



# Howard Astronomical League Monthly Meeting

May 16<sup>th</sup>, 2024

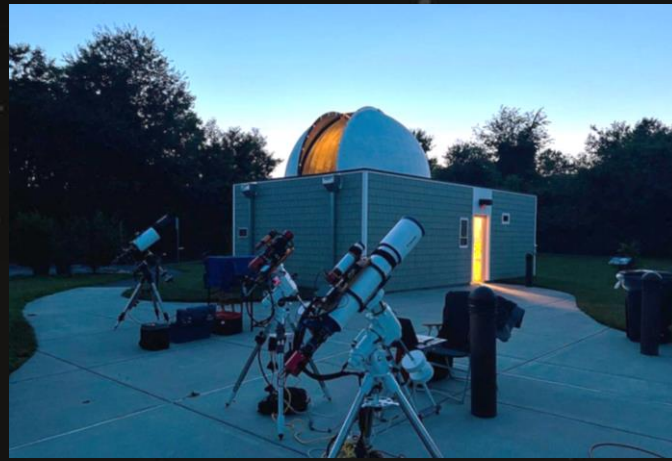
# Tonight's Agenda, May 16<sup>th</sup>, 2024

- ⇒ • Introductions
- Announcements
  - 2024 Schedule of Star Parties
  - Recent Outreach Events
  - New HAL SeeStar S50 Loaner Program
- Featured speaker – **Jim Johnson, Former HAL President**
- What's Out in the Sky This Month...
  - What's up In Space – **Wayne Bagget**
- Members' Astro-Images and Sketches
- Wrap-up & Discussion

# HAL Star Parties...

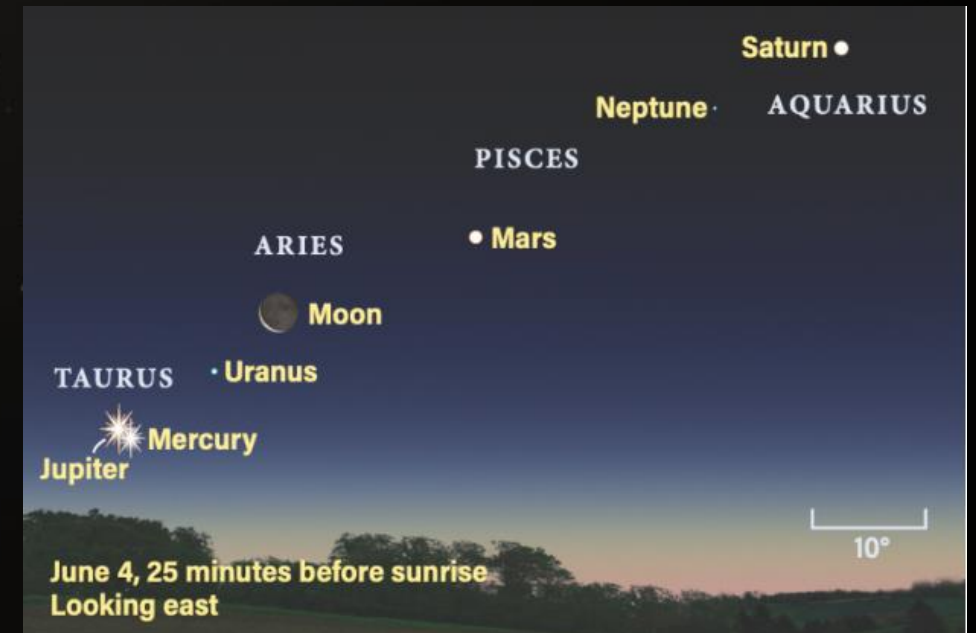
## HAL's 2024 Scheduled Star Parties

Month	Date	Invitees
March	09	Members
March	16	Public
April	06	Members
April	13	Public
May	04	Members
May	18	Public
June	08	Members
June	15	Public
July	06	Members
July	13	Public
August	03	Members
August	10	Public
September	07	Members
September	14	Public
October	05	Members
October	26	Public
November	02	Members
November	09	Public



## Upcoming Events

- Moon
  - Full May 23<sup>rd</sup> (Flower Moon)
  - New June 6th
- 6 Planet Alignment, early morning on June 4th



Regional Star Party info...

<https://skyandtelescope.org/astronomy-resources/annual-stargazing-events/>

# Earth Day Celebration at Clarksville Commons Thank you, Phil Whitebloom for Representing HAL



# Bryant Woods Elementary School Field Trip to HALO on May 3<sup>rd</sup>. Thank you, Wayne Baggett for Volunteering





## New HAL Resource Available to Club Members

### SeeStar S50 Loaner Program Guidelines:

- Club Members may check out the HAL SeeStar S50 for their personal use
  - We have an online sign-up sheet for making the check-out request (thank you, Jim Tomney)
  - Checkout period will be approx. one month (duration between HAL meetings)
  - Each month at the HAL public meeting conducted at the Robinson Nature Center, the SeeStar will be given to the person in attendance who is highest on the list
  - Once you check it out, it is expected that you will return it to subsequent meetings (work with the HAL observatory director if there is a problem)
- Upon checkout you acknowledge that...
  - You are responsible for the instrument while it is checked out
  - If the instrument is damaged, you will reimburse HAL for the cost of repair/replacement (up to \$500).
  - You'll be provided links to training and you can ask the HAL observatory director or HAL Google Group for advice any time
  - You will need to supply your own mobile device (smart phone or tablet) to operate the instrument



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## Jim Johnson

Jim is a HAL past president who remains actively involved in HAL activities. Under his leadership as president, the Watson telescope was replaced with the Illig telescope to better support HAL's outreach effort. He has served as the HAL election committee chair for the last six years. Jim is an avid deep sky and planetary astrophotographer who enjoys camping at dark sky sites.



# The Great North American Total Solar Eclipse of 2024

The Collective Experience  
of the  
Howard Astronomical League

Jim Johnson  
HAL General Meeting  
May 16, 2024

Background image derived from  
2017 HDR Corona by Ken Everhart

# Contents

Introduction

Context

People

Planning

Locations

Weather

Observations

Wrap Up

## Purpose, Scope and Sources

Purpose: To summarize and present HAL's collective solar eclipse experience in a one-hour presentation.

### Sources:

howardastro@googlegroups.com emails,  
Information sent directly to me,  
HAL Facebook page, and  
Word of mouth

Contributions from over 50 members and guests

A variety of narratives  
Hundreds of still images  
Nearly an hour of video



# Caveats



- Limited to the input that received from members and guests  
...but more input received in 2024 than 2017
- Had to be very selective to scale to a 1-hour presentation
  - Dozens of stories are summarized
  - Included many photos as possible out of hundreds to choose from
  - No videos included

# Presentation Format

Open discussion as we go – what can you add to the story?

A lot of material to cover and many will have something to add

Please keep comments brief so that everyone gets an opportunity to participate!!!

# Context

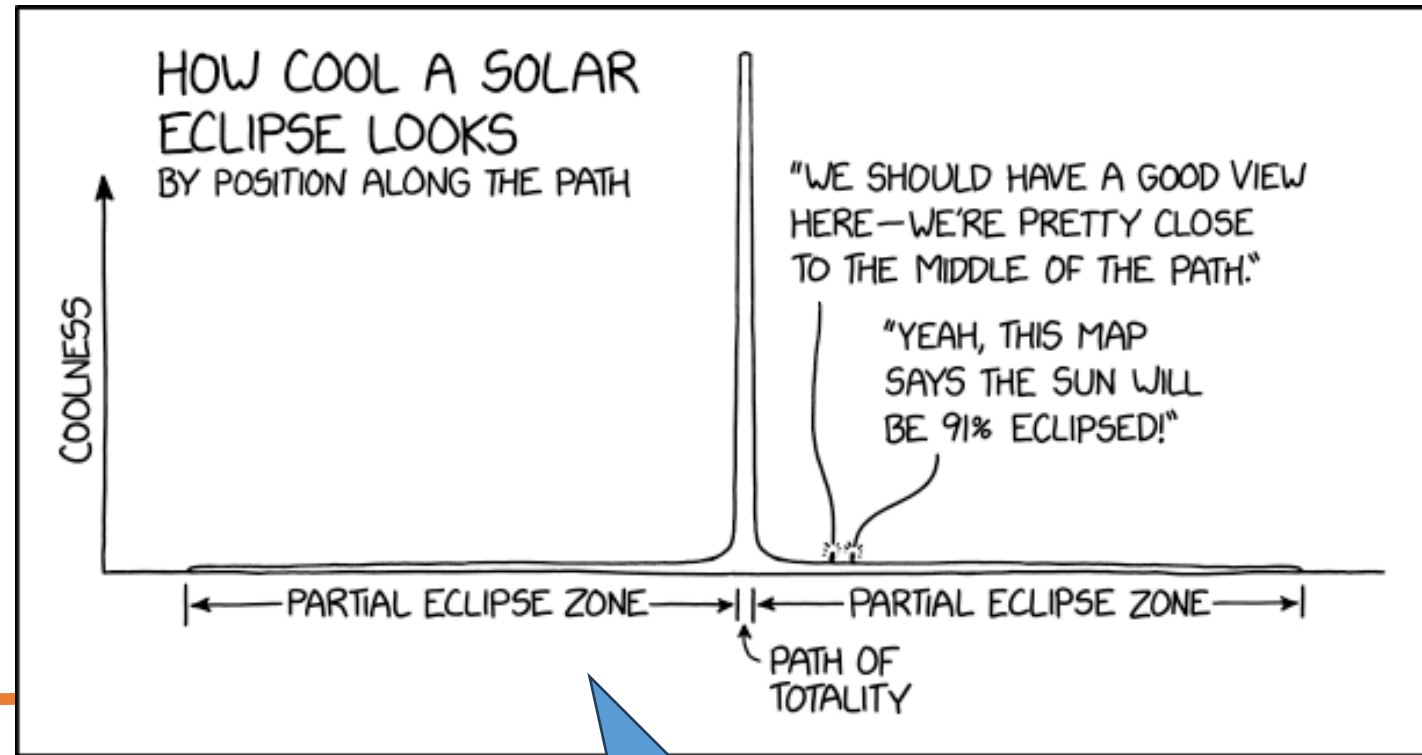
A note before we get started...

Take notice of the sky in the photos as we step through the presentation.

# Bottom Line Up Front

From xkcd.com

Contributed by Wayne  
Baggett



A partial eclipse is like a cool sunset. A total eclipse is like someone broke the sky.



# Eclipse Overview

- Second total eclipse on the US mainland since 1979
- Path of Totality
  - US, Canada and Mexico, hence the Great North American Total Solar Eclipse of 2024
  - 12 million people live in the path of totality
  - 2 – 7 million expected to travel to the path
- Heavy traffic expectations reported in the press
- Some jurisdictions made emergency declarations

# Typical News Headlines

*The Procrastinator's guide to viewing the solar eclipse.* USA Today (August 20, 2017).

