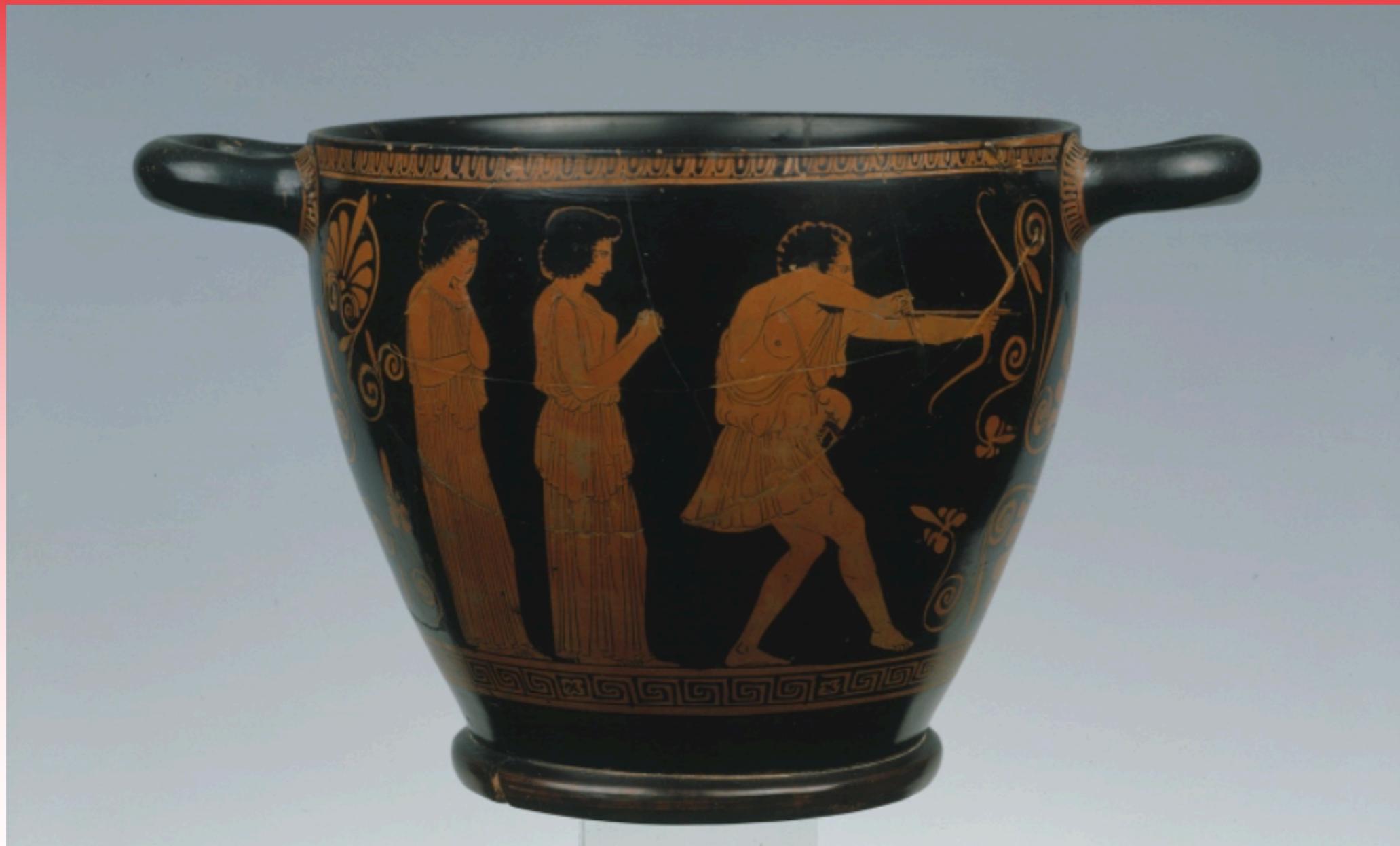


Prolog:  
The Eclipse of 1207 BC and  
The Slaying of the Suitors



## Odysseus Slaying the Suitors

Staatliche Museen zu Berlin, Ident.Nr. F 2588

[http://www.smb-digital.de/eMuseumPlus \(CC\) BY-NC-SA](http://www.smb-digital.de/eMuseumPlus (CC) BY-NC-SA)

Theoclymenus wailed out in [the midst of the suitors],

"Poor men, what terror is this that overwhelms you so?  
Night shrouds your heads, your faces down to your knees—  
cries of mourning are bursting into fire—cheeks rivering tears—  
the walls and the handsome crossbeams dripping dank with blood!  
Ghosts, look, thronging the entrance, thronging the court,  
go trooping down to the world of death and darkness!  
The sun is blotted out of the sky—look there—  
a lethal mist spreads all across the earth!"

At that they all broke into peals of laughter aimed at the seer.

*From Book XX,  
The Odyssey, Homer, Translated by Robert Fagles,  
New York, Penguin Group, 1996.*

