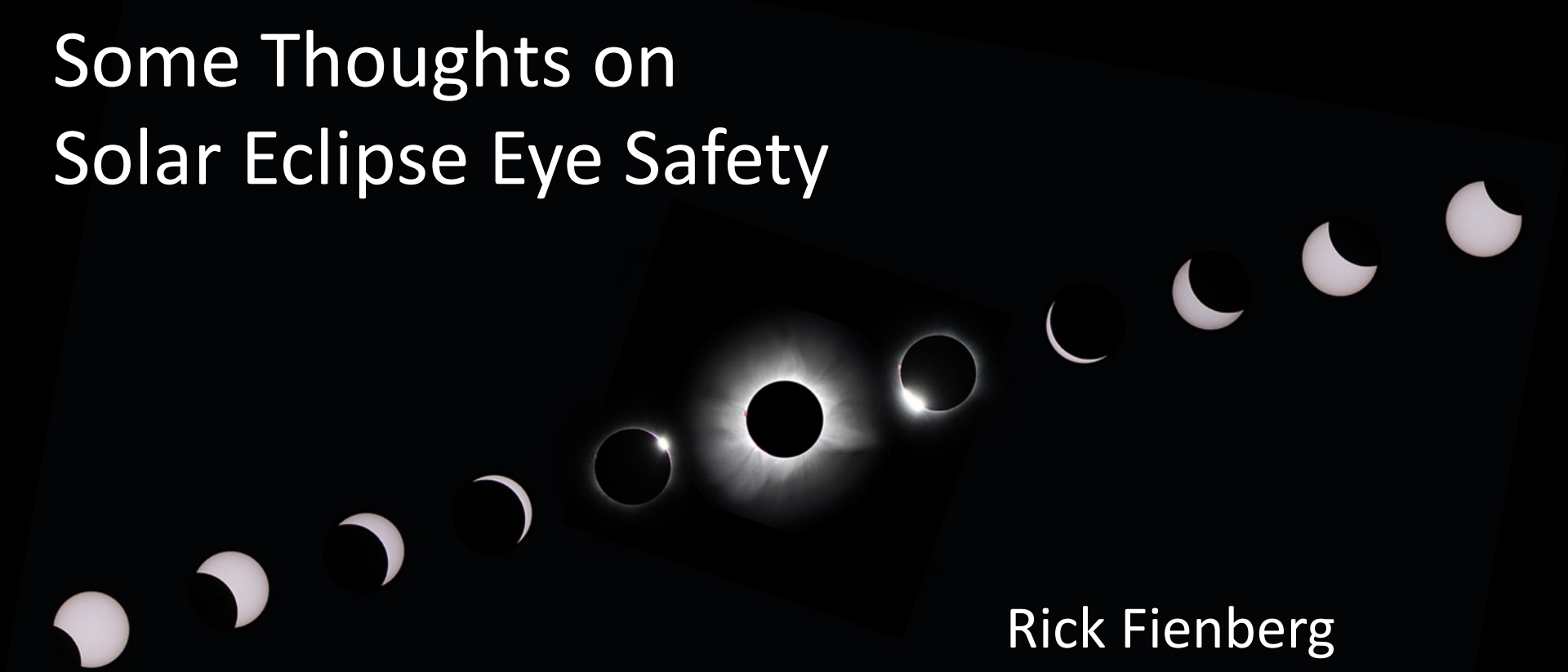
Some Thoughts on Solar Eclipse Eye Safety



