Ask an Astronomer

Question: "Why are solar eclipses only visible in some parts of the world?"

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To understand how solar eclipses happen, we really just need to think about how shadows work.

The Sun shines on both the Earth and Moon, and both the Earth and Moon cast shadows opposite the direction of the Sun. A solar eclipse is what we see when a shadow from the Moon falls on the Earth.

But the Moon is much smaller than the Earth. Just like this softball is much smaller than the sidewalk. The shadow of the softball can only cover a little bit of the concrete.

The same thing happens in a solar eclipse. When the Moon is new and is passing between the Earth and the Sun, its shadow only covers a small portion of the Earth. Only those people standing directly in the full shadow of the Moon, known as the "umbra," see a total eclipse. Someone near the edge of the shadow, called the "penumbra," will see a partial eclipse, while someone outside the shadow will see no eclipse at all.

A solar eclipse happens somewhere on Earth roughly every year and a half.

In an interesting coincidence of nature, the Moon is about 400 times smaller than the Sun, but is 400 times closer, so the Sun and Moon appear to be the same size in the sky, about the size of a pea held at arm's length.

If the Moon were smaller or farther away, we would never have total eclipses, since it would not be large enough to cover the entire Sun. If it were larger or closer, then its shadow would be larger and the total eclipse would cover much more of the Earth, but we would not see the Sun's corona during a total eclipse.

Since each solar eclipse only affects a small portion of the world, a region can go hundreds years without experiencing one. Many people plan trips years in advance to be in just the right place at the right time to see these rare events. I'm one of those people.

For "Ask an Astronomer," I'm Dr. Susan Stolovy of the SIRTF Science Center.