A total solar eclipse will be visible to millions of Americans in April: Here's how to view it

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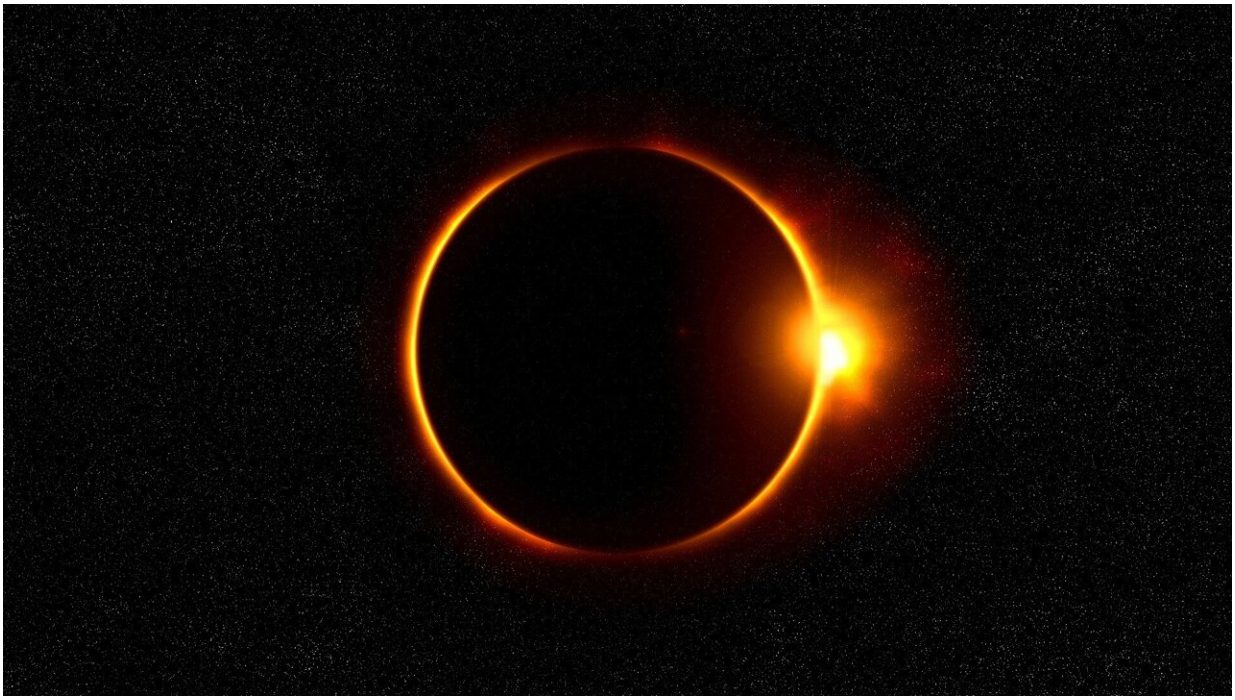

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Paul Maley has spent much of his life chasing solar eclipses.

He has witnessed 83 solar eclipses from 1960 to 2023. On April 8, he plans to see the 84th aboard a cruise ship in Mexico, located right in the path of totality—the swath where the moon fully blocks the sun.

"It's more eclipses than anyone living or dead," he said, proudly.

But millions of Americans will also get a chance to see the next eclipse. The heavenly display will be visible—weather permitting—in North America to about 31.5 million people living in the path of totality, including a long stretch through the U.S. The rest of the continental United States, as well as parts of Alaska and Hawaii, will be able to see a partial solar eclipse.

Maley's pursuit of the phenomenon has taken him across the world—from the icy land of Antarctica to the Cocos Islands off the western coast of Australia. Some of the experiences have been unnerving, like a trip to Turkey in 1999 during a period of unrest when military police filled the streets, Maley said.

Others have been blissfully simple. A trip to watch a partial eclipse—which doesn't attract nearly the same fanfare as a total eclipse (more on that later)—in South Korea with his wife ended with a celebration for two at a Dunkin Donuts.

Maley, 76, says these journeys are somewhat of an obsession for him. But they also provide an escape and are an easy way to put one's place in the universe in perspective, he said.

"No matter how many things in this world are screwed up, whether it's political or military or economic, nobody can change what's going on in the sky when it comes to an eclipse of the sun," he said. "It's going to happen. There's nothing you can do about it, so you might as well go there and enjoy it and free yourself from all the problems that you're facing."