*Consumer alert: Will you be able to use your cell phone in the midst of eclipse.* News/ONBC (March 15, 2024)

*Solar eclipse emergency: Texas County braces for fuel shortages, massive crowds.* AccuWeather, (March 8, 2024)

*Comets, planets, stars might also be visible during 2024 total solar eclipse.* WCIA.com (February 29, 2024)

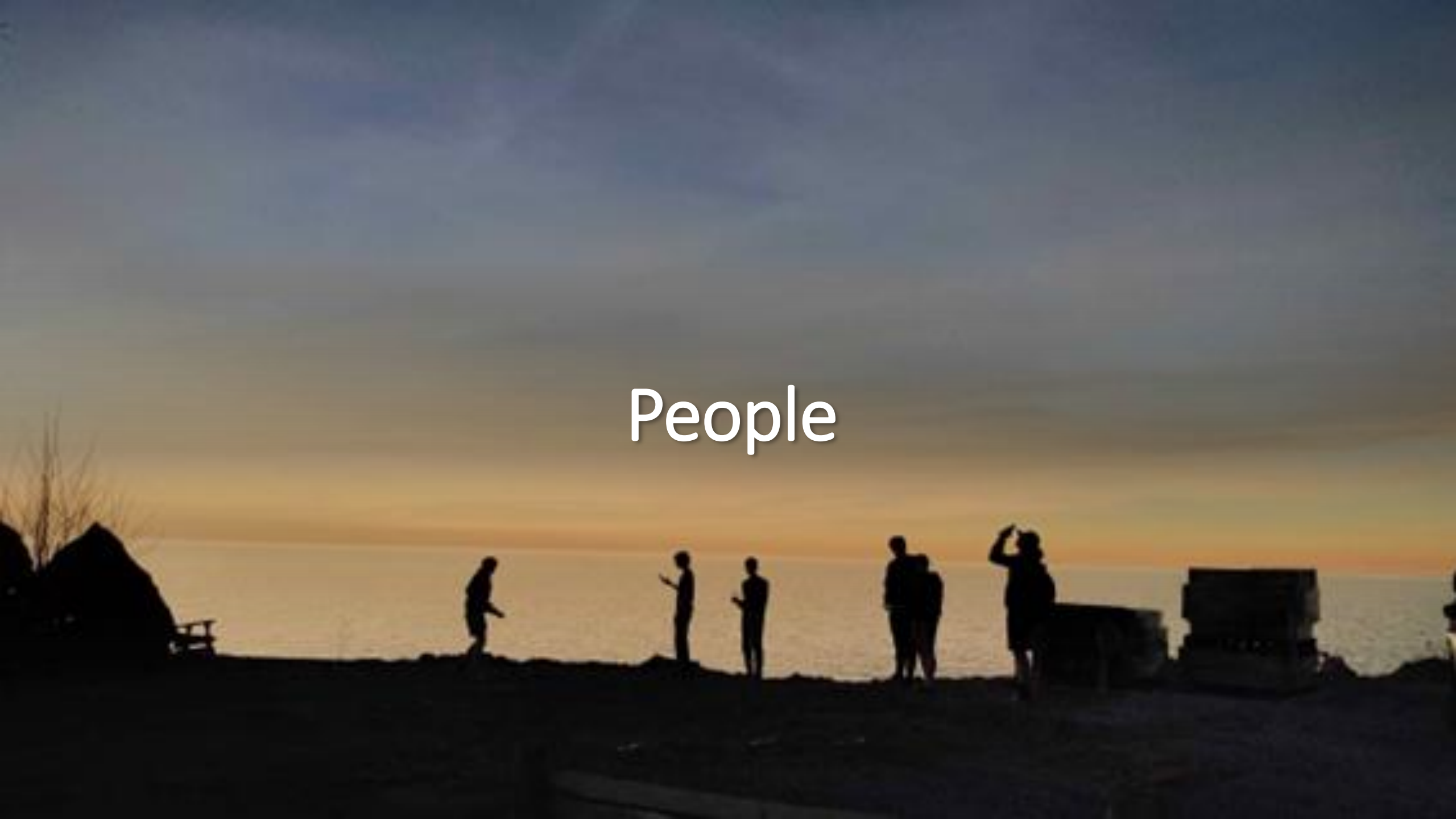
*Southwest Airlines offering a unique experience to see the 2024 total solar eclipse.* Hummadi, (October 14, 2023)

*Solar eclipse weather forecasts. AccuWeather provides 1<sup>st</sup> cloud outlook.* AccuWeather (March 7, 2024)

*Tahoe snow totals have already eclipsed 7 feet.* San Francisco Chronicle (March 3, 2024)

*Stock up on food, water, and fuel ahead of the eclipse, emergency officials warn.* IFL Science, (March 15, 2024)

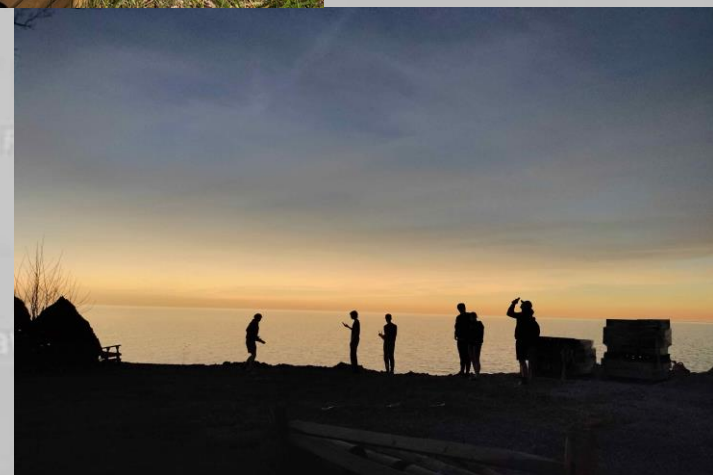
# People



# We made a lot of people connections

- Many favorable descriptions of interactions with other viewers
- Met people from many other countries and states
- Two people met Bray Falls, discoverer of new nebulae and an astrophotography social media personality
- Some viewed the eclipse among large crowds (400 – 500) at organized events. One report of 30,000+
- In a few cases, groups or families travelling together had little to no interaction with others

# Eclipse Observers



# Eye safety

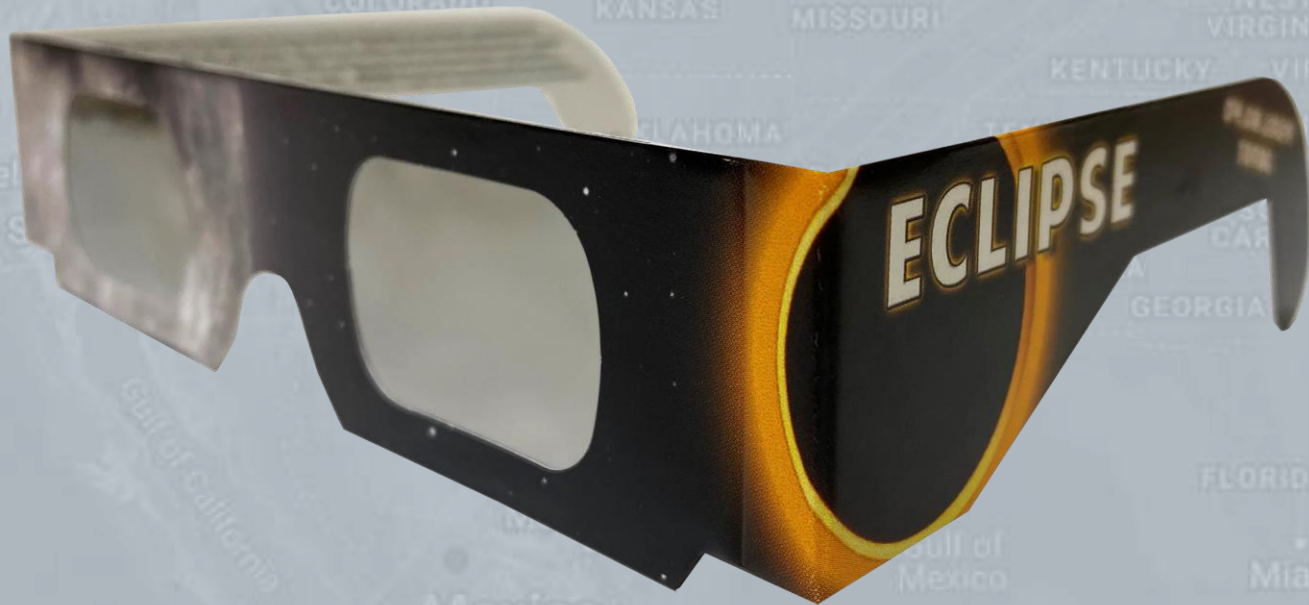
- Viewing the partial phases of the eclipse is inherently dangerous, and must be done correctly to prevent injury
- Lots of emphasis in the media, HAL presentations, and discussions
- Good news – no eye injuries reported



# Eclipse Shades



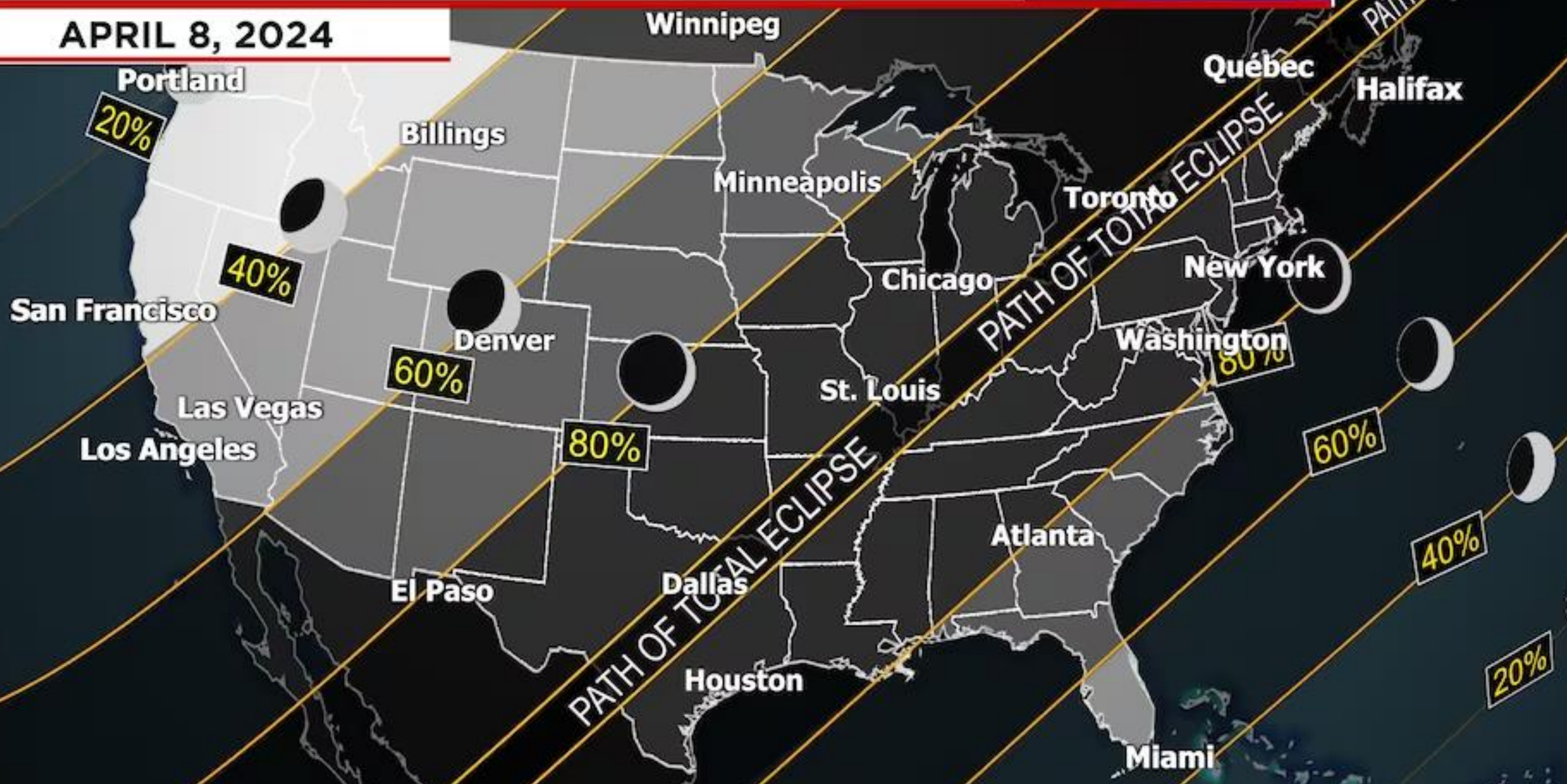
- Great source of eclipse anxiety in 2017
- Seemingly not an issue for 2024
- Efforts to collect shades for reuse emerged after the eclipse



