

25 burning questions about solar eclipses

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USA TODAY



This March 9, 2016, file photo shows a total solar eclipse in Belitung, Indonesia.

The most hyped solar eclipse in American history will be breaching Oregon's coast and making its way across the country in less than a month.

As you prepare to journey into the path of totality, or take a look up as you go about your day, here are the important things you need to know about the spectacular event:

First, what is a solar eclipse?

A solar eclipse occurs when the moon passes between the sun and the Earth at a particular angle. The moon blocks the light from the sun, casting a shadow on the Earth that, in the path of totality, turns day into twilight. It's only by coincidence that the moon is able to do this. The sun is 400 times wider than the moon, but it is also 400 times farther away, so they appear to be the same size in the sky.

When is the Great American Eclipse?

August 21, visible in Oregon from 10:15 a.m. to 10:27 a.m.

When was the last total solar eclipse visible in Oregon?

It was on Feb. 26, 1979, which also crossed Washington, Idaho, Montana and North Dakota, a day on which the weather was described as "bleak."

Is this the only total solar eclipse visible in Oregon during my lifetime?

Yes, it probably is. The next total solar eclipse in the U.S. will be on April 8, 2024, but the path of totality only crosses the country from Texas to New England. More total eclipses in the U.S. will follow in 2044, 2045 and 2078, but those will also miss the Beaver State.

Why is this called the "Great American Eclipse?"

This is the first total solar eclipse to only pass over the United States and no other nation since the country was founded.

How long will the solar eclipse last?

It will take 91 minutes for the eclipse to cross the country, but it will only be visible for a couple minutes at any given location.

Where is the "path of totality?"

The shadow of the moon as it entirely blocks the sun's light will sweep across parts of 12 states: Oregon, Idaho, Wyoming, Nebraska, Kansas, Missouri, Illinois, Kentucky, Tennessee, Georgia, North Carolina and South Carolina.

Some Oregon cities in the path include: Lincoln City, Newport, Dallas, Salem, Albany, Lebanon, Sweet Home, Madras, Fossil, Baker City and Ontario.

How "fast" is the eclipse?

The speed of the moon's shadow will

average more than 1,600 mph, but it will actually slow down as it travels across the country because of the relationship between the earth's and moon's rotations and the planet's curvature. In Oregon, the speed will top 2,200 mph, just less than three times the speed of sound.

How many people will be able to see the total eclipse?

An estimated 12 million people live within the path of totality, though many more are expected to travel to within the path. The number of people within one day's drive of the totality zone is around 200 million.

What will I see during a total solar eclipse?

During a total solar eclipse, as the disk of the moon blocks out the last sliver of light from the sun, the sun's outer atmosphere, the corona, becomes visible. The corona isn't an indistinct haze; sky watchers report seeing great jets and ribbons of light, twisting and curling out into the sky.

How does nature respond to a total eclipse?

Plants and animals act as though night is falling, as flowers close up and birds return to roost. The temperature can drop 10 degrees or more, and it feels much cooler if there's a breeze.

Where will a partial solar eclipse be visible?

If you're not in the "path of totality," you'll still get a chance to see a partial eclipse, when only a part of the sun is blocked by the moon. A partial eclipse will be visible in all of North America, parts of South America, western Europe and Africa. While a partial eclipse is still cool, you won't notice your surroundings getting dark.

Could this be the most-viewed eclipse ever?

Astronomy magazine says yes, basing this proclamation on four factors: 1) The attention it is getting from the media; 2) The superb coverage of the highway system in our country; 3) The typical weather on that date; and 4) The vast number of people who will have access to it from nearby large cities.

How can you look at the solar eclipse?

The only moment it's safe to look directly at the eclipse is during the 2-3 minutes when the sun is completely behind the moon. Before and after that — and

during a partial eclipse — special eclipse glasses must be worn, though welder's goggles or similar eye protection also work. That's because the sun's surface is so bright that if you stare at any portion of it, no matter how small, it produces enough light to permanently damage your retina. Our eyes never evolved to look at the sun without suffering severe damage. Regular sunglasses are also not safe to use.