Rick Fienberg

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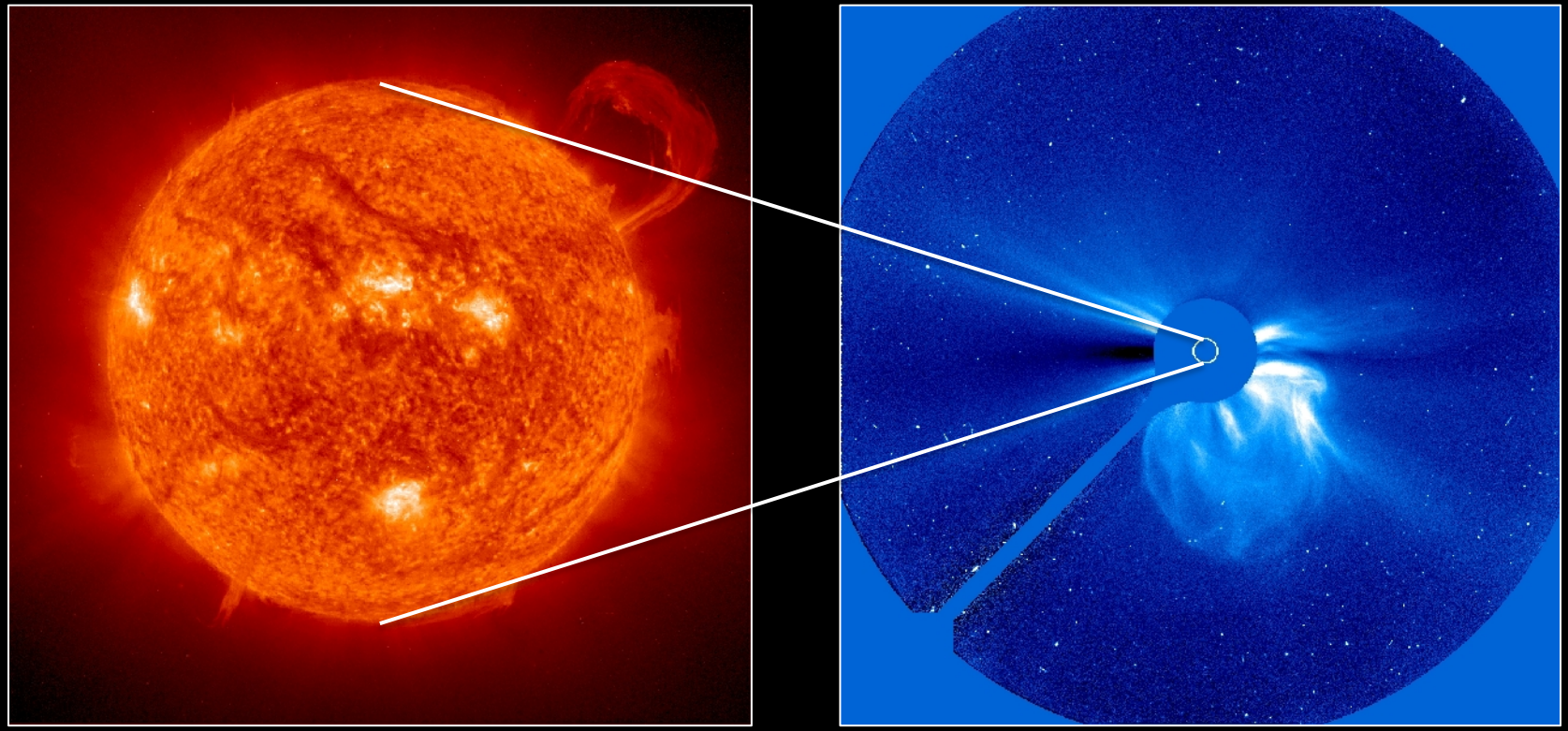
But...

A total solar eclipse is about as bright as the full Moon — and just as safe to look at.*

*Even with binoculars or a telescope!

Miloslav Druckmüller / Shadia Habbal / Peter Aniol / Pavel Štarha

Q: But doesn’t the Sun emit dangerous rays during a solar eclipse?



A: No more so than at any other time.
The Moon has no “focusing” effect.