# 2024 Solar Eclipse Planning



APRIL 8, 2024



# HAL members and guests invested an astounding amount of time into eclipse planning!

## Picking viewing sites based on

- Travel and weather contingencies
- Climate considerations
- Locations of friends and family
- Concurrent with other travel

## Anticipating loss of connectivity

- Carried an atlas with the path of totality annotated
- Downloaded Google Maps data for travel areas

## Photography

- Equipment
- Techniques
- Objectives

## Other

- Detailed packing lists
- Detailed checklists
- Packed camping gear

More member/guest input in 2024 than in 2017.  
Probably more eclipse travelers too.

## A variety of travel plan configurations

- Elected to view the partial eclipse from home or somewhere else
- Traveled directly to and from the viewing location on eclipse day
- Traveled to a jumping off point, then to the viewing location on eclipse day. Reverse for homeward trip
- Some planned to move along the eclipse path to better weather if needed
- Some planned to remain at the chosen eclipse viewing location no matter the weather

# Eclipse Viewing Methods and Aids

- Eclipse glasses or unaided eye
- An assortment of telescopes
  - Eyepiece views
  - Laptop live camera views
  - Several Seestar S50 devices
- Binoculars
- Pinhole cameras: some successful, some not
- C14 finder scope
- A few colanders
- Eclipse timer smart phone app (\$2 to \$3)
- Countdown timer on watch



Collander  
Gerry Doyle, Remmel Dam Park AR



Collander  
Richard Orr  
Columbia MD



Sun Funnel  
Ron Farris  
Richmond IN



Binoculars  
Phil Whitebloom  
Ayers Cliff QC



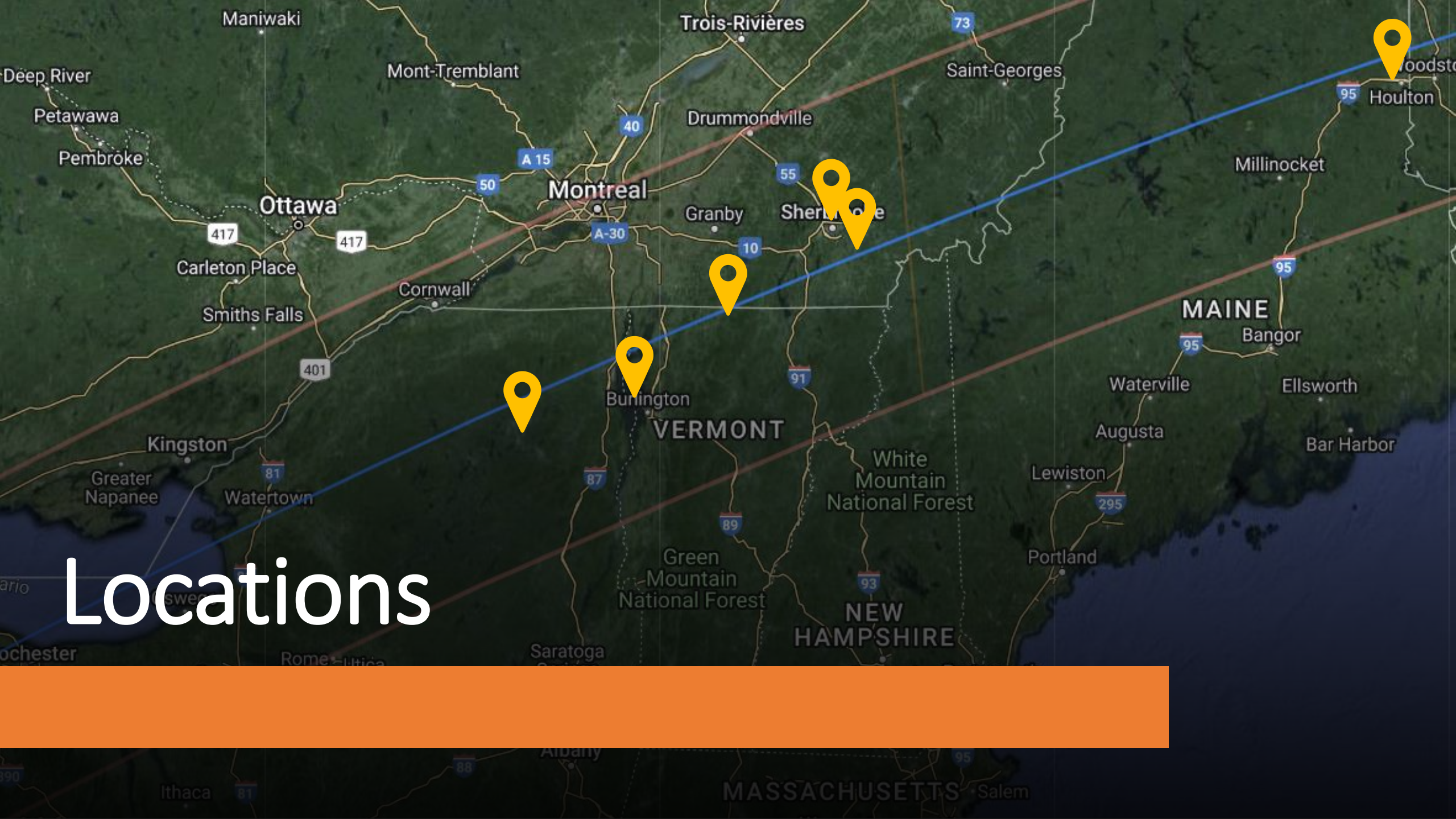
DSLR  
Scott Dalrymple



Telescope & Camera, JP Willingham, Marion IN

# In the final days prior to the eclipse

- Traveled to viewing destinations or jump off points
- Set up camp
- Set up equipment
- Practiced imaging
- Perseverated over the weather charts and forecasts
- Changed viewing locations due to weather considerations
  - Dallas-Fort Worth to Benton AR
  - Stonewall TX to Houlton ME
  - Buffalo NY to Cleveland OH
  - Texas to Plattsburg NY
  - Texas to Orleans VT
  - Plattsburg NY to Richford VT
  - Burlington VT to Newport VT
  - Metropolis IN to Hopkinsville KY



# Locations

# Viewing settings

- Some reported setting out to reach the eclipse centerline without having selected a specific observing venue
- Others had very specific destinations in mind.
- In either case, there were a variety of viewing settings
  - Hotel, mall, shopping center and other parking lots
  - Public/community parks, to include a beach park
  - Public school parking lots
    - Open in some states,
    - Schools closed in some locations. Some parking lot entrances blocked
  - Organized events with parking, restrooms. Some included entertainment
  - Campgrounds
  - Patio/hammock
  - A gas Station
  - Homes/houses: With relatives, lake cottage, small farmhouse
  - Civic center

# A variety of eclipse viewing settings...

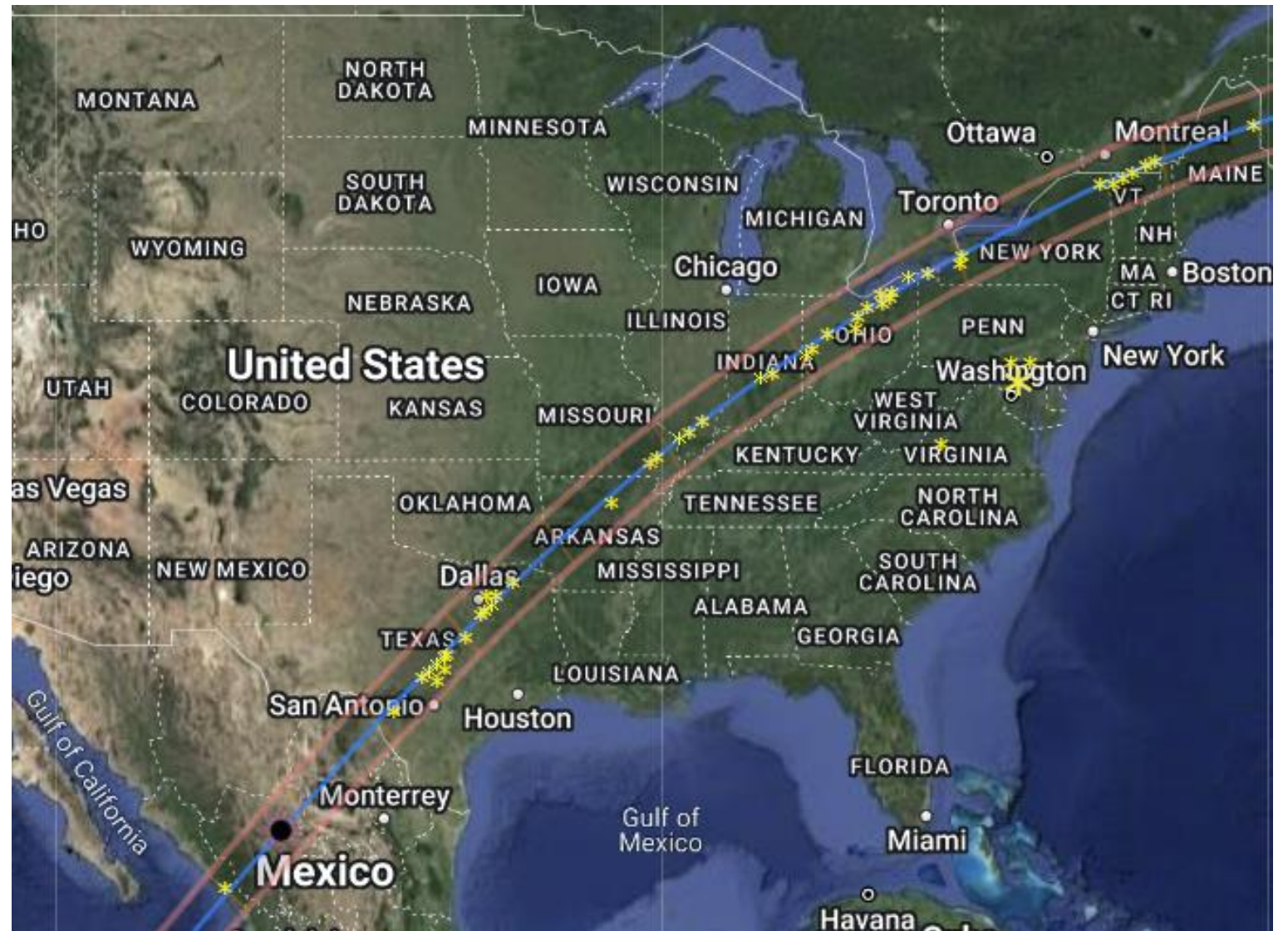


# We were very spread out

- Dale Ghent was the first to witness totality as the shadow made landfall near Mazatlan, Mexico
- Other eclipse travelers were spread across in every US state on the totality path except for New Hampshire
  - But there was some “clumpiness” in TX, OH, and VT
- Two groups of travelers observed from the Quebec, Canada section of the path
- George Uhl was the last to witness totality from Houlton ME as the path crossed back into the US before returning to Canada

Where we  
were when it  
happened

Is HAL collectively as  
good as Fred Espenak at  
plotting eclipse paths?



