a couple fingers	3°	The three stars in Orion's belt.
3 middle fingers , together	5°	The arc between the Big Dipper pointer stars (the two stars at the far end of the bowl).
Fist	10°	The arc between the two stars at the top of the Big Dipper's bowl.
index-to-little-fingers , spread-wide	15°	The arc the sun moves in 1 hour — 1/24 of the way around sky. The moon is pretty close to this, too.
thumb-to-little-finger , spread wide, like the mahalo shaka hand gesture	25°	Width of the Big Dipper (from the end of the handle to the end of the bowl). From the Big-Dipper pointer-stars to Polaris just a bit wider than this.
2 x index-to-little finger spreads, or 3 x fists	30°	From the Big-Dipper pointer-stars to Polaris .
9 x fists	90°	From horizon to straight up , or $\frac{1}{4}$ of the way around the horizon .

4.2 Telescope attributes and their formulas

Telescope attribute	abbreviation	calculate by	for our Dobsonian reflector Orion SkyQuest XT4.5	value read from label on our Dobsonian reflector Orion SkyQuest XT4.5
Diameter	D	= FL \div f/ratio	900 mm \div 7.9 =	114 mm (4½ in)
Focal Length	FL	= D \times f/ratio	114 mm \times 7.9 =	900 mm
Focal Ratio	f/ratio	= FL \div D	900 mm \div 114 mm =	7.9 (usually written f/7.9)
↓ Best eyepiece for sun funnel projecting full-disk solar/lunar image dia \approx 100 mm.	FLEYPEICE	\approx FL _{TELESCOPE} \div 43 mm ❄❄	900 mm \div 43 mm =	21 mm (calculated, not read from telescope), which I rounded to a 20 mm eyepiece so a sun/moon image fits within the rear-projection screen.
❄❄ details https://eclipse2017.NASA.gov/static/img/make-sun-funnel/Build_a_Sun_Funnel_v4.pdf#page=48				

4.2.1 Telescope eyepiece magnification

Focal Length eyepiece	Magnification = FLEYPEICE \div FL _{TELESCOPE}	... on our Orion Sky-Quest XT4.5	Usage	my notes
25 mm	114 mm \div 25 mm =	4½ X	wide-angle	Use first!
10 mm	114 mm \div 10 mm =	11 X	mid-angle	Use second , to see more detail.
6 mm	114 mm \div 6 mm =	19 X	strong magnification	Use on special objects — must adjust scope often!
↑ 20 mm	114 mm \div 20 mm =	6 X	↑ Best for sun funnel projecting full-disk solar or lunar image at dia \approx 100 mm.	Clamped into my sun funnel , although I carry a tool to remove.

4.3 Terminology

- **Saros Cycle** of **18 years 11 days 8 hours** is calculated by the Least Common Multiple of the Earth-Moon:
 - **Synodic month**
 - **Draconic month**
 - **Anomalistic month**

-End.- [send comments to the author](#)