# The eclipse foreseen by Theoclymenus:

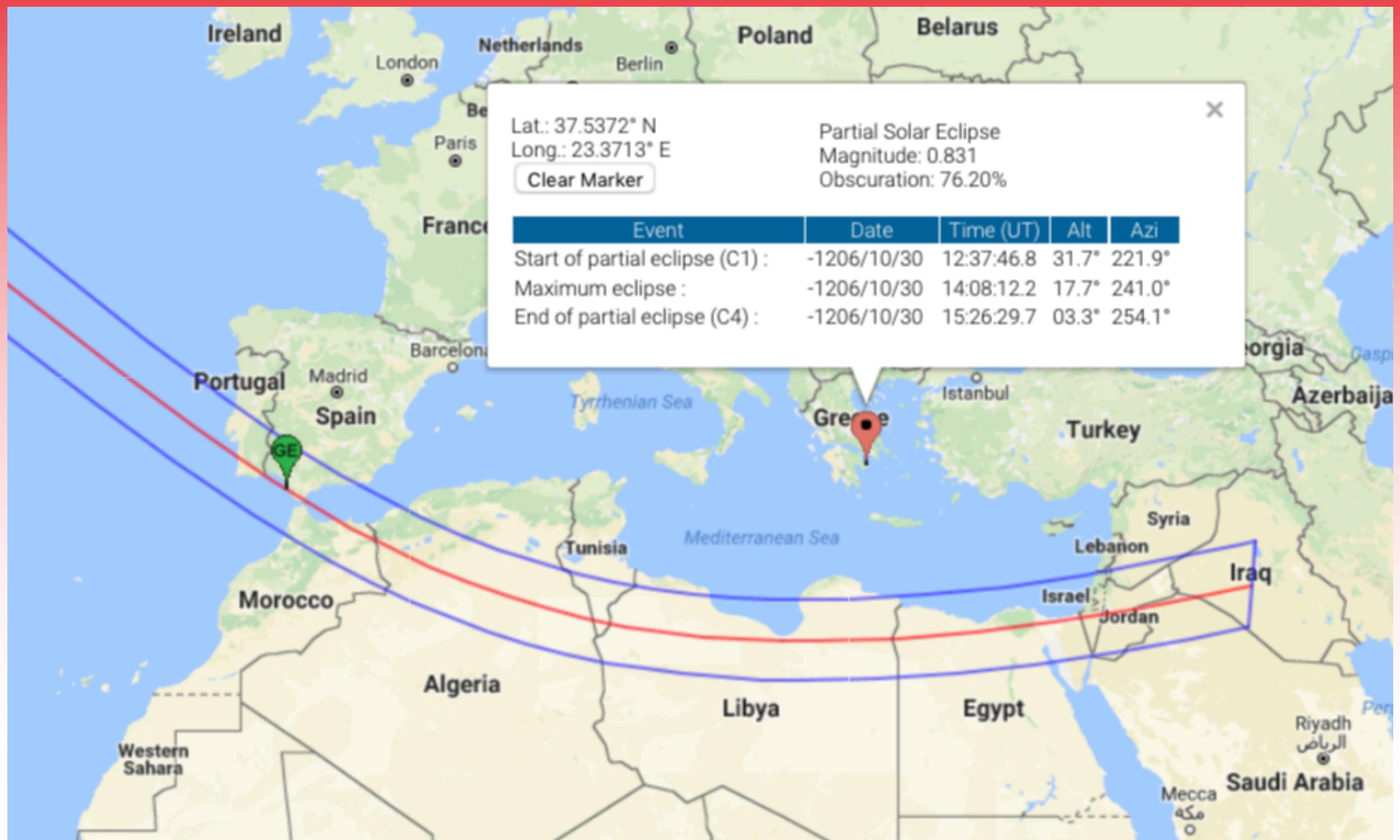
The annular solar eclipse, of 30 October 1207 B.C. constitutes an autumn return of Odysseus to Ithaca five days before the eclipse. The eclipse offers a precise astronomical dating of the event and dates the legendary Trojan War's end as well.

St. P. Papamarinopoulos, P. Preka-Papadema, P. Antonopoulos, H. Mitropetrou, A. Tsironi and P. Mitropetros, "A New Astronomical Dating of Odysseus Return to Ithaca," Mediterranean Archaeology and Archaeometry, Vol. 12, No. 1, pp. 117-128, <http://maajournal.com/Issues/2012/Vol12-1/Full9.pdf>.

# Narrowing it down:

"Odysseus arrived in Ithaca on 25 October, 1207 BC. Five days later, there was a solar eclipse with 75% coverage in the Ionian Sea, and it is precisely when the massacre of Penelope's suitors took place," says Preka-Papadema.

- From 1300 to 1130 BC, the period when the events of both Homeric poems presumably took place, there were 14 solar eclipses.
- Only five of them were visible in the Ionian Sea area, and two of them only obscured 2% of the sun.
- The third one happened at sunset, which implies that the remaining two are the only ones worth studying.
- In 1143 BC, there was a full solar eclipse, but it was so close to the decline of the Mycenaean cities that researchers struck it off the list as well.
- The fifth eclipse took place on 30 October, 1207 BC, from 14:30 to 17:00 h: this must be the one described in the Odyssey.



October 30th, 1207 BC, NASA Catalog of Solar Eclipses

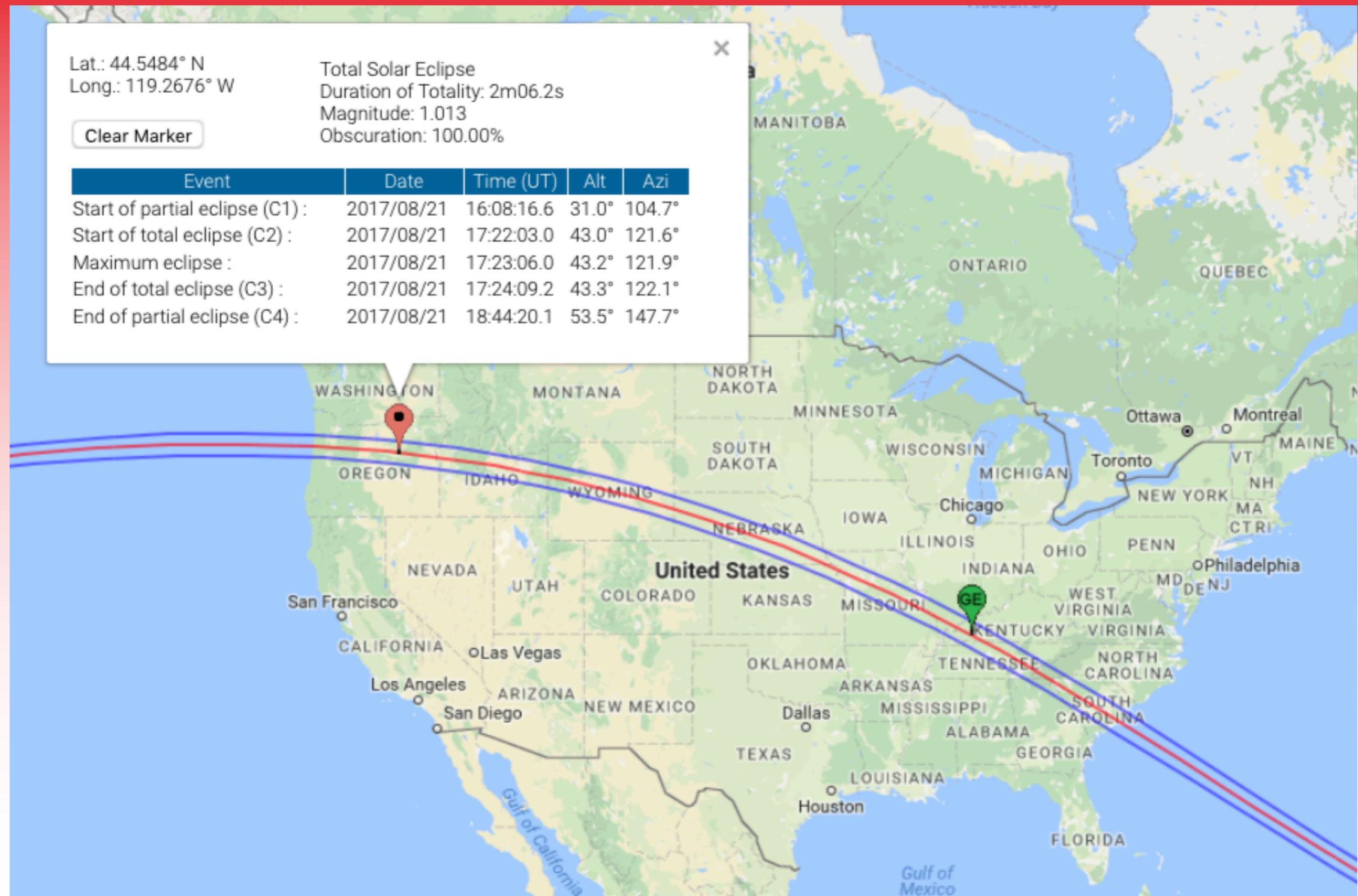
<https://eclipse.gsfc.nasa.gov/SERelease/SEReleaseMap.php?Ecl=-12061030>