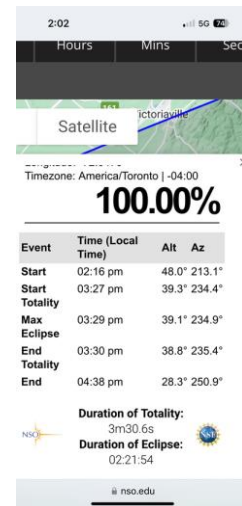
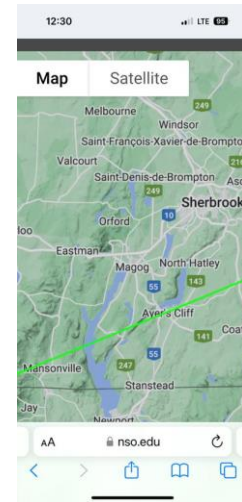
# Traffic and mobility...

- Some traveled to viewing sites a couple of days early and/or left a couple of days later to avoid traffic
  - One Sunday traveler reported slightly heavier traffic than normal on NJ Turnpike
  - A BP station in Canton OH ran out of gas
- Compared to 2017, widespread post-eclipse jams were not visible on a traffic map immediately following the eclipse
- Most post-eclipse travelers reported no traffic delays if traffic was mentioned at all, but some did:
  - Epic jam in New York on I-87
  - 3-hour drive from Boston to Orleans VT turned into 10-hour return trip
  - I-95 southbound traffic from Houlton ME to Bangor ME was brutal
  - 3.5 hours from W. Mass to observing site, 9.5 hours back
  - Southbound traffic on Tuesday from central PA into the DC and Baltimore area caused 45-minute to one-hour delays

# The luckiest eclipse travelers on the planet!

## JoAnn & Stanley Shapiro and Phil Whitebloom

- Last minute decision to relocate from Manchester, VT to Jackman, ME for better sky conditions
- Following Google Maps directions, unexpectedly arrived at a Canadian customs station and...
  - Everybody on board had a passport!!!
- While in Canada, a camper wheel bearing burned out and they were...
  - In reach of a shop that could repair the bearing!!!
  - Right on the totality center line with a great place from which to view the eclipse!!!



Weather



# Weather:

- Probably the greatest source of pre-eclipse anxiety
- Long term planning for weather
  - Climatology influenced site selections
  - Some travel plans included last-minute weather considerations
  - Other travel plans did not include weather backup considerations
- The week, days and hours prior
  - Much hand wringing and divining over weather forecasts
  - Much discussion in the howardastro email group

# Weather

## Last few day's forecasts

Vastly differing forecasts by various models that didn't converge on eclipse day with most regions looking to be pretty dreadful

A few made large changes from TX to OH, PA, or VT

Some of discussion about what each of the various models meant

## On eclipse morning

Some elected to relocate to more favorable skies – just couple of hours drive

Some others made small changes within a region OH to OH, or VT to ME, etc

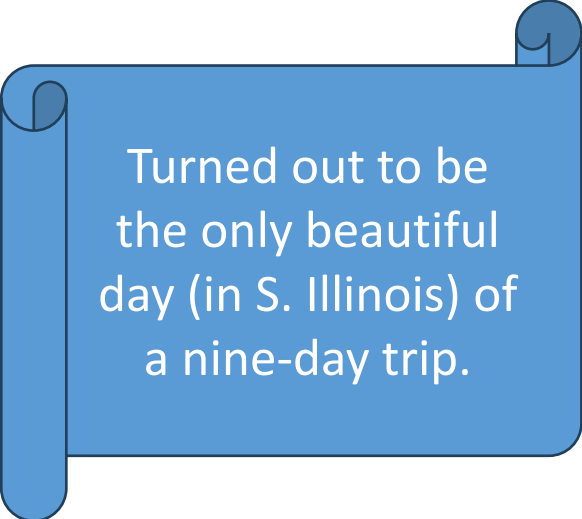
Some stayed in place at planned observing location

## Totality

Close, but no one reported being completely clouded out. Everyone got at least a glimpse

Some places with sketchy weather forecasts turned out ok

High, thin clouds in many areas did not detract from the eclipse experience



Turned out to be the only beautiful day (in S. Illinois) of a nine-day trip.

EXCLUSIVE ACCUWEATHER FORECAST

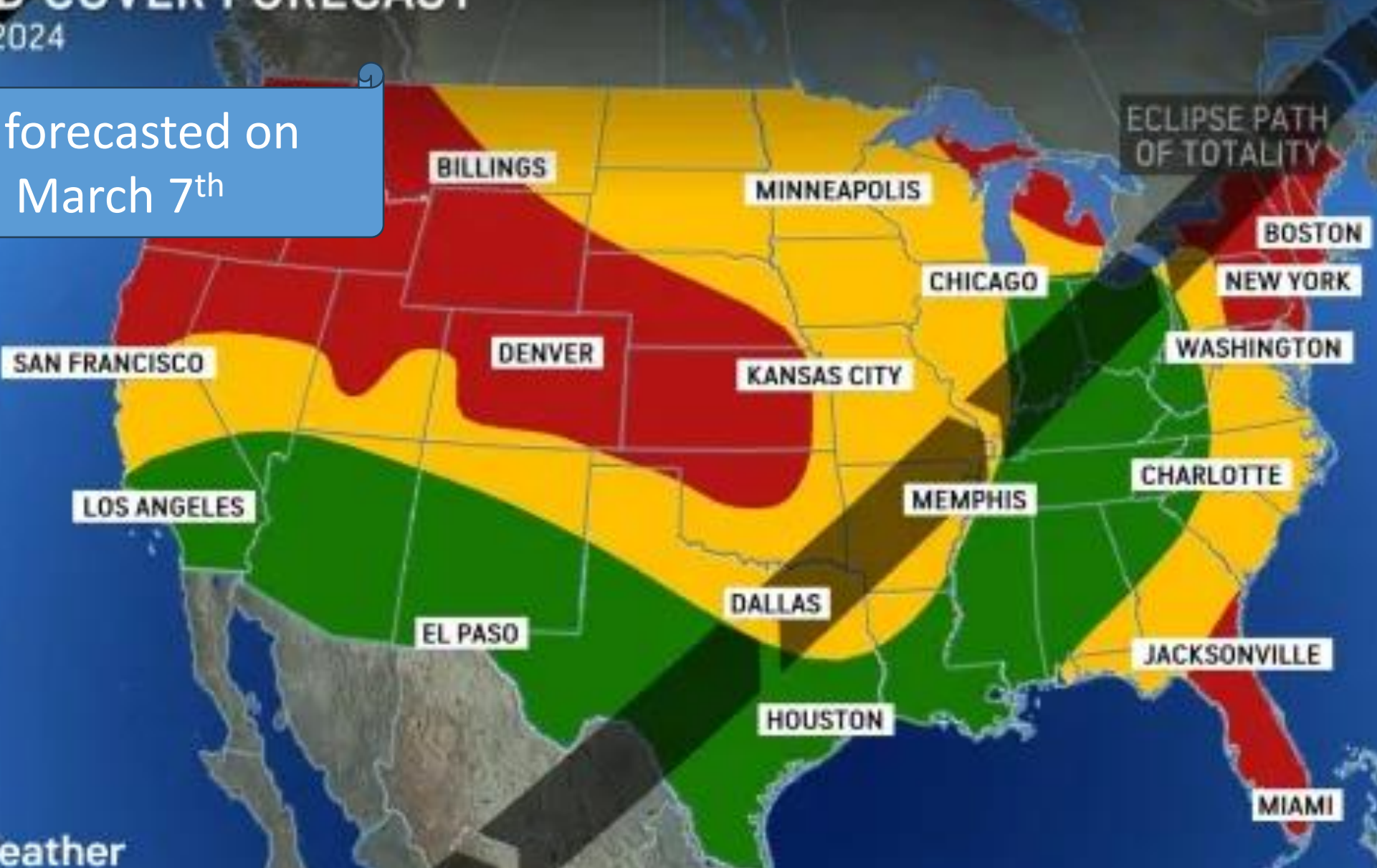
# CLOUD COVER FORECAST

APRIL 8, 2024

RISK OF CLOUD COVER



As forecasted on  
March 7<sup>th</sup>



EXCLUSIVE ACCUWEATHER FORECAST

# CLOUD COVER FORECAST

APRIL 8, 2024

RISK OF CLOUD COVER



As forecasted on  
April 8<sup>th</sup>

Does it seem that the  
Weather Service is as  
good as HAL and Fred  
Espenak in plotting the  
totality path?