But the Sun at any other time, e.g.,…

- when no solar eclipse is occurring,
- during a partial or annular (ring) solar eclipse, or
- during the partial phases of a total or annular eclipse

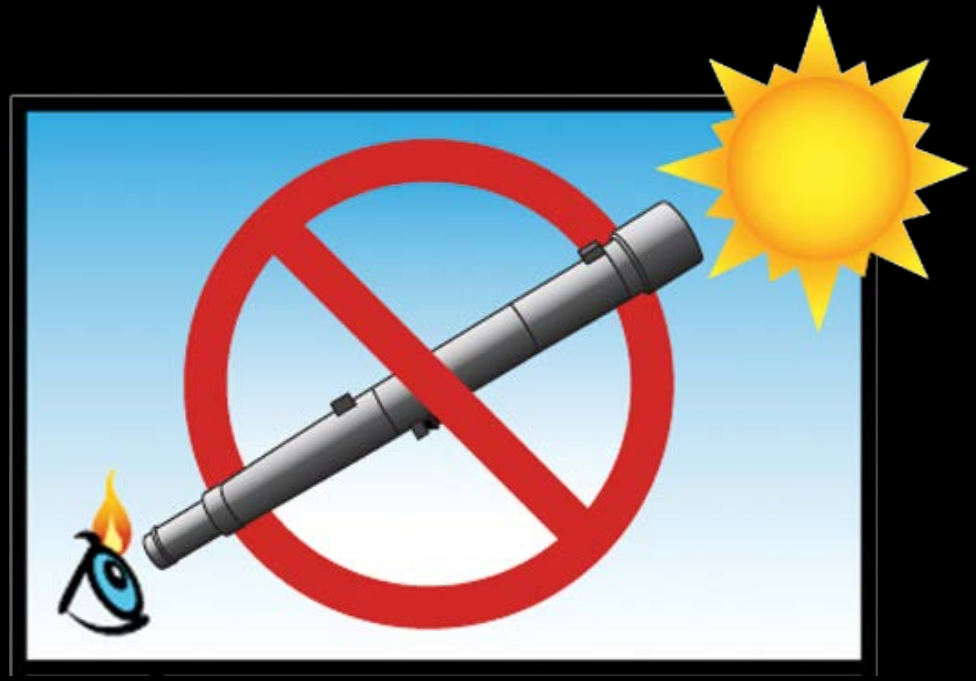
…is dangerously bright. *There is a genuine risk of retinal injury.*

To observe the Sun outside of a total solar eclipse, view it…

- *directly* only through special-purpose safe* solar filters
- or *indirectly* only by using pinhole** or optical projection.

**Ones that comply with the ISO 12312-2 standard.*

*** Don't look at the Sun through the pinhole!*



Never look at the Sun through unfiltered optics,
even if you're wearing "eclipse glasses."


Safe solar filter over the FRONT of the telescope.
Finderscope covered with dust cap for safety.
Rick Fienberg

How to View the 2017 Solar Eclipse Safely

A solar eclipse occurs when the Moon blocks any part of the Sun. On Monday, August 21, 2017, a solar eclipse will be visible (weather permitting) across all of North America. The whole continent will experience a partial eclipse lasting 2 to 3 hours. Halfway through the event, anyone within a 60- to 70-mile-wide path from Oregon to South Carolina (http://bit.ly/1xuYxSu) will experience a brief total eclipse, when the Moon completely blocks the Sun's bright face for up to 2 minutes 40 seconds, turning day into night and making visible the otherwise hidden solar corona — the Sun's outer atmosphere — one of nature's most awesome sights. Bright stars and planets will become visible as well.

A total solar eclipse is about as bright as the full Moon — and just as safe to look at.
But the Sun at any other time is dangerously bright; view it only through special-purpose safe solar filters.

Looking directly at the Sun is unsafe except during the brief total phase of a solar eclipse ("totality"), when the Moon entirely blocks the Sun's bright face, which will happen only within the narrow path of totality (http://bit.ly/1xuYxSu).

The only safe way to look directly at the uneclipsed or partially eclipsed Sun is through special-purpose solar filters, such as "eclipse glasses" (example shown at left) or hand-held solar viewers. Homemade filters or ordinary sunglasses, even very dark ones, are not safe for looking at the Sun. To date three manufacturers have certified that their eclipse glasses and hand-held solar viewers meet the ISO 12312-2 international standard for such products: Rainbow Symphony, American Paper Optics, and Thousand Oaks Optical.