# The Great American Eclipse of 2017

*Talk for Sons in Retirement (SIR) Branch 146  
Luncheon, July 13th, 2017*

Brian Hill  
Assistant Professor  
Department of Physics & Astronomy  
Saint Mary's College of California  
[physics.stmarys-ca.edu/faculty/brianhill](http://physics.stmarys-ca.edu/faculty/brianhill)

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  - B. Where to Be
  - C. The Phases of the Eclipse
  - D. Eye Protection
  - E. Future Eclipses
- Epilog: The Eclipse of 1919 and The Bending of Starlight

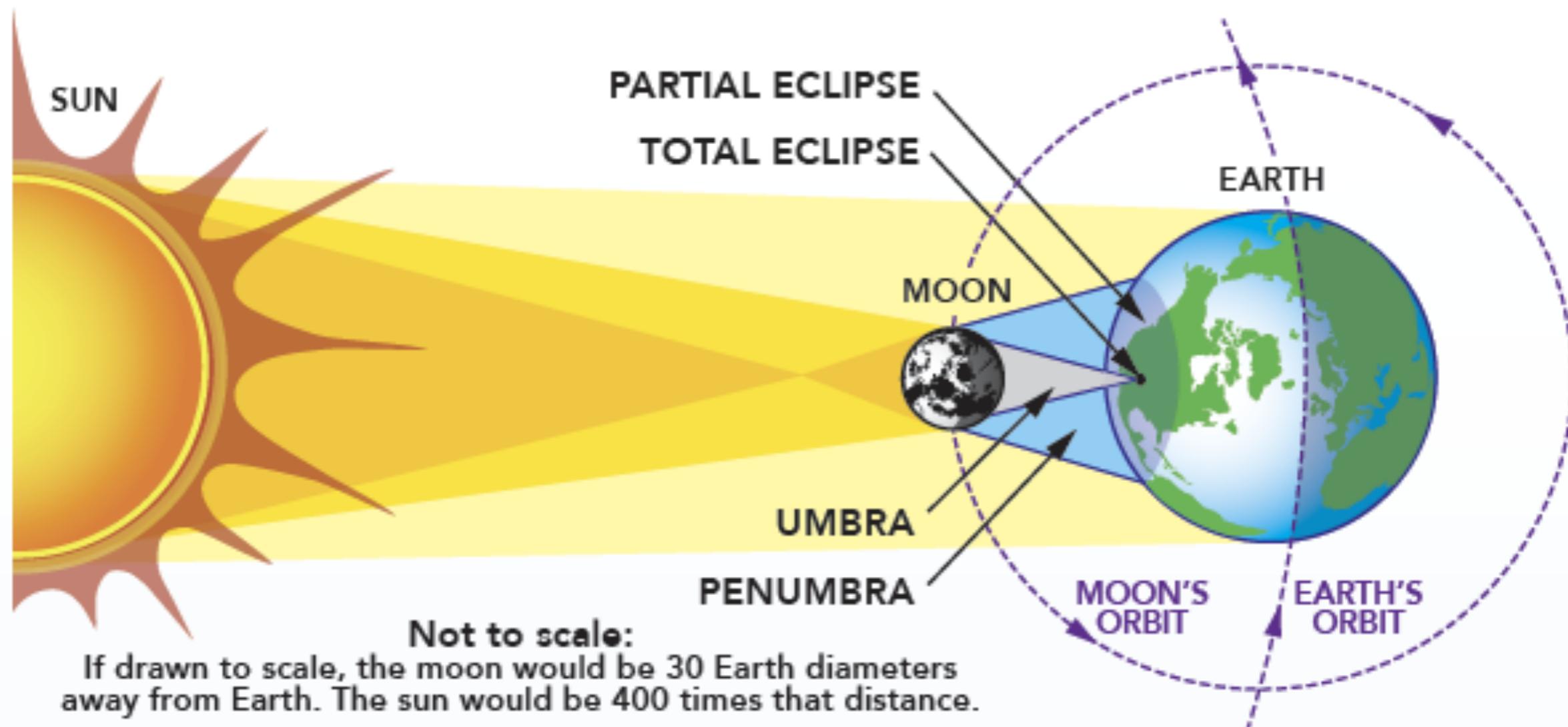


# August 21st, 2017, NASA Catalog of Solar Eclipses

<https://eclipse.gsfc.nasa.gov/SEsearch/SEsearchmap.php?Ecl=20170821>

# TOTAL SOLAR ECLIPSE: Monday • August 21, 2017

This will be the first total solar eclipse visible in the continental United States in 38 years.