SAN FRANCISCO

BILLINGS

MINNEAPOLIS

CHICAGO

BOSTON

NEW YORK

DENVER

KANSAS CITY

WASHINGTON

CHARLOTTE

MEMPHIS

EL PASO

DALLAS

JACKSONVILLE

HOUSTON

MIAMI

ECLIPSE PATH  
OF TOTALITY




# Eclipse Observations and Reactions

# WHAT BECOMES VISIBLE DURING TOTAL SOLAR ECLIPSE

**JUPITER**



**12P/ PONS-  
BROOKS COMET**



**VENUS**





# Observed before totality

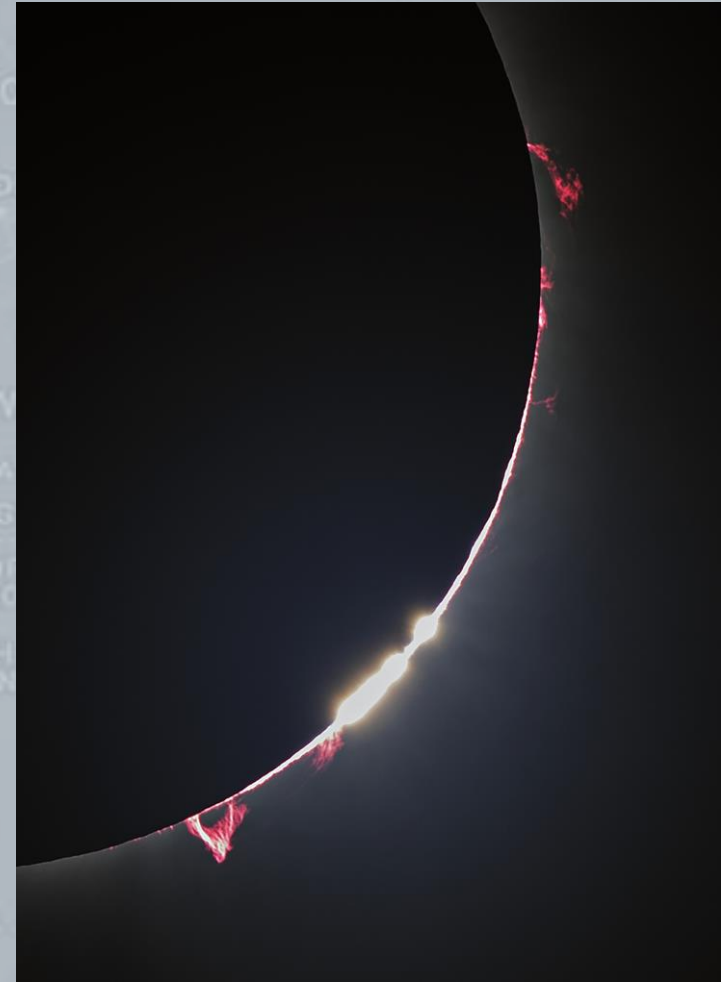
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- Moon's shadow approaching, especially in areas with high, thin clouds
- Crescent projections on the ground (e.g., colanders)
- Shadows sharpening
- Light turning silvery or silvery green
- Venus (yes, before totality)
- Cooling effect

# Observed during totality...

Collectively, we observed all phenomena that was expected to be seen

- Bailey's Beads/Diamond Ring
- Corona, prominences
- Cooling effect (greater than 2017)
- Venus and Jupiter
- Crowd reactions, animal behaviors
- 360 degree sunset effect
- Faint rainbow-like ring in the clouds
- Shadow bands on the ground
- Darkness, but not as dark as a moonlit night
- Streetlights came on

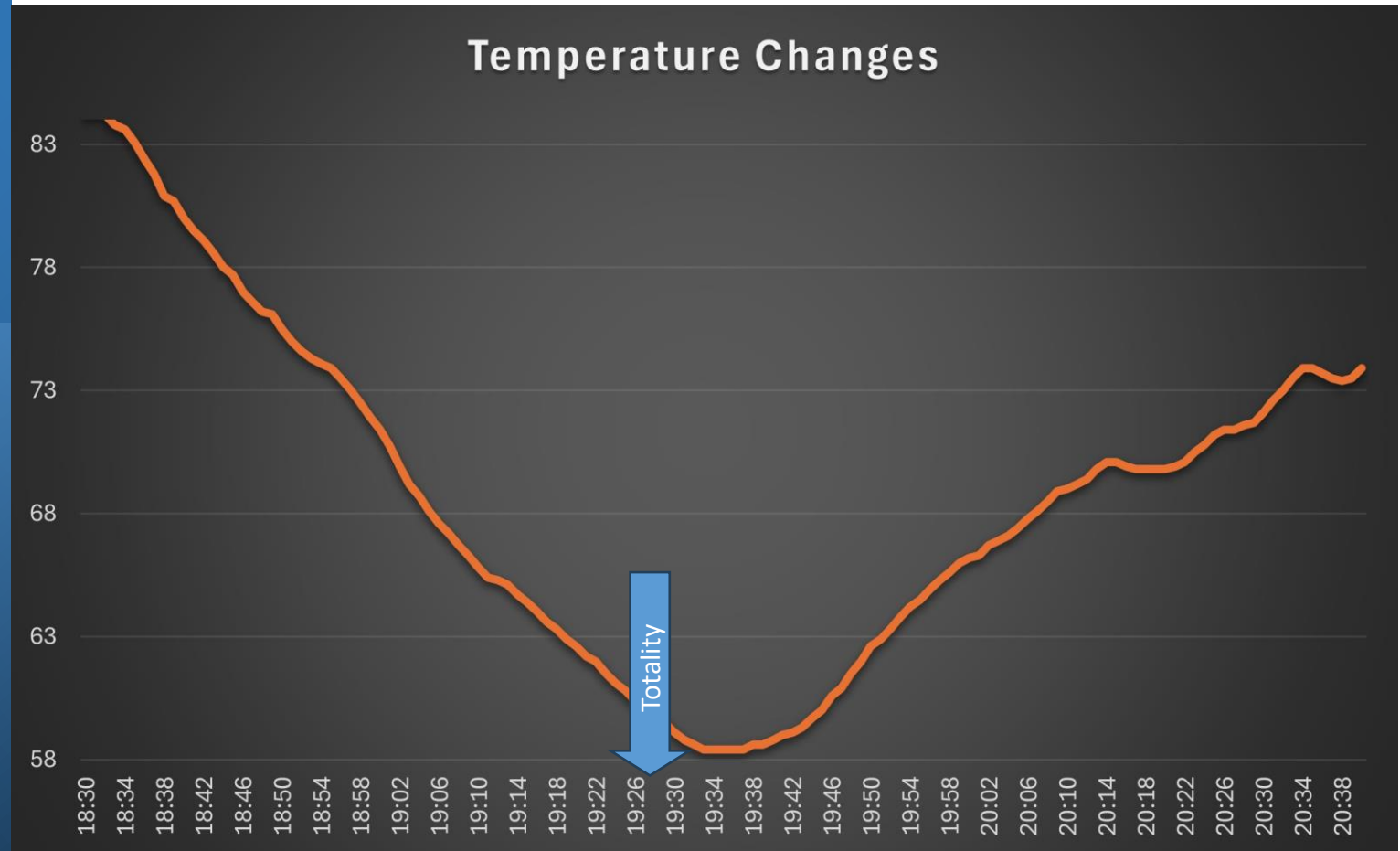


James P. Willingham, Marion, IL

The light was not dusk nor dawn, but something else.

The temperature drop was significant

Charted by Jim Tomney,  
Plattsburg, NY



Some reported more dramatic temperature drop than in 2017. One person surmised that April vs. August accounts for the difference between the two eclipses.

# What we didn't observe...

Some reported looking for but not seeing certain things:

Planets: Mercury (only 2% illuminated), Saturn, Mars

Stars

Comet 12P/Pons-Brooks

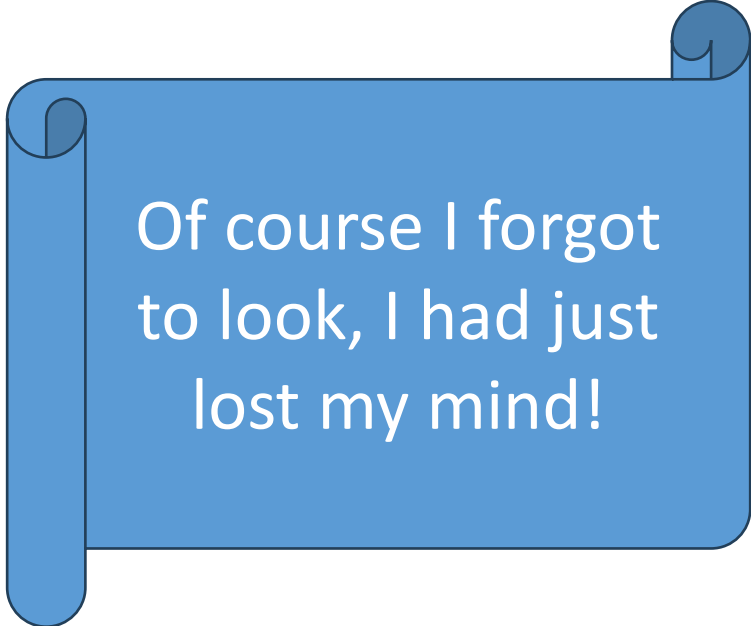
Shadow bands

Moon's shadow approach or retreat

Forgot to look for it:

Prominences

Shadow Bands



Of course I forgot  
to look, I had just  
lost my mind!

# Reactions

## Humans

Gasps - self and others

Cheers

Applause

Awe. Amazement. Elation.

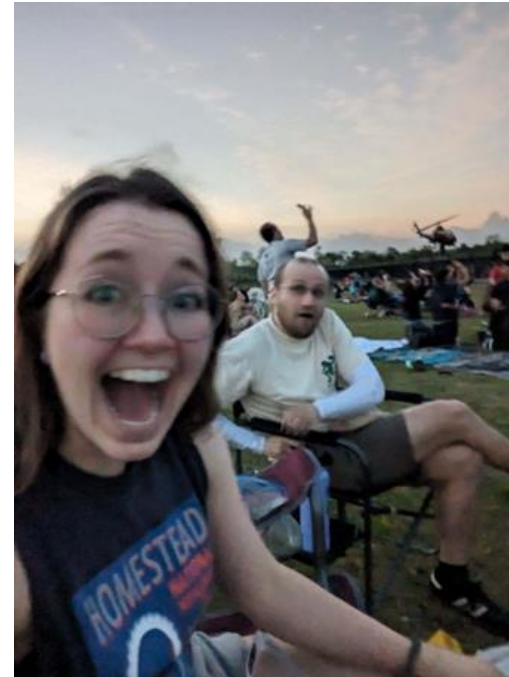
## Animals

Birds: Went wild with calls, began chirping or became quiet

Rooster crowing

Crickets chirping

An anxious dog



Ernie Wright

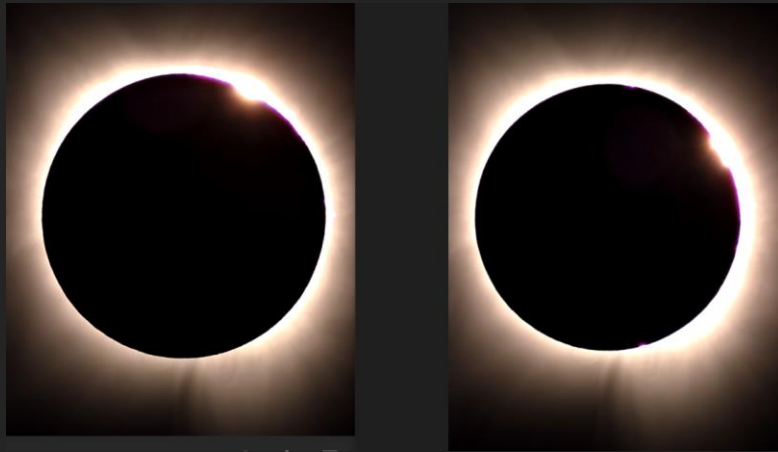
Paris TX

It was also a lifelong ambition as much of what I do today is bucket list.

# Feeble attempts to reduce the eclipse experience to words...

- Breathtaking
- Absolutely stunning
- Breathtakingly stunning
- Words fail to convey the beauty and magical nature
- No images I have seen match the actual view of totality
- No picture comes within a mile of the actual view
- A camera cannot capture what the eye perceives

"A partial eclipse is like a cool sunset. A total eclipse is like someone broke the sky." – From XKCD.com, provided by Wayne Baggett



Steve Bilanow, Bluff Dale TX

## An observation from the edge to the path of totality

Most eclipse viewers near the totality centerline experienced the last bit of the photosphere disappearing on one side of the disk, and then the first bit re-emerging on the opposite side of the solar/lunar disk.