Can you take a photo of the eclipse with your smartphone?

Technically yes, but the quality will be rather poor, since smartphone cameras were not designed with astrophotography in mind. For a good photograph, you'll need a higher quality camera, a telephoto lens and a solar filter for the lens. Just like how the sun can damage your eyes, it can also destroy camera sensors, so a filter is particularly necessary during the moments before and after totality. If this is your first eclipse, many eclipse watchers suggest putting down the camera and just experiencing it in the moment. Most of the best shots you'll see will be taken with professional DSLR cameras on tripods, or even shot through a telescope.

Will there be "eclipse tourists?"

Absolutely. In Oregon alone there are dozens of events in towns all along the path of totality trying to capitalize on this event. Vineyards are offering packages to camp and drink wine for several nights. The Oregon State Fairgrounds in Salem are having a viewing party. Organizers of the SolarFest in Madras are calling it "a rare, mind-blowing cosmic experience." There are even eclipse concerts planned. But most of these events are, at this point, sold out.

Will traffic be bad on Aug. 21?

Yes. Definitely yes. This could be one of the worst traffic days in U.S. history, some NASA representatives predict. Between 1 and 2 million people are expected to come into Oregon, and that's not even including the many people who live in the state expected to drive into the path of totality. Public safety officials expect 125,000 to 500,000 people to enter the Salem area, seriously straining the city's infrastructure.

What cities have highest likelihood of clear viewing conditions?

Based on historical weather conditions, folks in Idaho, Wyoming and Nebraska will have the best chance of clear skies. Casper, Wyo., has an 88 percent chance of clear skies on Aug. 21.

What cities have highest likelihood of cloudy viewing conditions?

Both the Pacific and Atlantic coasts could see cloudy conditions. Increased cloud cover will also be possible as the eclipse travels across the country east of the Mississippi River. Both Nashville and Columbia have a 44% chance of clear skies.

Do solar eclipses affect humans?

No, there's no evidence that eclipses have any physical effect on humans. However, throughout history, eclipses have been known to produce profound psychological effects. For millennia, they were sometimes interpreted as portents of doom by countless civilizations.

Why are solar eclipses so rare?

It takes three celestial bodies (the sun, moon and Earth), all of which are on various orbital paths, to line up in the exact way at the right time to create an eclipse. On average, a total eclipse is visible from any one spot on Earth about once every 375 years. In the U.S., it takes about 1,000 years for every geographic location in the Lower 48 to be able to view a total solar eclipse. So you must be in just the right place at just the right time to observe a total solar eclipse.

How are eclipses predicted?

Astronomers first must work out the geometry and paths of the Earth and moon as they orbit around the sun, mathematically figuring out the motions of each of the three bodies in three-dimensional space. Astronomers then feed the current positions and speeds of the Earth, moon and sun into a computer, programming it to calculate their future paths in relation to one another and what will be the view from the vantage point of us down here on Earth. Eclipses are specific predictions of where the three bodies will be at an exact time and place. Current eclipse forecasts are accurate to less than a minute.

How many total solar eclipses are there each year?

There is one somewhere on Earth roughly every 18 months.

When was the first solar eclipse?

Solar eclipses have occurred ever since the Earth, sun and moon have been around, but it took a while before anyone was here to record them. According to inscriptions on a monument in Ireland, people there were noticing eclipses about 5,000 years ago. Eclipses were also recorded in ancient China, Babylonia and Greece.

Are there other kinds of eclipses?

Yes, a few, including annular eclipses, hybrid solar eclipses and lunar eclipses. An annular eclipse occurs when the moon covers the sun's center, leaving the sun's visible outer edge to form a "ring of fire" or "annulus" around the moon. A hybrid eclipse shifts between a total and annular eclipse: At certain points on the Earth, it's a total eclipse, whereas at other points it appears as annular. Finally, a lunar eclipse is when the Earth blocks sunlight from getting to the moon.

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Sources: NASA, NOAA, Astronomy.com, AstronomyToday.com, Sky and Telescope, Space.com, "Get Eclipsed" by Pat and Fred Espenak.

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