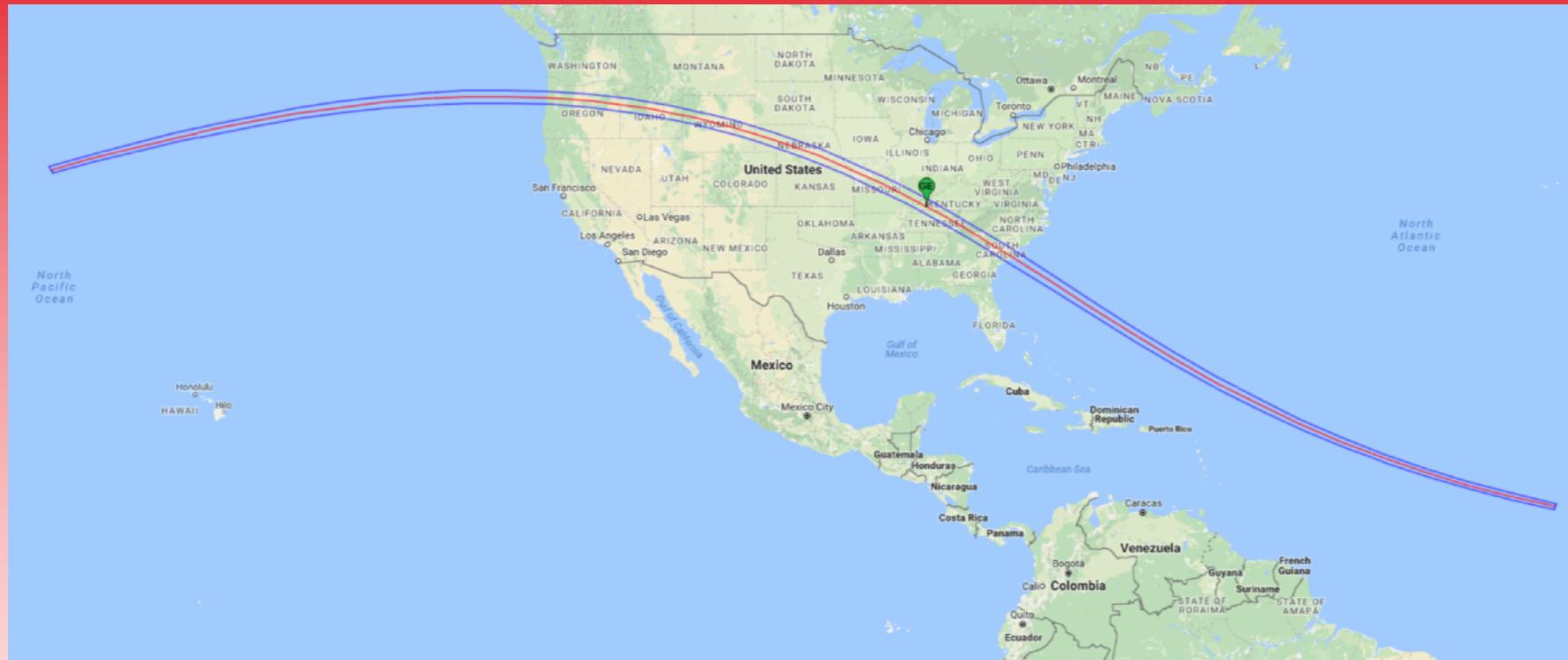


Above: Schematic of umbra and penumbra. <https://eclipse2017.nasa.gov/how-eclipses-work>.

Below: Moon and Earth to Scale. [https://en.wikipedia.org/wiki/Orbit\\_of\\_the\\_Moon](https://en.wikipedia.org/wiki/Orbit_of_the_Moon).

At this scale, the Sun would be 400 slide-widths away and 2.5 slide-heights high.





## NASA Eclipse Catalog, Full Track of August 21, 2017 Eclipse

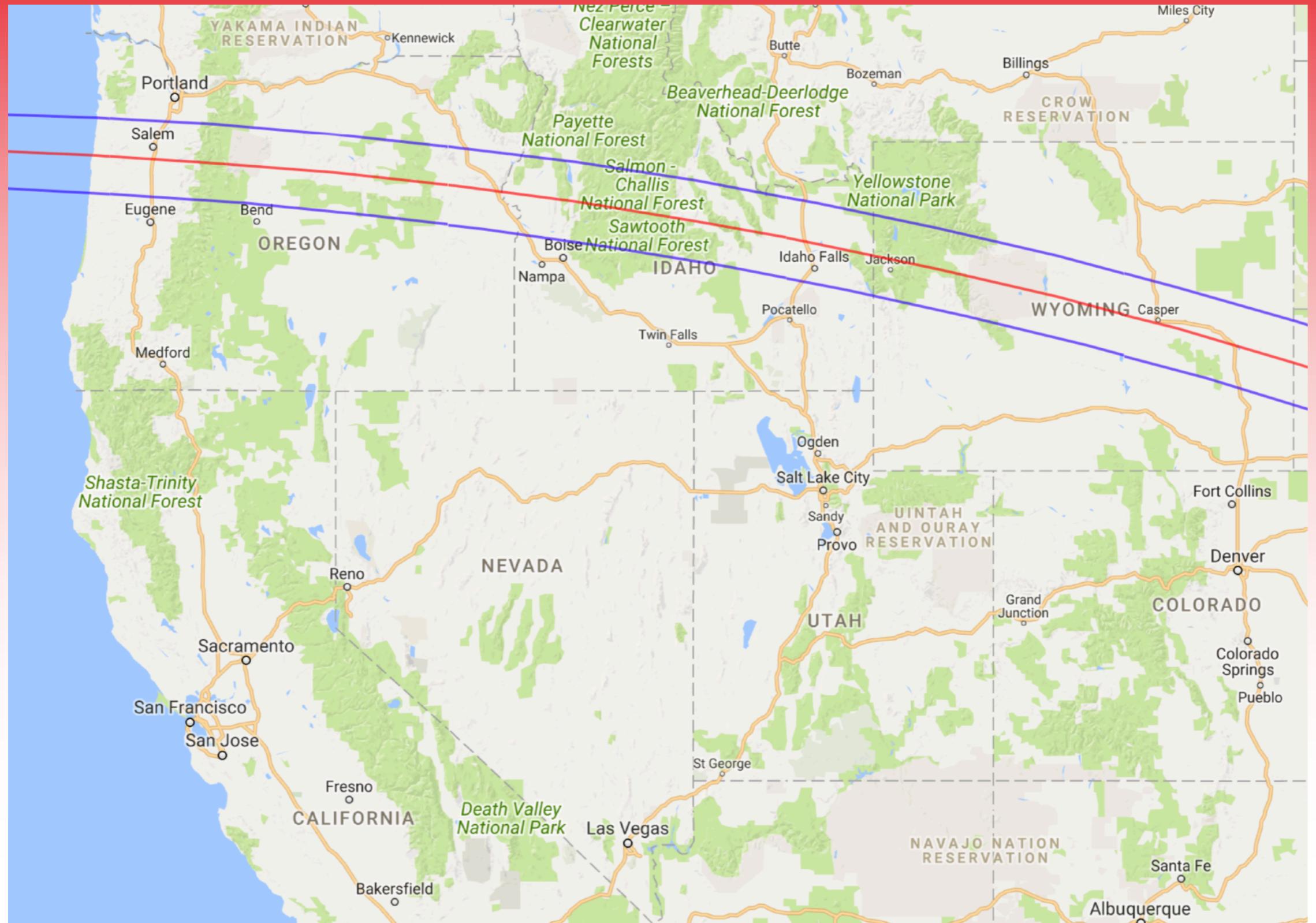


NASA Scientific Visualization Studio,  
August 21, 2017 Eclipse Shadow Cones Animation