From a point toward the outer edge of the path of totality, the point at which the last and first bits disappeared and reappeared were much closer to one another.

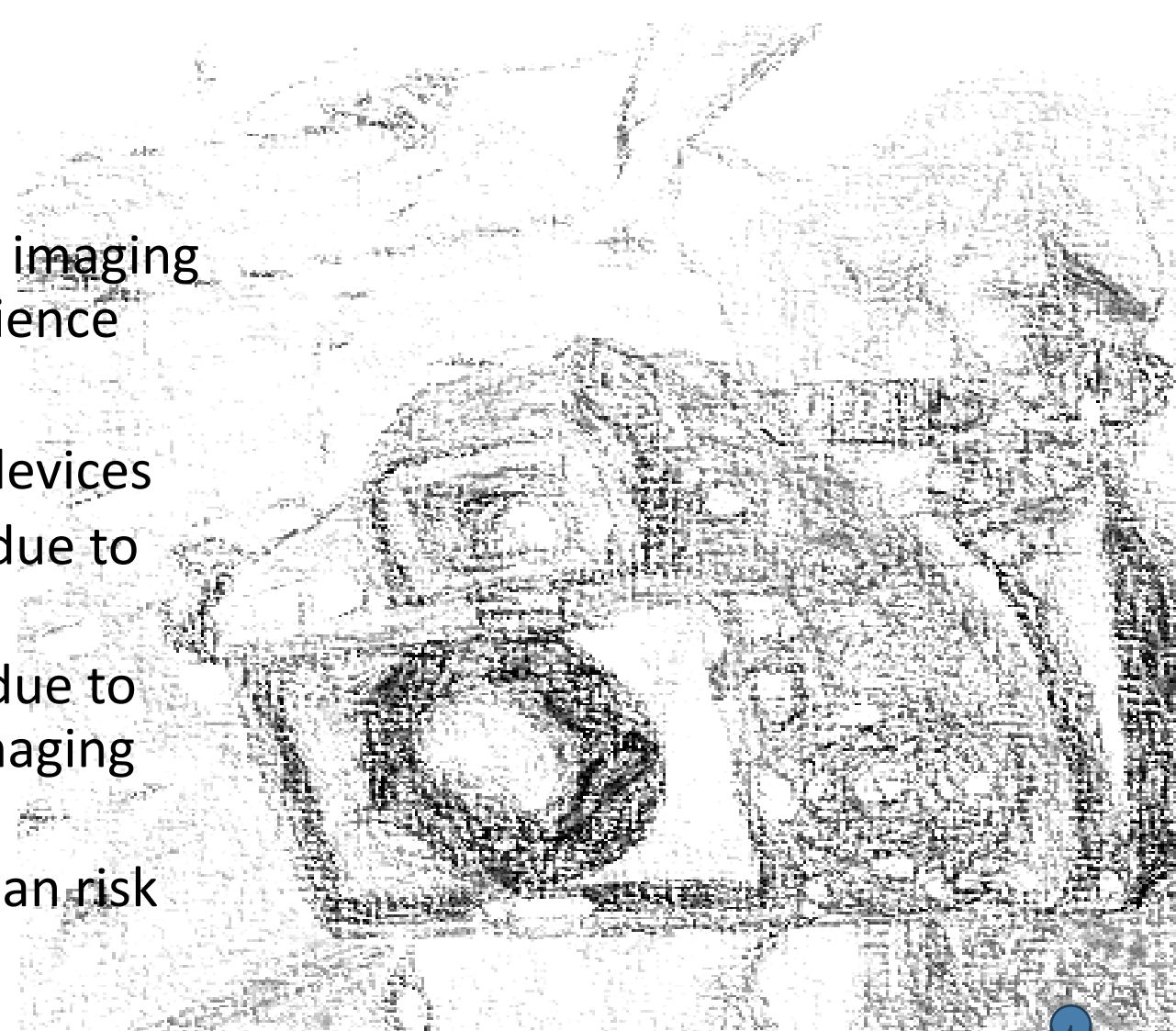
# Observations and actions after totality

- Moon's shadow retreating, especially in areas with thin, high clouds
- A few reported observing until partial phase was over (C4)
- Saw the waxing crescent Moon during drive home – 28.75 hours old
- Saddened by view of the Key Bridge disaster site on the way home
- Sipped celebratory wheated bourbon

# Eclipse Imaging

- Some gave imaging a try with caveat that imaging would not compromise the eclipse experience
- Some with multiple scopes/cameras
- New development - several Seestar S50 devices
- No instances of missing views of totality due to imaging issues
- One case where no image was captured due to commitment to not get wrapped up in imaging issues
- Some elected to forego imaging rather than risk missing any of the eclipse

As expected during a pressure moment I dropped a few balls, but I was able to be more “in the moment” this time compared to 2017 where I was too focused on attending the photography equipment





Members' and Guests'  
Eclipse Photos



Leona Illig  
Gambrills MD

Lee Amoss  
Mount Airy MD





Brad Sheard  
Ellicott City MD



David Stein  
Seabrook-on-the-Lake OH



Richard Orr  
Columbia MD



Doug Biernacki and Jim Johnson  
Wildcat Woods Campgrounds OH



Rich Friedrich  
Missouri

The Sun  
HESTIA *by* VAONIS  
Monday, Apr 8



Thomas Cronin  
Oella MD



John Nagy  
Ellicott City MD



Ron Farris  
Richmond IN



Jim Tomney  
Plattsburg NY

*Jim Tomney*



James P. Willingham



George Uhl  
Houlton ME



Gerry Doyle  
Remmel Dam  
Park AR



Kendall Rust  
Jessieville AR  
(Provided by James  
Willinghan)



