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Blind Love



Love is blind! Engraving from Harper's Weekly magazine (April 28, 1883) shows a woman viewing the transit of Venus through a telescope. Doing so with no solar filter would result in instant eye damage and likely blindness. Do not let June 5, 2012, be your blind date--use proper observing equipment and common sense.

Color image at <http://www.nmm.ac.uk/rog/Transit%20of%20>

2012 June 5-6 Eye Safety Six Ways to See the Transit of Venus

Safe Viewing Techniques

To observe the transit of Venus directly you must protect your eyes at all times with proper solar filters. However, do not let the requisite warnings scare you away from witnessing this rare spectacle. You *can* experience the transit of Venus safely, *provided you use proper eye protection*. A variety of solar viewing devices available for purchase are listed at the [Store](#) page, or you can [build a Sun Funnel](#) for your telescope.



See <http://youtu.be/4RGr9FcBrSM> video or read [Viewing the Transit & Eye Safety at june2012/eye-safety/280-viewing-the-transit-eye-safety](#) for definitive advice on viewing the sun safely; by B. Ralph Chou, MSc, OD.

Six Ways to See the Transit of Venus



See [Viewing the Transit & Eye Safety](#) by B. Ralph Chou, MSc, OD, for definitive advice on viewing the sun safely. Below are six suggestions for observing the sun and the transit of Venus. Or watch the best video on the subject: <http://youtu.be/4RGr9FcBrSM>.

1 As suggested in the [safety guidelines](#) above, the use of **eclipse shades** or of **#14 shade welding glass** will permit a large number of people who do not have specialized equipment to observe this event. However, as the planet approaches the limb of the sun, subtleties like the "black drop" effect will not be discernible. At one minute of arc in size, Venus is near the visual limit of most people's eyes. It's tiny compared to the sun, which is about 32 arcminutes in diameter.
YES!



Eclipse Shades or Solar Shades appear similar to sunglasses, but they have a special filter that permits safe viewing if the filter is in new condition. Eclipse/solar shades are available through Rainbow Symphony and other retailers listed at <http://www.mreclipse.com/Totality/TotalityApC.html> under "Solar Filters." Before looking at the sun, inspect the material to make sure the lenses are not scratched or compromised in any way. If so, discard the shades.



NO!



Do not be lulled into thinking that you can look safely at the sun while wearing sunglasses, for sunglasses do not protect your eyes sufficiently. So don't try it!
Image courtesy of Sarah.

Do not try to view the sun directly with the naked eye or through any questionable medium. These children, depicted on the April 28, 1883, cover of Harper's Weekly, are at risk of serious eye injury. They are using smoked glass, which is not sufficient.



2 Pinhole projectors are a safe, indirect viewing technique for observing an image of the sun. While popular for viewing solar eclipses, pinhole projectors suffer from the same shortcomings as unmagnified views when Venus

Unattended Equipment Hazards

Always be aware of the power of the sun. Yes, it obviously can fry your eyes without your knowing it, for your eyeball has no pain receptors within. But there are other burn hazards. Keith Johnson of the Fleischmann Planetarium shares this story:

"Just to underscore the necessity of keeping constant watch on your telescope while it's pointed at the Sun... I was running a basic astronomy class lab in Tucson while I was in grad school one day, and we were observing the Sun with a white-light filter. I had placed a film container over the finder as usual. But apparently not firmly enough: it fell off at one point, and I didn't notice it.

One undergrad had come in her pajamas and bathrobe, believe it or not (it was an early-morning class). While she was peering intently through the main eyepiece, I noticed some smoke starting to come from the shoulder of her bathrobe. Sure enough, the finder had set her robe on fire! or at least smoldering..."

Safety Notice

Viewing the sun without proper equipment and/or techniques can result in serious eye injury and blindness. The solar observing descriptions and comments listed in this website are not an endorsement of any particular technique or product. Observers are responsible for their own eye safety. This website accepts no responsibility for the conduct of others in viewing the sun. For definitive advise on observing the sun, see *Viewing the Transit & Eye Safety*, by Dr. B. Ralph Chou, at <http://www.transitofvenus.org/june2012/eye-safety/280-viewing-the-transit-eye-safety>.

"It is never safe to look at the sun without proper eye protection. No filter should be used with an optical device (e.g. binoculars, telescope, camera) unless that filter has been specifically designed for that purpose and is mounted at the front end (i.e., end towards the Sun). Unsafe filters include all color film, black-and-white film that contains no silver, photographic negatives with images on them (x-rays and snapshots), smoked glass, sunglasses (single or multiple pairs), photographic neutral density filters and polarizing filters, computer disk media. Most of these transmit high levels of invisible infrared radiation which can cause a thermal retinal burn. The fact that the Sun appears dim, or that you feel no discomfort when looking at the Sun through the filter, is no guarantee that your eyes are safe. A person with eye damage from improper viewing may not notice the damage until hours later."