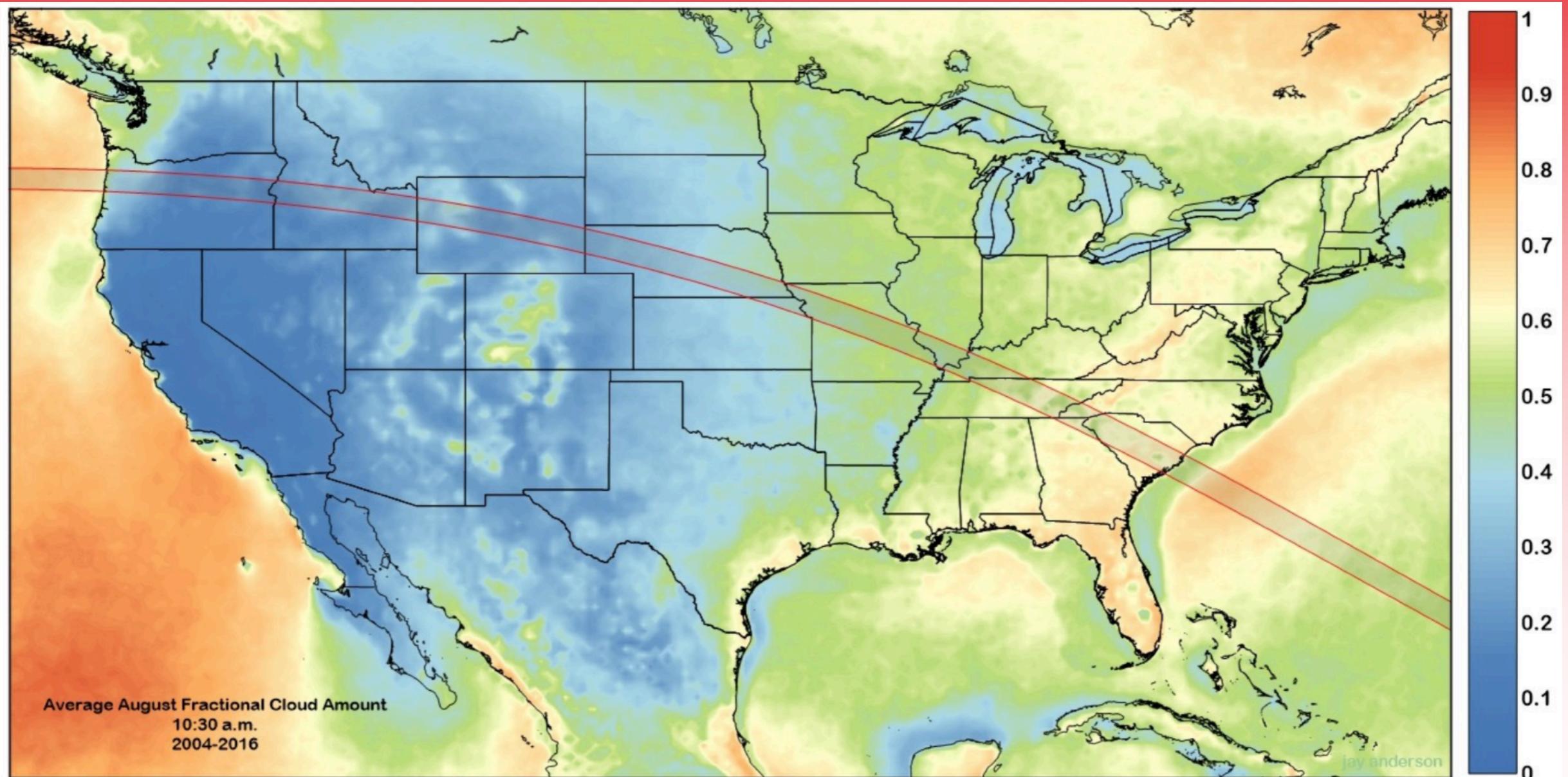


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Road Trip! Oregon, Idaho, Wyoming!?



# Cloud Cover Fraction

Source: <http://eclipsophile.com/overview/>

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# The Phases of the Eclipse

**first contact** - the *partial phase* of the eclipse begins

**second contact** - when the *total eclipse phase* begins

**third contact** - when the *total eclipse phase* ends

**fourth contact** - the *partial phase of the eclipse* ends

# Partial Eclipse

- Will Happen Throughout North America
- Here it starts about 9AM PDT (16:00 UT)
- Peaking about 17:15 UT (10:15 AM PDT)
- Approximately 75% Obscuration Here
- Ends about 11:30 AM PDT



# Total Eclipse

- A 75-Mile Wide Band from Oregon to S. Carolina
- Crosses the whole US in 1 1/2 Hours
- In Oregon Totality is about 17:15 UT (10:15 AM PDT)
- Lasts only 2 minutes  
(maximum Hopkinsville, KY, 2 minutes 40 seconds)



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# Eye Protection

- You cannot safely look at the Sun.
- If you try to look at the disk of the Sun briefly, your pupils contract and you get an achy feeling which forces you to look away.
- These normal protection mechanisms DO NOT kick in when the disk shrinks to a crescent.
- To view the partial phases of the eclipse YOU MUST have eye protection or you will burn — as in *permanently scar* — your retinas.

## Eye Protection (cont'd)

- You CAN enjoy totality without eye protection.
- You will see the Sun's corona which is normally drowned out by the much brighter light from the disk.  
Venus, Jupiter, Mars and Mercury will be visible.
- According to NASA's website, it is not safe to view the diamond ring effect or Baily's beads without eye protection.
- Get onto a reputable on-line source and get eclipse glasses ordered ASAP.