David Glasser  
Dallas TX



Joe Novotka

Gene Handler  
Greers Ferry AR





Ian Slepian  
Buffalo NY



Phil Whitebloom  
Ayers Cliff QC



Atul Agrawal, National  
Museum of the US Air Force



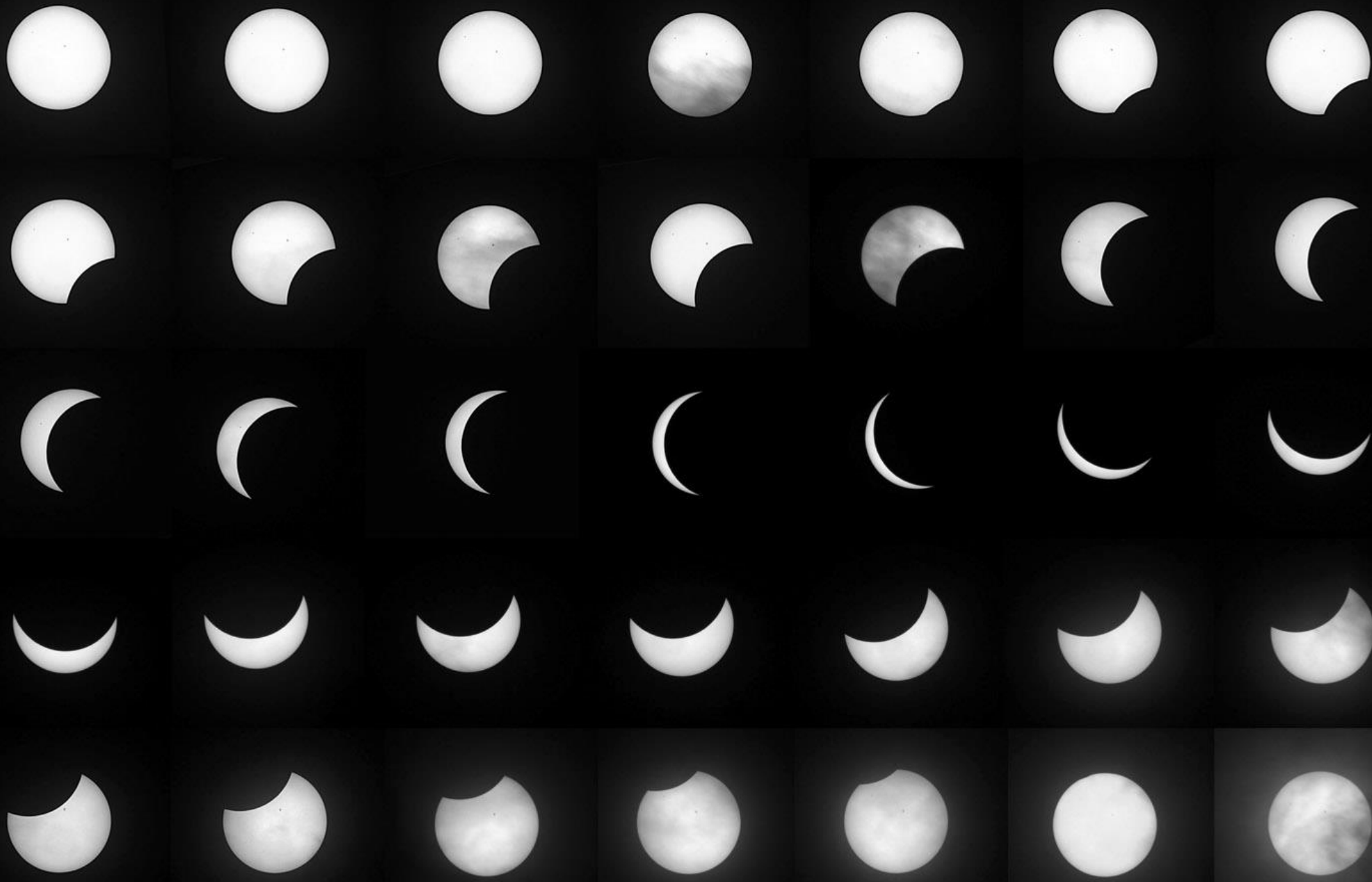
Leonardo Sanabria  
Elkridge MD



Deborah King  
Buffalo NY



Ed Killinger  
Hunt Valley MD



Stephen Gauss  
Mount Airy MD

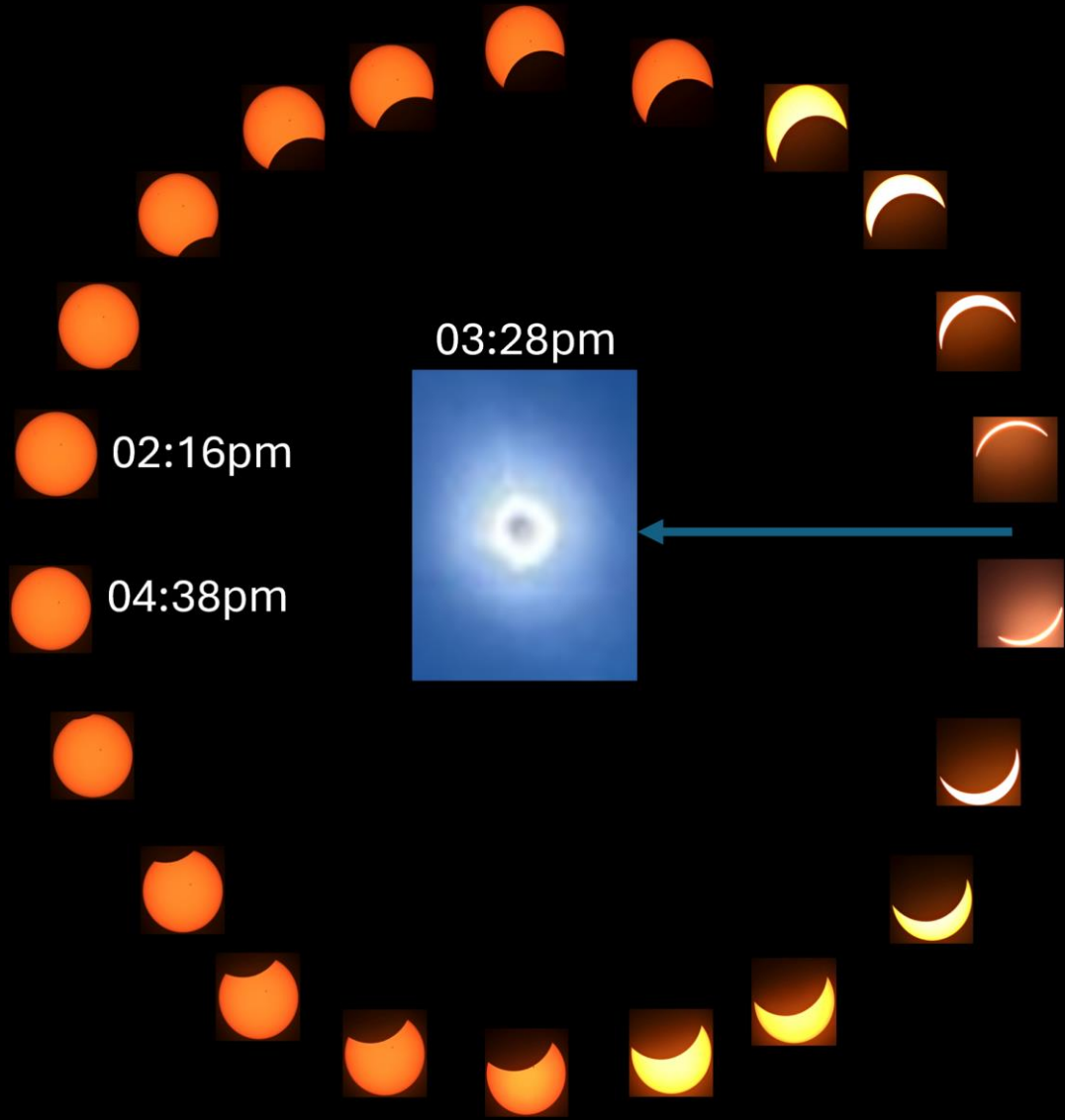
8 April 2024 Solar Eclipse from Mount Airy, MD Images taken every 5 minutes from 1340 to 1635



Devin Gingrich

I had hoped to capture the background during totality, but was too awestruck and forgot. It was all I could do to remember to mash the OM-1's remote trigger!

Total Eclipse  
Magog, Quebec  
April 8, 2024



Dennis Conti  
Magog QC



Richard Ren  
Richford VT



Ken Everhart  
Orleans VT



David Illig  
Gambrills MD

# Online Eclipse Postings

Please view at your leisure...

[HAL Facebook](#)

[Salman Sheikh](#)

[James Willingham](#)

[Richard Ren](#)

[James Stuby](#)

[David Illig](#)

[Richard Orr](#)

[Jim Tomney](#)

[Lanthen Mihalic](#)



# Summary

# National Perspective: Post Eclipse Headlines

*Eclipse day was sunny in Indiana. Where were the crowds?* The Herald Times (April 11, 2024)

*How to tell if you have eye damage after viewing the eclipse.* KOAT Action News (April 10, 2024)

*Vermont officials estimate 160K people drove to the state for Monday's eclipse.* VT Digger (April 9, 2024)

*For these eclipse chasers a 3-hour trip became an 11-hour marathon.* Boston.com (April 11, 2024)

*Astronauts get eerie view of Moon's shadow as it trudges across Earth during solar eclipse.* FoxWeather (April 9, 2024)

*What were those red blobs coming out of the sun during the eclipse?* NBC DFW (April 10, 2024)

*What to do with your solar eclipse glasses.* AccuWeather (April 10, 2024)

# Lessons Learned

- Lodging
  - Early reservations might pay off
  - With an eye toward weather and cancellation policies – reserve multiple sites?
- Weather
  - Consider climate in site selection but be aware of the difference between weather and climate
  - Be flexible on eclipse day
- Traffic
  - Consider staying in place an extra day if lodging at your viewing site, or if you can camp for the night
- Eclipse Shades and Eye Safety
  - Be an-eye safety advocate
  - Recommend projection methods
  - Ask people how they plan to observe, and call out unsafe practices that might emerge

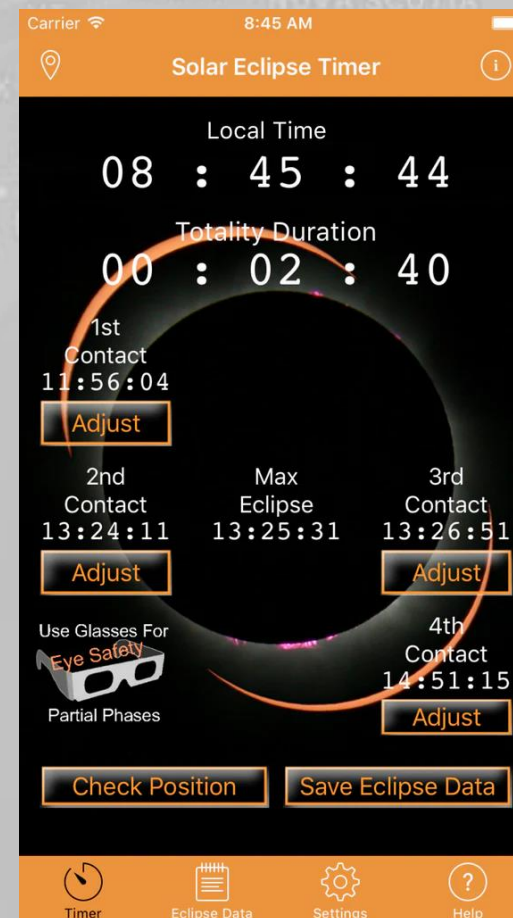
# Lessons Learned

- Take a passport if travelling near Canada
- Explore Outreach Opportunities
  - Look for organized events
  - Be prepared for ad hoc encounters
- Photography
  - Don't put your viewing experience at risk. Leave it for the experts
  - But if you must:
    - Study
    - Plan
    - Practice
- Optics
  - View unfiltered at totality only
  - Do not be at the eyepiece as 3<sup>rd</sup> contact approaches



# Notable differences from 2017

- Cooler weather, more noticeable cool down at totality
- More travelers and submitters
- More reports of seeing prominences with unaided eye
- Use of smartphone timer apps
- Arrival of Seestar
- Solar eclipse glasses widely available



Lessons learned from 2017 were applied to 2024.

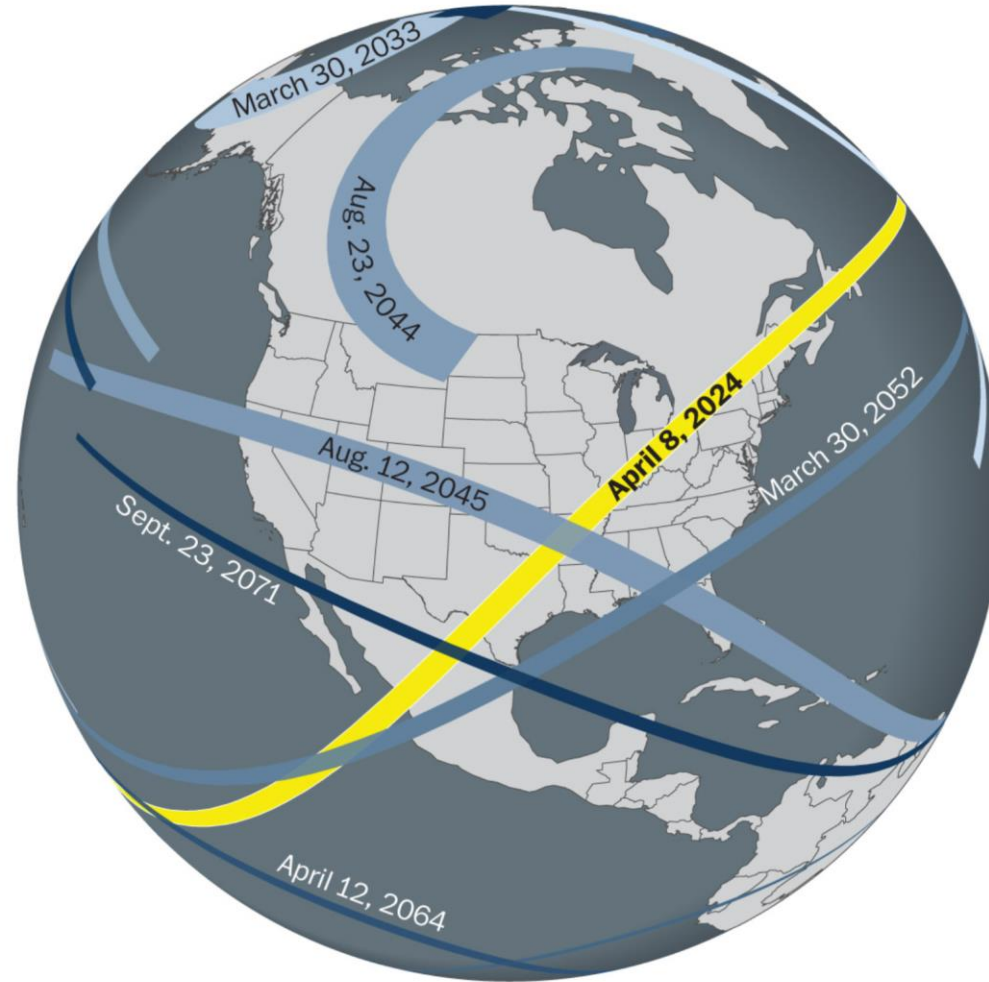


**The Next Eclipse:**  
August 12, 2026

### Total eclipses over the next 50 years

■ This year's eclipse 2025  2073

Next US Eclipse:  
March 30, 2033



# Conclusions

- We're a determined and adventurous bunch
- Some of us are incredibly lucky
- The effort to get to totality is worth it



It is hard to stop HAL!!!