- Always inspect your solar filter before use; if scratched or damaged, discard it. Read and follow any instructions printed on or packaged with the filter. Always supervise children using solar filters.
- Stand still and cover your eyes with your eclipse glasses or solar viewer before looking up at the bright Sun. After glancing at the Sun, turn away and remove your filter — do not remove it while looking at the Sun.
- Do not look at the uneclipsed or partially eclipsed Sun through an unfiltered camera, telescope, binoculars, or other optical device. Similarly, do not look at the Sun through a camera, a telescope, binoculars, or any other optical device while using your eclipse glasses or hand-held solar viewer — the concentrated solar rays will damage the filter and enter your eye(s), causing serious injury. Seek expert advice from an astronomer before using a solar filter with a camera, a telescope, binoculars, or any other optical device.

- If you are within the path of totality (http://bit.ly/1xuYxSu), remove your solar filter only when the Moon completely covers the Sun's bright face and it suddenly gets quite dark. Experience totality, then, as soon as the bright Sun begins to reappear, replace your solar viewer to glance at the remaining partial phases.

An alternative method for safe viewing of the partially eclipsed Sun is pinhole projection. For example, cross the outstretched, slightly open fingers of one hand over the outstretched, slightly open fingers of the other. With your back to the Sun, look at your hands' shadow on the ground. The little spaces between your fingers will project a grid of small images on the ground, showing the Sun as a crescent during the partial phases of the eclipse.

A solar eclipse is one of nature's grandest spectacles. By following these simple rules, you can safely enjoy the view and be rewarded with memories to last a lifetime. More information:

eclipse.aas.org eclipse2017.nasa.gov

This document does not constitute medical advice. Readers with questions should contact a qualified eye-care professional. v.160824

- Messaging developed with NASA
- Endorsed by eye-care academies

Dr. Mario Motta, AAS Solar Eclipse Task Force member and past president of the Massachusetts Medical Society:

“I am a trustee for the AMA, which means I’m on the governing board. I intend to get the AMA to cooperate with any public safety message that we craft.

“I served eight years on the AMA Council of Science and Public Health and was the primary writer of the AMA reports on light pollution and LED lighting.”


Can you spot the fakes/counterfeits?
ECLIPSMART
ECLIPSE
ECLIPSE
AUGUST 21ST 2017
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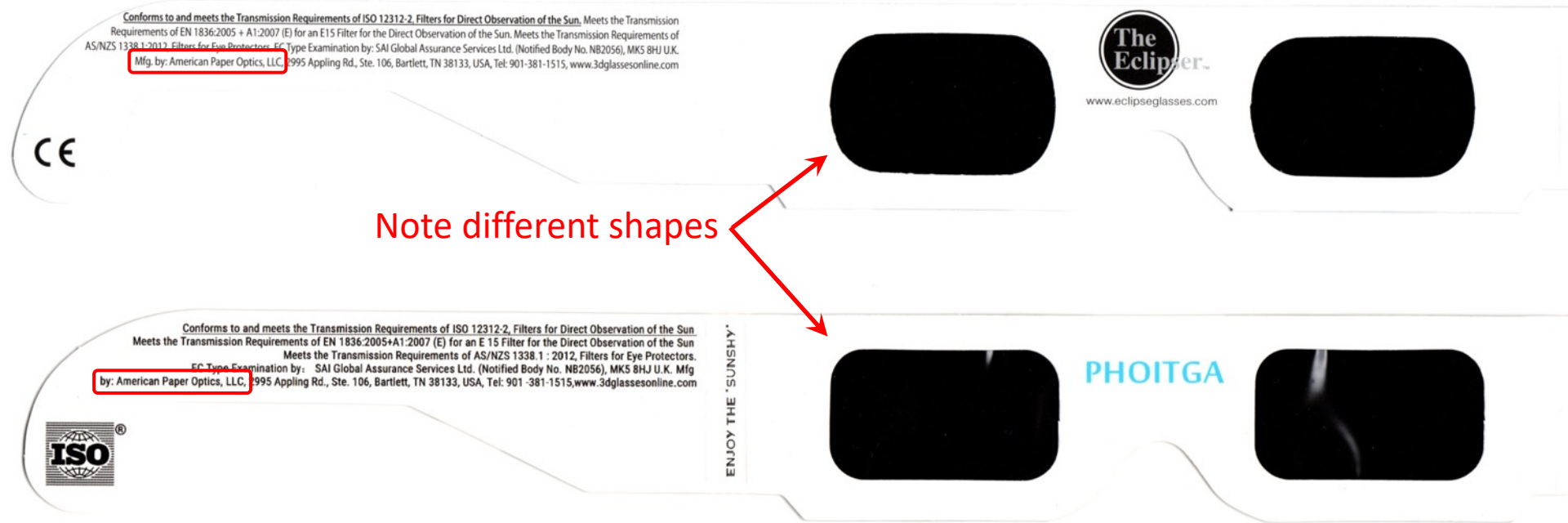
Eclipse Megamovie
A citizen science project
Eclipse Megamovie
A citizen science project