A boy wearing protective viewing glasses during a partial solar eclipse in 2014  
Credit: NASA/Bill Ingalls

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

20-pack for \$20 on Amazon: <https://www.amazon.com/gp/product/B073BPN5RS>

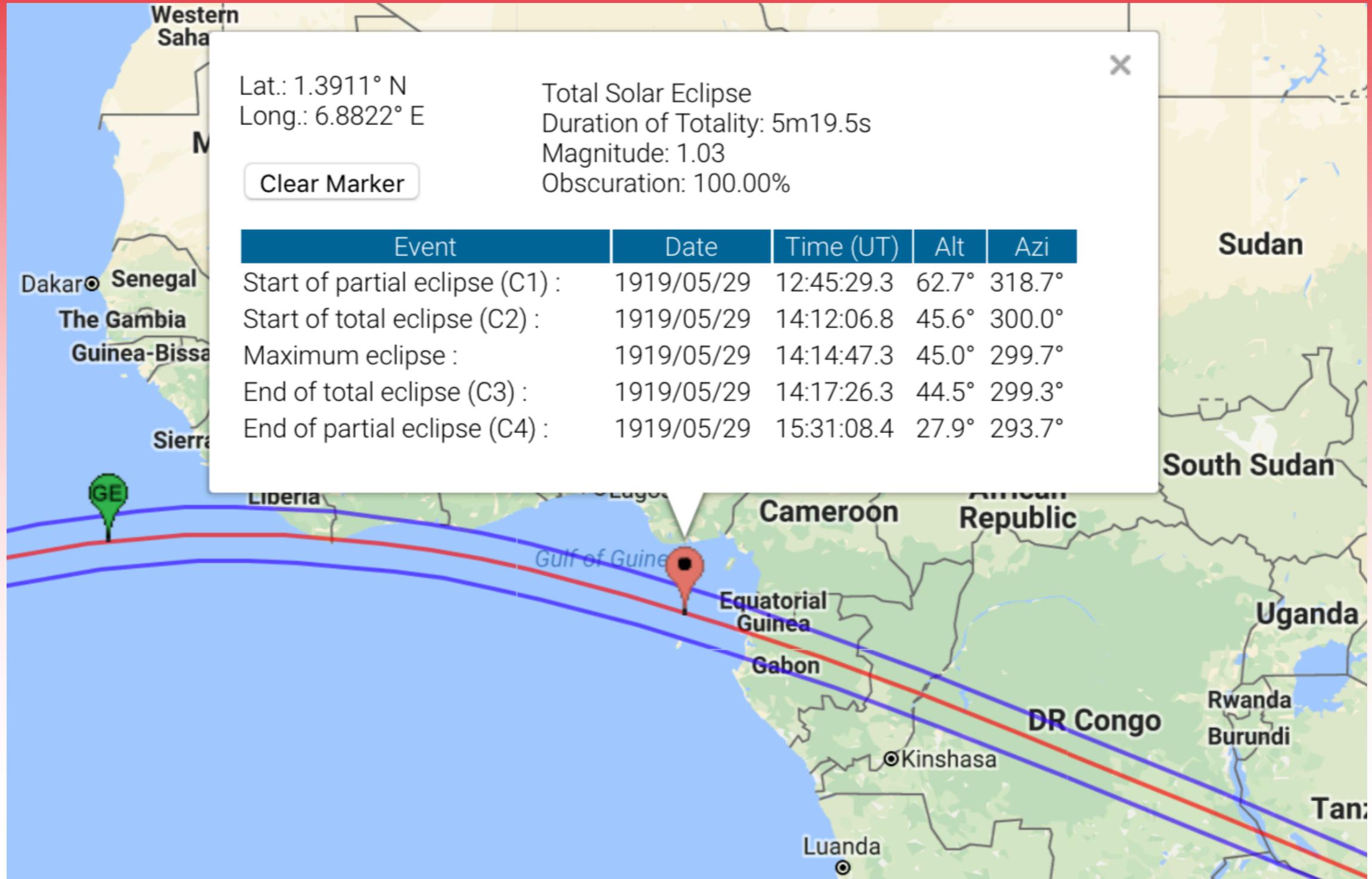
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Total solar eclipses over  
North America in the  
21st century