# Tonight's Agenda, May 16<sup>th</sup>, 2024

- Introductions
- Announcements
  - 2024 Schedule of Star Parties
  - Recent Outreach Events
  - New HAL SeeStar S50 Loaner Program
- Featured speaker – **Jim Johnson, Former HAL President**
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- Members' Astro-Images and Sketches
- Wrap-up & Discussion

# What's Up in Space: GAIA Black Hole Discovery

- GAIA launched by ESA in 2013 from French Guiana
  - Mission is to investigate the origin and evolution of the Milky Way by conducting a census of 1 billion stars
    - Create a 3D map of the Milky Way with both positions and space velocities of the stars
  - Orbits the Sun-Earth L2 point
  - Has two identical imaging instruments, two photometers, and one radial velocity spectrometer
  - Measures the astrometric positions, brightness, and radial velocities of stars down to mag 20
  - Measures positions with an accuracy as good as 24 microarcseconds (0.000024 arcseconds)

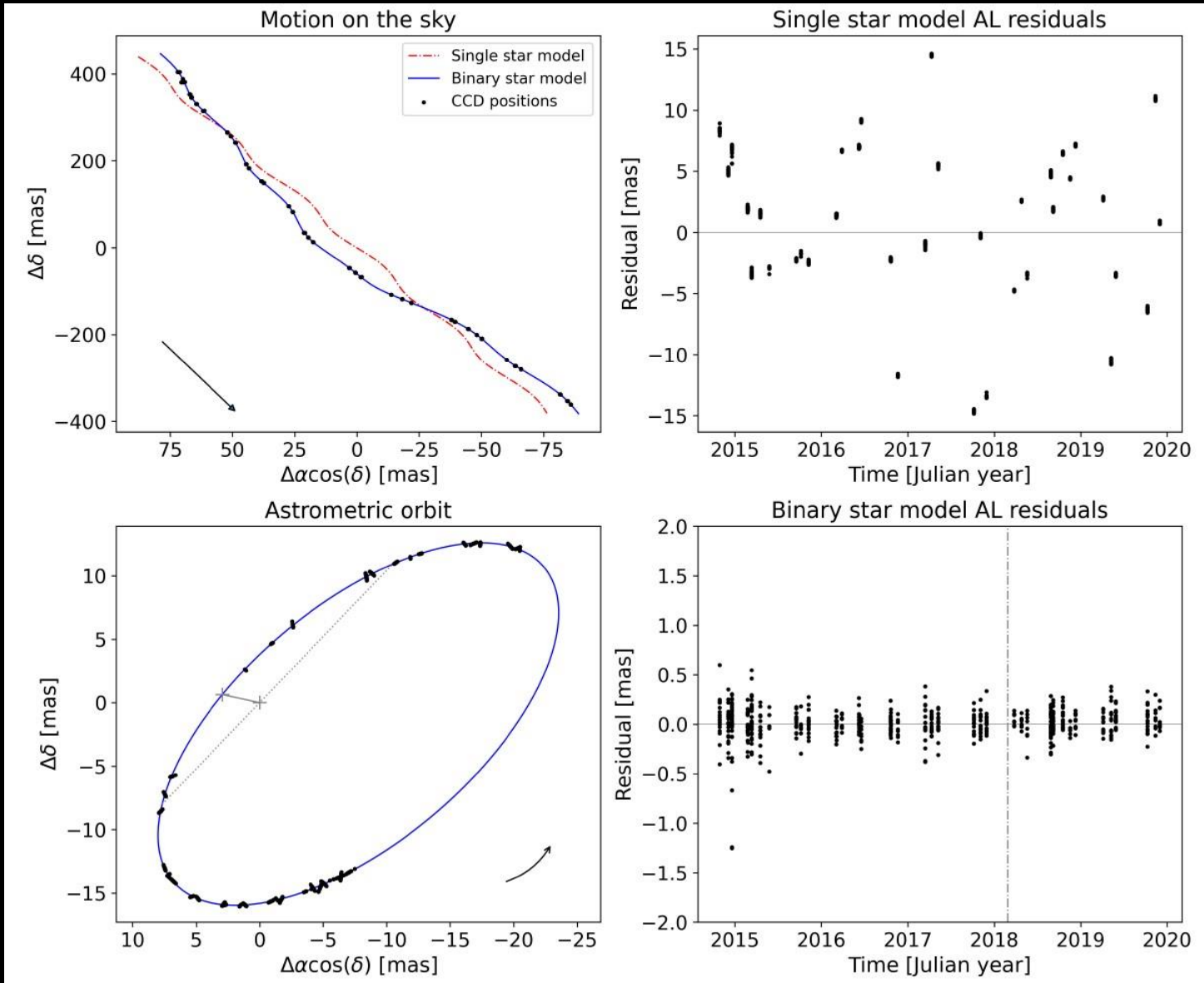


Image Courtesy ESA; from <https://science.nasa.gov/mission/gaia/>

# What's Up in Space: GAIA Black Hole Discovery

- Previous black holes from Gaia
  - Data included in Gaia's DR3 was studied and found two black holes: BH1 and BH2
  - BH1 has a mass of  $10 M_{\text{sun}}$ , and BH2 is  $9 M_{\text{sun}}$  (El-Badry, K., et al. 2023, MNRAS, 521,4323)
- New black hole – BH3
  - Found during preparation of the data for DR4 (Panuzzo, P., et al. 2024, A&A preprint, April 8, 2024)
    - Discovered while validating the solutions of binary systems in the data
  - The directly-observed companion star is a very-low metallicity G giant
    - Magnitude of 11.2 (Gaia G-band)
    - Distance using Gaia parallax is 590 pc (1900 ly)
    - Shows an orbital period of 11.6 years
    - The primary object is not visible

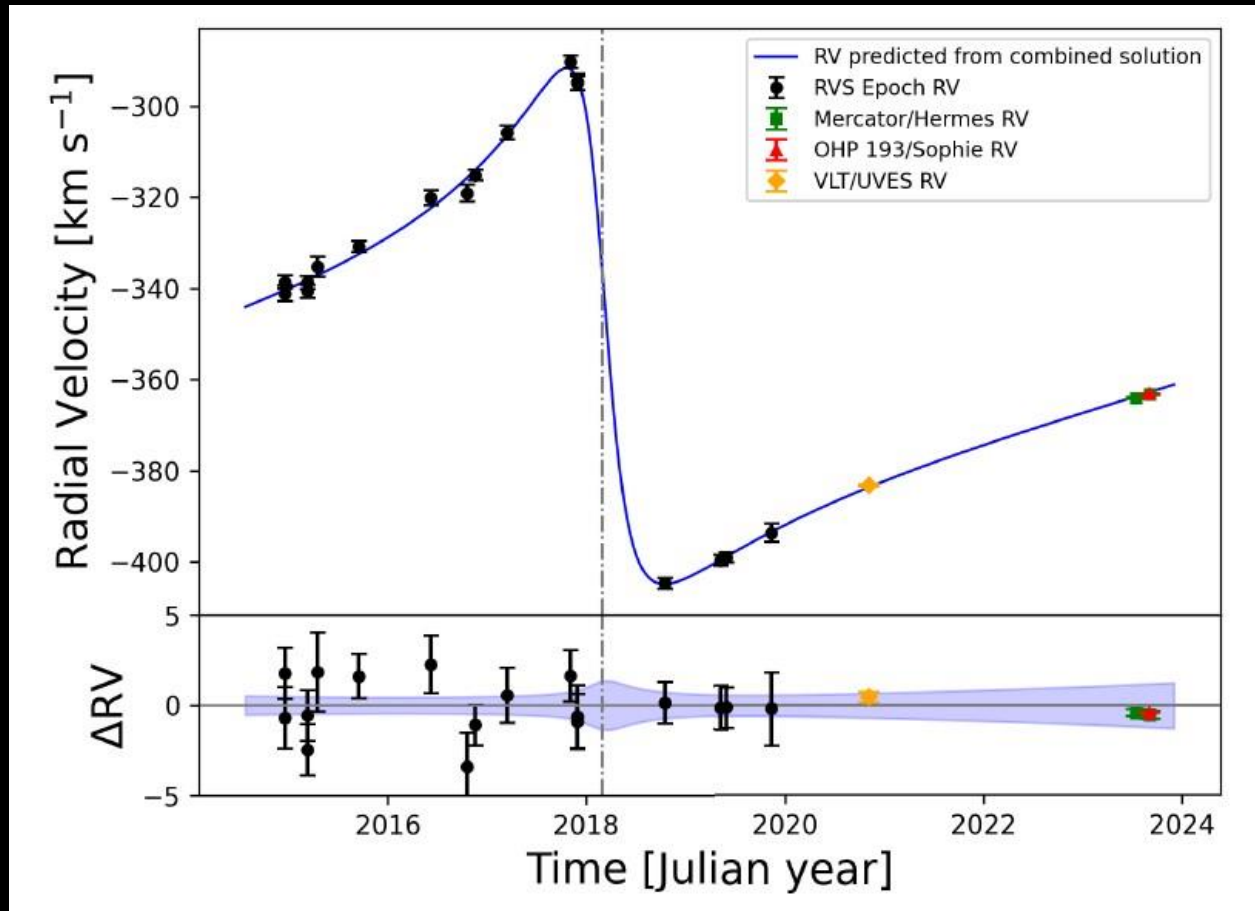
# What's Up in Space: GAIA Black Hole Discovery



- Observational data
  - Top: Motion on sky, including parallax, proper motion, and orbital motion
  - Bottom: Astrometric orbit after subtracting parallax and proper motion
    - “+” show barycenter and periastron, dotted line shows the line of nodes

Panuzzo, P., et al. 2024, A&A preprint, April 8, 2024

# What's Up in Space: GAIA Black Hole Discovery



Panuzzo, P., et al. 2024, A&A preprint, April 8, 2024

- Observational data
  - Radial velocity data with predicted value from orbit solution (solid curve)
    - Includes Gaia data (black) and ground-based observations (green, orange, yellow)
    - Vertical dashed line shows time of periastron passage
  - Spectroscopic and photometric studies result in a mass of the observed star to be  $0.76 M_{\text{sun}}$
- Combining the orbit solution with the radial velocity data and the stellar mass, the derived primary object mass is  $32.7 M_{\text{sun}}$

# What's Up in Space: GAIA Black Hole Discovery

- Primary object ( $32.7 M_{\text{sun}}$ ) identification
  - Since the primary object is invisible at the 590 pc distance, cannot be a normal star (or a close binary of normal stars) with the derived mass
  - Also inconsistent with a single or binary neutron star
  - Remaining possibilities
    - Single black hole
    - Binary black hole
    - Binary of black hole + other compact object
  - Further study is needed to distinguish among these possibilities
  - If this is a single black hole, it is the most massive stellar mass black hole discovered in the Milky Way

The paper announcing the discovery is Panuzzo, P., et al. 2024, A&A preprint, April 8, 2024, available at <https://www.eso.org/public/archives/releases/sciencepapers/eso2408/eso2408a-panuzzo-et-al.pdf>

# Tonight's Agenda, May 16<sup>th</sup>, 2024

- Introductions
- Announcements
  - 2024 Schedule of Star Parties
  - Recent Outreach Events
  - New HAL SeeStar S50 Loaner Program
- Featured speaker – **Jim Johnson, Former HAL President**
- What's Out in the Sky This Month...
  - What's up In Space – **Wayne Bagget**
- ⇒ • Members' Astro-Images and Sketches
- Wrap-up & Discussion




 Seestar S50

Ellicott City / 2024.05.13 17:17

Sun



 Seestar S50

Ellicott City / 2024.05.13 22:48

M 81

25mm

Harrini Meenashi Sundar



James Willingham



James Willingham

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Thank you