<http://www.leaderdog.org/>

For observers who refuse to view the sun safely--Leader Dogs for the Blind in Rochester, Michigan.

approaches the edges of the sun. Small features like the 'black drop' effect will not be discernible.

Dr. Hugh Hunt demonstrates a successful pinhole projection (right) of the 2004 transit of Venus at <http://www2.eng.cam.ac.uk/~hemh/transit.htm>. Additional instructions for pinhole projectors are at <http://www.exploratorium.edu/eclipse/how.html>; from the Exploratorium.



3 You may **project a magnified view** of the sun through a reflector telescope or binoculars onto a white surface, which conveniently allows a larger number of people to watch concurrently. See http://casa.colorado.edu/~dduncan/wp/?page_id=261 for video instructions for projecting the sun, by Dr. Doug Duncan.



The projection technique sometimes has its own limitations. Because magnified projections usually have an exposed focal point beyond the eyepiece, a bystander can inadvertently put her eye or body in the sight line of the sun. Hence, a projecting telescope must not be left unattended. (See Unattended Equipment Hazards, left column.) Large reflector telescopes can generate too much heat by concentrating a lot of the sun's energy on the secondary mirror and eyepiece, so the incoming light must be attenuated first. "Stop down" the aperture. Likewise, SCT or Schmidt-Cassegrain telescopes can experience too much heat build-up as the light bounces internally.



Hubert van Hecke provides the [design and instructions for making his sunspotter](#). Additional pages at his Ask Mr. Science web page indicate [how to take sunspot data and analyze them](#).



The Exploratorium demonstrates how to view a planet in transit safely by [projecting the image of the sun with binoculars](#). Important: Do not look at the sun through binoculars without solar filters on the large ends of both the barrels. Do not leave this rig unattended.

4 A method for allowing a large crowd to witness the transit of Venus concurrently is to project a magnified image through a closed-loop device.

A popular projection device used during the 2004 transit of Venus was the now-improved Sun Funnel. Made from simple materials (a plastic funnel, a clamp, an eyepiece, and some projection fabric), the device fits in your telescope like an eyepiece with an appendage. A clear image of Venus transiting the sun appears on the screen. Because the entire light path is enclosed, observers are not at risk. A larger version of the screen uses a bucket to yield a larger image. Download [simple instructions and supplies list](#) written by AAS Press Officer Richard Tresch Fienberg.



Bruce Hegerberg's design for a Sun Gun is online at www.sunguntelescope.com.

Another viewing tool is Gene Zajac's modified version of a Sun Gun (see 1999 GLPA Proceedings). The device safely allows a crowd of spectators to view a large projection of the sun, the transiting planet, and sunspots.

TIP: To avoid excessive heat build-up on your eyepiece, do not aim the telescope continuously at the sun for an extended time. For large scopes, stop down or attenuate the incoming light, for the telescope's purpose is to magnify the image of the sun, not to gather a lot of sunlight.



The **Sunspotter** is commercially available from Science First. It provides a surface on which you can safely trace the sun's outline and sunspots onto a piece of paper.

The Venuscope and solar shades are commercially available from SODAP-SOBOMEX- Department Sky & Space.

<http://www.solarscope.com/>

A Solarscope is commercially available from [Light Tec Optical Instruments]



The transit of Venus is perhaps best when **viewed directly when magnified**, which demands an *appropriate solar filter* over the large end of the telescope. Often made of glass or Mylar, these "white light" filters block about 99.99% of the incoming sunlight, which allows the eyepiece then to magnify the image. A filtered, magnified view will show the sun (either blue or orange), the planet Venus, the "black drop" effect, and sunspots. See **Solar Filters** or

http://skyandtelescope.com/observing/objects/sun/article_101_1.asp for a list of retailers.



Note #1: The sun's immense energy must be drastically reduced *before* it enters the telescope. Do not use small filters that fit over the eyepiece (as found in some older, cheaper telescopes), for the concentrated sunlight can shatter them.

Note #2: Remove unfiltered finder scopes so they are not inadvertently accessed. Do not rely on a lens cap--even if it is taped on--to keep the eyes of a prying person at bay. (See Unattended Equipment Hazards in left column.)



Special telescopes with built-in hydrogen-alpha filters show additional solar features, such as the sun's surface granulation and prominences extending outward into space. Though more expensive than traditional telescopes, they offer wonderful views of the magnified sun not seen by astronomers in previous centuries.

6 Transit not visible from your location, or clouds interfering? Watch the **live webcast** from atop Mauna Kea in Hawaii, with expert commentary brought to you by the fun team at NASA EDGE. Don't miss the 2012 transit of Venus!