American Paper Optics



Not American Paper Optics

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Safety requirements for solar viewing

Too little, too late

Amazon has implemented safety requirements for all filters for solar viewing offered on the site. › Learn more

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Amazon's Choice

How to View a Solar Eclipse Safely

View

Looking directly at the Sun is unsafe except during the brief total phase of a solar eclipse ("totality"), when the Moon entirely blocks the Sun's bright face, which will happen *only* within the narrow path of totality. To find out whether your home or any other specific location is within the path on April 8, 2024, see Xavier Jubier's Google Map, which supports zooming in to street level.

The *only* safe way to look directly at the uneclipsed or partially eclipsed Sun is through special-purpose solar filters, such as "eclipse glasses" (example shown at left) or handheld solar viewers. Homemade filters or ordinary sunglasses, even very dark ones, are not safe for looking at the Sun; they transmit *thousands* of times too much sunlight. See our **Reputable Vendors of Solar Filters & Viewers** page for a list of manufacturers and authorized dealers of eclipse glasses and handheld solar viewers verified to be compliant with the ISO 12312-2 international safety standard for such products.

Reputable Vendors of Solar Filters & Viewers





Here you'll find lists of reputable manufacturers and authorized dealers of solar filters and viewers; these include companies with which members of the AAS Solar Eclipse Task Force have had prior (and positive!) experience as well as companies whose products have been certified safe by authorities we recognize and whose certification we have confirmed to be genuine. *Your eyes are precious!* You don't need astronomers to tell you that, but you *do* need astronomers to tell you where to get safe solar filters: from the companies listed on this page. To do otherwise is to take unnecessary risks. If a supplier isn't listed here, that doesn't mean its products are unsafe — only that we have no knowledge of them or that we haven't convinced ourselves they are safe. For more information see our Eye Safety pages.

"Eclipse Glasses" & Handheld Viewers

The following telescope and solar-filter companies manufacture and/or sell eclipse glasses (sometimes called eclipse shades) and/or handheld solar viewers that have been verified by an accredited testing laboratory to meet the ISO 12312-2 international safety standard for such products. They are listed in alphabetical order; those with an asterisk (*) are based outside the United States.

Hi Rick,

Thank you for reaching out, and hope you have been well. We are going to pass on the opportunity to speak at this event, but appreciate that you considered us. We remain committed to customer safety.