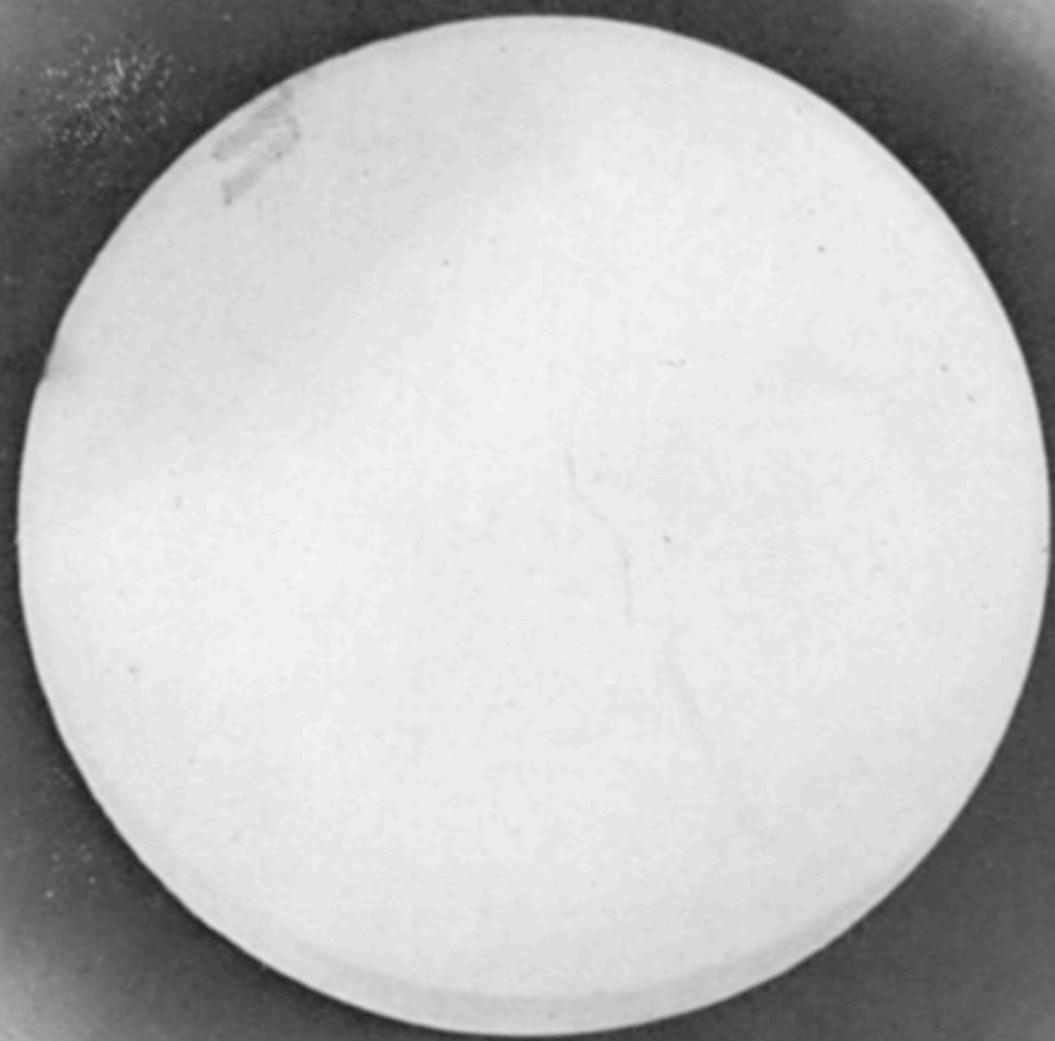


# Epilog: The Eclipse of 1919 and The Bending of Starlight

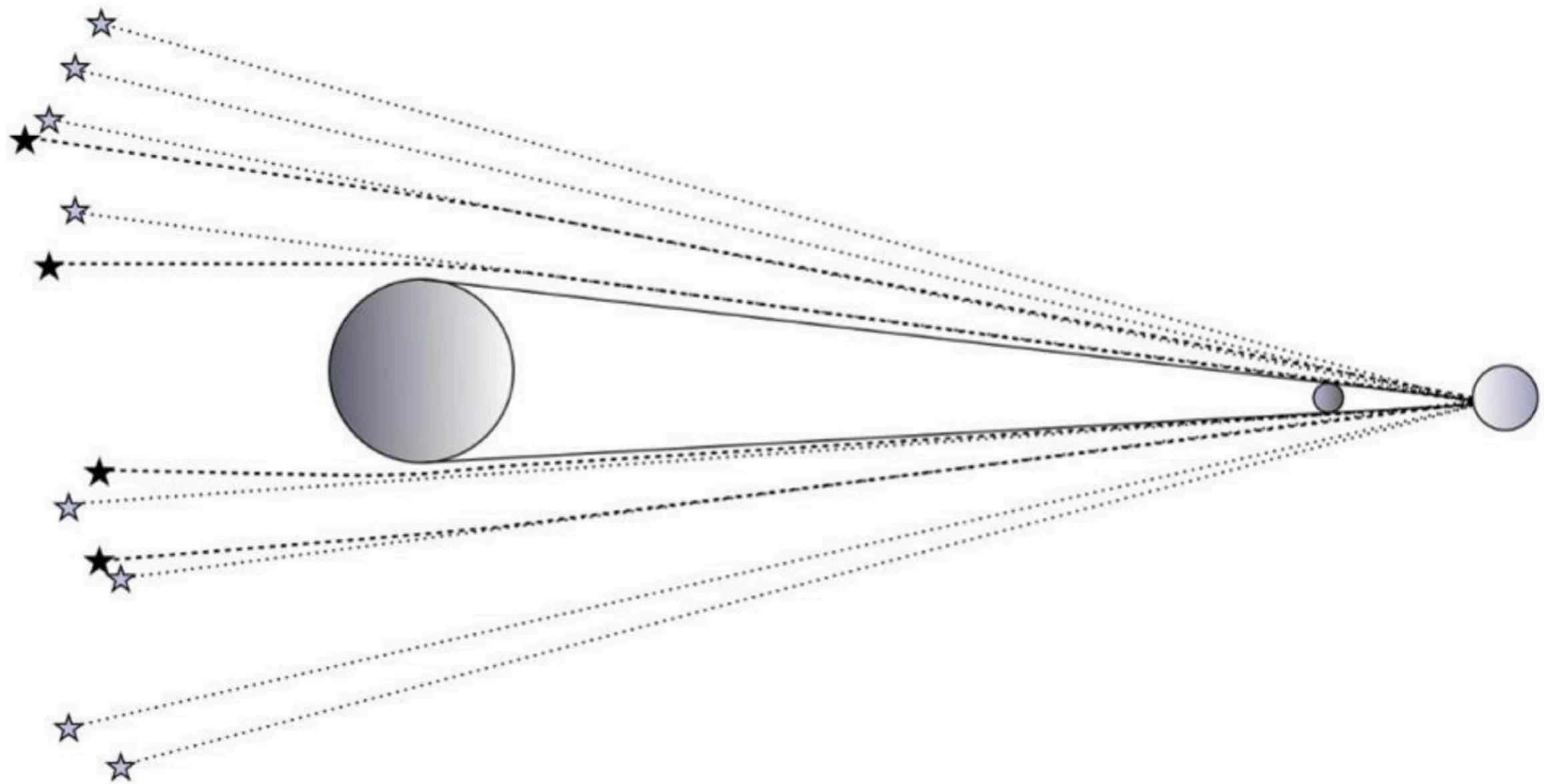


May 29th 1919, NASA Catalog of Solar Eclipses

<https://eclipse.gsfc.nasa.gov/SEsearch/SEsearchmap.php?Ecl=19190529>



# Bending of Starlight

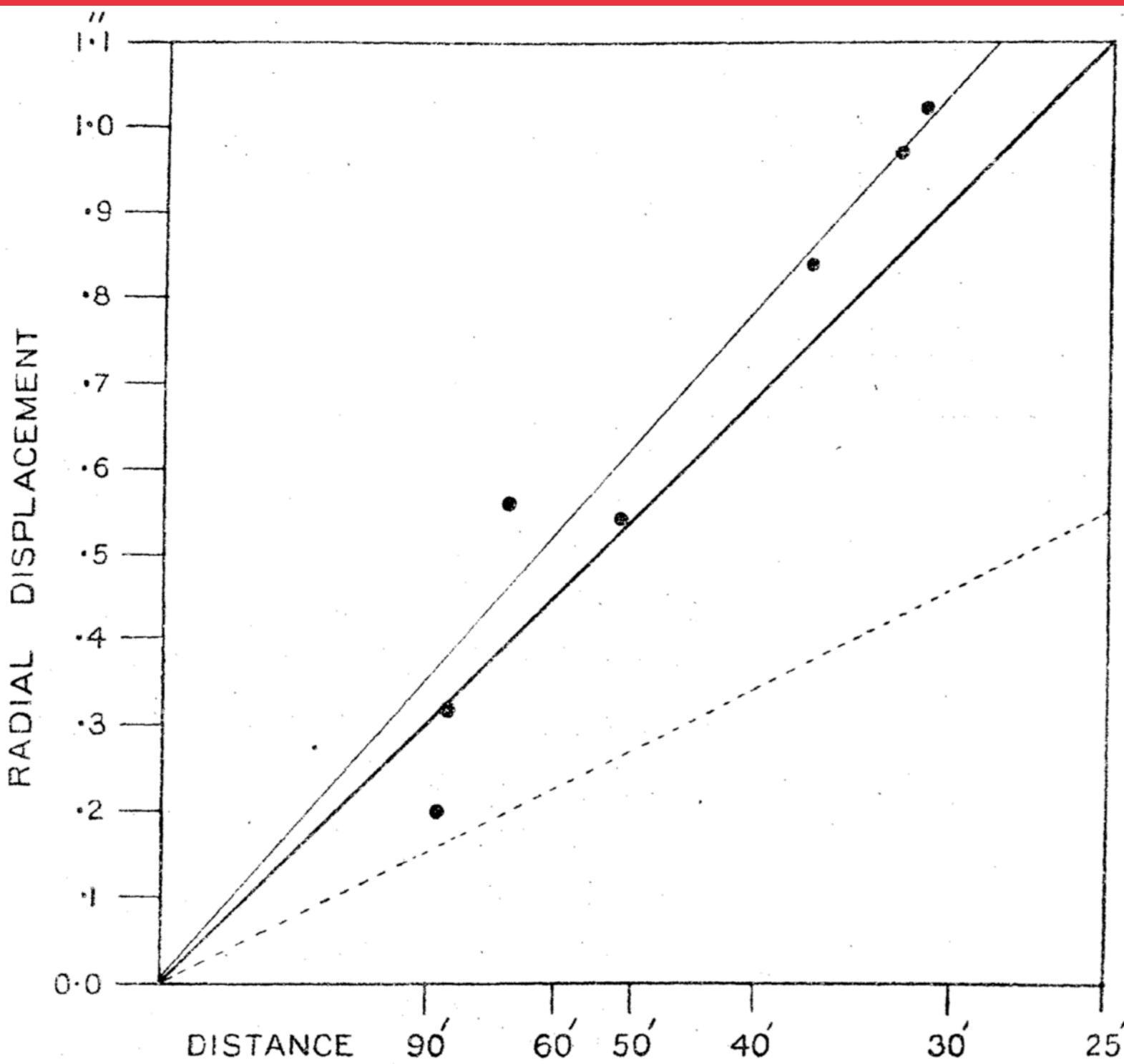


During a total eclipse, stars would appear to be in a different position than their actual locations, due to the bending of light from an intervening mass: the Sun. Image credit: E. Siegel / Beyond the Galaxy.

## RADIAL Displacement of Individual Stars.

| Star. | Calculation. | Observation. |
|-------|--------------|--------------|
|       | "            | "            |
| 11    | 0·32         | 0·20         |
| 10    | 0·33         | 0·32         |
| 6     | 0·40         | 0·56         |
| 5     | 0·53         | 0·54         |
| 4     | 0·75         | 0·84         |
| 2     | 0·85         | 0·97         |
| 3     | 0·88         | 1·02         |

F. W. Dyson, A. S. Eddington and C. Davidson,  
 "A Determination of the Deflection of Light by the Sun's Gravitational Field, from  
 Observations Made at the Total Eclipse of May 29, 1919,"  
 Philosophical Transactions of the Royal Society of London Series A (1920) 291.



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Philosophical Transactions of the Royal Society of London Series A (1920) 291.

# LIGHTS ALL ASKEW IN THE HEAVENS

Men of Science More or Less Agog Over Results of Eclipse Observations.

## EINSTEIN THEORY TRIUMPHS

Stars Not Where They Seemed or Were Calculated to be, but Nobody Need Worry.

## A BOOK FOR 12 WISE MEN

No More in All the World Could Comprehend It, Said Einstein When His Daring Publishers Accepted It.

Special Cable to THE NEW YORK TIMES.

LONDON, Nov. 9.—Efforts made to put in words intelligible to the non-scientific public the Einstein theory of light proved by the eclipse expedition so far have not been very successful. The new theory was discussed at a recent meeting of the Royal Society and Royal Astronomical Society. Sir Joseph Thomson, President of the Royal Society, declares it is not possible to put Einstein's theory into really intelligible words, yet at the same time Thomson adds:

"The results of the eclipse expedition demonstrating that the rays of light from the stars are bent or deflected from their normal course by other aerial bodies acting upon them and consequently the inference that light has weight form a most important contribution to the laws of gravity given us since Newton laid down his principles."

Thompson states that the difference between theories of Newton and those of Einstein are infinitesimal in a popular sense, and as they are purely mathematical and can only be expressed in strictly scientific terms it is useless to endeavor to detail them for the man in the street.

"What is easily understandable," he continued, "is that Einstein predicted the deflection of the starlight when it passed the sun, and the recent eclipse has provided a demonstration of the correctness of the prediction."

