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Eclipse and Eye Safety

Marvel Davis

Western Oregon University, madavis13@wou.edu

Jessica Donahue

Western Oregon University, jdonahue13@mail.wou.edu

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Eclipse and Eye Safety

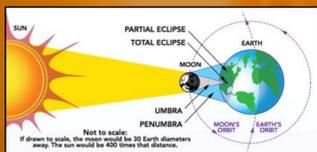
By Marvel Davis and Jessica Donahue



Introduction

Eclipses occur due to the periodic alignments of the earth, moon, and sun. Solar eclipses happen when the moon moves between the earth and the sun. This occurrence is rare due to the angle and tilt of the earth and moon changing all the time. However, when it does occur the moon produces two shadows, one called the umbra shadow, which is relatively small, and a second one called the penumbra, which is much larger.

The umbra occurs when the eclipse is in totality and it completely blocks out the sun making it safe to view without special glasses, while the penumbra is the partial eclipse where some of the sun's damaging light is allowed to pass through, special glasses must be worn at this time.(1)



Picture Source: <https://eclipse2017.nasa.gov/how-eclipses-work>

Sun Warning

It is never safe to look directly at the sun, even if the sun is partially obscured. The only safe way to view the sun in it's un-eclipsed or partially eclipsed state is to use special safety glasses made specifically for viewing the sun.

Homemade filters or regular sunglasses, even if very dark, are not enough protection to view the sun without injury.

Sun viewing glasses need to meet the ISO 12312-2 International standard for sun viewing.(2,3)

Failure to wear adequate eye wear can result in permanent eye damage or blindness.(4)

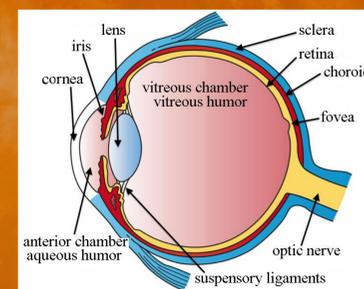


<https://www.nasa.gov/content/eye-safety-during-a-total-solar-eclipse>

Only when the sun is in **totality** is it safe to view the sun without eye protection, the picture above shows when it is **NOT** safe to view the sun yet because the sun has not reached totality.(5)

Safe Viewing

There are two types of eye damage caused by sun exposure: Short-term and Long-term damage. This damage results from an exorbitant amount of ultraviolet light hitting the retina. Short-term damage is caused by staring at the sun, while long-term damage can occur from a lifetime of sun exposure. Permanent damage to the retina can occur within approximately 100 seconds. This is called solar retinopathy.(6,3)



Children are more susceptible to retinal damage than adults because their lenses are clearer than that of adults, so less exposure does more damage, however eye damage is cumulative over your lifetime. (7)

Solar Retinopathy

Solar retinopathy occurs when eyes are overexposed to the sun, it destroys the cones and rods in the eye creating small blind spots.(8) Since there are no pain receptors in the retina there are no symptoms associated with retinal damage until vision is impaired.(9)

Do's and Don'ts

- **DO NOT** use scratched glasses as they can let unfiltered light through to your eyes.
- **DO NOT** view the sun through an unfiltered camera, telescope or other such device - the light becomes concentrated and can burn your eyes even through special glasses
- **DO NOT** look directly at the sun, it **WILL** damage your eyes permanently
- **DO NOT** use homemade devices to filter the sun, specialty glasses are a must
- **DO** wear safety glasses the entire time the sun is in Partial eclipse

Sources

1. How Eclipses Work | Eclipse 2017 <https://eclipse2017.nasa.gov/how-eclipses-work>.
2. Safety | Eclipse 2017 <https://eclipse2017.nasa.gov/safety>.
3. American Academy of Ophthalmology - Solar Eclipse Eye Safety <https://www.aao.org/eye-health/tips-prevention/solar-eclipse-eye-safety>.
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5. Eye Safety During a Total Solar Eclipse <https://www.nasa.gov/content/eye-safety-during-a-total-solar-eclipse>.
6. UCSB Science Line <http://scienceline.ucsb.edu/getkey.php?key=3269>.
7. Ultraviolet radiation and risks to our eyes from UV rays. <http://www.allaboutvision.com/sunglasses/spf.htm>.
8. The dark side of the sun <http://www.visioneyeinstitute.com.au/article/dark-side-sun>.
9. Professional Visioncare of West Hollywood | Randy Taketa, O.D. and Jimmy R. Cheng, O.D. | Optometrists <http://www.wehovisioncare.com/eyehealth.html>.



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.