What happens during a total solar eclipse?

A total solar eclipse happens when the moon passes between the sun and Earth, completely blocking the face of the sun from view and casting a shadow onto the Earth. For people viewing the eclipse from locations where the moon's shadow completely blocks the sun, known as the path of totality, the sky will become dark.

Depending on the weather and visibility, people along the path of totality will see the sun's corona, the outermost part of the sun's atmosphere, which is typically obscured by the sun's brightness. Just before totality, viewers can also spot flashes of light—known as Baily's beads—along the circumference of the moon.

A rapid drop in temperature typically occurs during a total solar eclipse. At times, birds will fall silent and nocturnal animals will abruptly awaken, mistaking the brief phenomenon for nightfall.

The phenomenon also has appeared—and had various interpretations—in religious texts. Some Indigenous people have traditions they observe—like abstaining from food—during solar eclipse events.

The last total solar eclipse that crossed the United States was in August 2017. It was the first total solar eclipse visible in the contiguous U.S. in 38 years, according to NASA. The April eclipse will be the last to be visible in the Lower 48 until Aug. 23, 2044.

When will this total eclipse happen and who can see it?

The eclipse will begin over the South Pacific Ocean and will move diagonally across Mexico, the United States and Canada. Mexico's Pacific coast will be the first location in continental North America to

experience totality around 11:07 a.m. PDT.

The eclipse will enter the United States in Texas and make its way through Oklahoma, Arkansas, Missouri, Illinois, Kentucky, Indiana, Ohio, Pennsylvania, New York, Vermont, New Hampshire and Maine. A map on NASA's website provides an approximate time that each location in the path of totality will see the eclipse.

While more than 30 million Americans will get a chance to experience a total solar eclipse, most will see only a partial eclipse, which happens when the moon passes between the sun and the Earth but all three bodies are not perfectly lined up, as is the case on either side of the path of totality. Rather than being completely obscured, the sun will appear as a crescent shape.

The maximum duration of totality along the eclipse path will be 4 minutes, 28 seconds, though it's likely to be shorter in most locations.

Why does this happen and how often?

Solar eclipses occur because, as the Earth is orbiting the sun, the moon is orbiting the Earth. Roughly every 28 days as the moon makes a complete journey around the Earth it moves between the sun and Earth, said Nick DiFrancesco, an assistant professor of geology at the University at Buffalo.

But eclipses don't happen every 28 days.

"The three factors that influence whether an eclipse is going to occur or not are the alignment of the Earth, moon and sun, that tilt or inclination of the moon's orbit around the Earth and the last thing, essentially, is how close to the Earth the moon is," DiFrancesco said.

Those factors have to be in perfect alignment to get a total solar eclipse.

How to get the best viewing experience

People frequently travel to the path of totality to experience the total solar eclipse with their own eyes. Eclipse chasers will tell you that's the only way to do it. There are even travel guides that plan complete vacations with the eclipse as the central focus.

This year, Maley has helped organize a cruise for roughly 200 people to see the eclipse in Mexico. He also helped put together a trip for eclipse chasers at an all-inclusive beachfront hotel in Mazatlan, Mexico, which will feature discussions with experts in addition to the viewing.

Even the popular travel website Expedia put together vacation packages for the eclipse. The U.S. National Park Service has posted tips about which parks are best situated to see the eclipse.

However you choose to view it, experts say, you should plan ahead. Cities in the path of totality are expecting an influx of visitors and major traffic jams as people flood to those communities to get a glimpse of the scientific wonder.

The weather can also affect visibility. Experts suggest monitoring the forecast and being flexible enough to move from your initial location to one with less cloud cover, if necessary.

And while it's unlikely you'll need much gear to view the eclipse, there is one must-have: adequate eye protection. Solar viewing glasses, also known as eclipse glasses, can be purchased online. Experts recommend taking care to ensure the glasses meet the ISO 12312-2 standard for solar viewers and to inspect them for any damage prior to viewing the eclipse.

NASA experts say a quick way to do this is to pull out your phone flashlight and shine it onto the glass lens. If they offer enough protection, you'll only be able to see a pinpoint of light.

Maley may be biased but he says there is no substitute for seeing an eclipse in person.

"It's something that has to be seen. The photographs that people have taken, including myself, never do it justice, and even the videos are all two-dimensional," he said. "It's just something that cannot accurately be conveyed to people unless they're right there on the same spot experiencing it with you."

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