"His second theory as to the anomalous motion of the planet Mercury has also been verified, but his third prediction, which dealt with certain sun lines, is still indefinite."

Asked if recent discoveries meant a reversal of the laws of gravity as defined by Newton, Sir Joseph said they held good for ordinary purposes, but in highly mathematical problems the new conceptions of Einstein, whereby space became warped or curled under certain circumstances, would have to be taken into account.

Vastly different conceptions which are involved in this discovery and the necessity for taking Einstein's theory more into account were voiced by a member of the expedition, who pointed out that it meant, among other things, that two lines normally known as parallel do meet eventually, that a circle is not really circular, that three angles of a triangle do not necessarily make the sum total of two right angles.

"Enough has been said to show the importance of Einstein's theory, even if it cannot be expressed clearly in words," laughed this astronomer.

Dr. W. J. S. Lockyer, another astronomer, said:

"The discoveries, while very important, did not, however, affect anything on this earth. They do not personally concern ordinary human beings; only astronomers are affected. It has hitherto been understood that light traveled in a straight line. Now we find it travels in a curve. It therefore follows that any object, such as a star, is not necessarily in the direction in which it appears to be astronomically."

"This is very important, of course. For one thing, a star may be a considerable distance further away than we have hitherto counted it. This will not affect navigation, but it means corrections will have to be made."

One of the speakers at the Royal Society's meeting suggested that Euclid was knocked out. Schoolboys should not rejoice prematurely, for it is pointed out that Euclid laid down the axiom that parallel straight lines, if produced ever so far, would not meet. He said nothing about light lines.

Some cynics suggest that the Einstein theory is only a scientific version of the well-known phenomenon that a coin in a basin of water is not on the spot where it seems to be and ask what is new in the refraction of light.

Albert Einstein is a Swiss citizen, about 50 years of age. After occupying a position as Professor of Mathematical Physics at the Zurich Polytechnic School and afterward at Prague University, he was elected a member of Emperor William's Scientific Academy in Berlin at the outbreak of the war. Dr. Einstein protested against the German professors' manifesto approving of Germany's participation in the war, and at its conclusion he welcomed the revolution. He has been living in Berlin for about six years.

When he offered his last important work to the publishers he warned them there were not more than twelve persons in the whole world who would understand it, but the publishers took the risk.

The New York Times

Published: November 10, 1919  
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Thank you for your invitation and  
for your interest in astronomy

# BRIAN HILL, DEPARTMENT OF PHYSICS & ASTRONOMY



Photo by Henry Thatcher