Thanks,
Cecilia

AMERICAN ASTRONOMICAL SOCIETY

Solar Eclipse Eye Safety

B. Ralph Chou, BSc, MSc, OD, FAAO
Professor Emeritus, School of Optometry & Vision Science
University of Waterloo, Ontario, Canada

A solar eclipse is arguably the most spectacular astronomical event that anyone will experience in their lives. There is a great deal of interest in watching eclipses, and thousands of astronomers (both amateur and professional) and other eclipse enthusiasts travel around the world to observe and photograph them. This document is for them, i.e., for astronomers and other experts — including educators as well as medical and eye-care professionals — who may find themselves in the position of coaching laypersons through a solar eclipse and who want to understand in detail the principles of eye safety for solar observing.

Contents

Solar Retinopathy 1
Retinal Safety Calculation 2
Eclipse Eye Injury Statistics 3
How to View a Solar Eclipse Safely 4
Filters for Direct Viewing with the Unaided Eye 4
Indirect Viewing by Solar Pinhole Projection 6
Filters for Camera Lenses, Binoculars & Telescopes 6
Unsafe Filter Materials 7
A Warning About Warning Messages 7
Closing Thoughts 7
References 8
About the Author 9

A solar eclipse offers students a unique opportunity to see a natural phenomenon that illustrates the basic principles of mathematics and science taught through elementary and secondary school. Indeed, many scientists (including astronomers) have been inspired to study science as a result of seeing a total solar eclipse. Teachers can use eclipses to show how the laws of motion and the mathematics of orbits can predict the occurrence of eclipses. The use of pinhole cameras and telescopes or binoculars to observe an eclipse leads to an understanding of the optics of these devices. The rise and fall of environmental light levels during an eclipse illustrate the principles of radiometry and photometry, while biology classes can observe the associated behavior of plants and animals. It is also an opportunity for children of school age to contribute actively to scientific research — observations of contact timings at different locations along the eclipse path are useful in refining our knowledge of the orbital motions of the Moon and Earth, and sketches and photographs of the solar corona can be used to build a three-dimensional picture of the Sun's extended atmosphere during the eclipse.

Solar Retinopathy

Observing the Sun, however, can be dangerous if the proper precautions are not taken. The solar radiation that reaches the surface of Earth ranges from ultraviolet (UV) radiation at wavelengths longer than 290 nanometers (nm), to radio waves in the meter range. The tissues in the eye transmit a

SOLAR ECLIPSE ACROSS AMERICA
Monday, April 8, 2024: Sun … Moon … *You!*

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Resources / Downloads

Downloads

The resources linked below are intended for broad distribution and [illegible] produced, printed, and disseminated as long as no changes are made to them.

- 1-page Eclipse Safety Flyer (available in English and Spanish)
- 2-page Eclipse Safety Flyer (graphics only — works in all languages!)
- Technical Report on Solar Eclipse Eye Safety
- White Paper on Community Eclipse Planning
- Instructions for Building a Sun Funnel
- Observer's Guide to Viewing the August 2017 Solar Eclipse
- A Guide for Public Libraries and Their Communities
- Infographic: Total Solar Eclipse Viewing Guide

Also, see our Royalty-free Images & Videos page and NASA's Down[illegible]

"Solar Eclipse Eye Safety" is a 9-page technical report written for the American Astronomical Society by Ralph Chou, Professor Emeritus in the School of Optometry & Vision Science at the University of Waterloo, Ontario, Canada. Dr. Chou was lead writer for the ISO 12312-2 standard on filters for direct observation of the Sun, which was adopted worldwide in 2015, and is widely recognized as a leading expert on protective solar filters. His report is intended for astronomers, educators, health-care professionals, the media, and anyone else who wants to understand how sunlight can damage the eye and what constitutes a safe solar filter.

- Technical Report on Solar Eclipse Eye Safety

"Community Eclipse Planning" is a 14-page primer on how to prepare your community for a total solar eclipse. It was produced by Kate Russo, a psychologist and eclipse-chaser whose book *Total Addiction* explores what drives some people to organize their lives around seeing total eclipses of the Sun wherever and whenever they occur. Dr. Russo has helped communities large and small, in a variety of different countries, get ready for an influx of eclipse-chasers. If your city of town lies within the path of totality on August 21, 2017, and you're a government, public-