Solar System Series
Our Sun

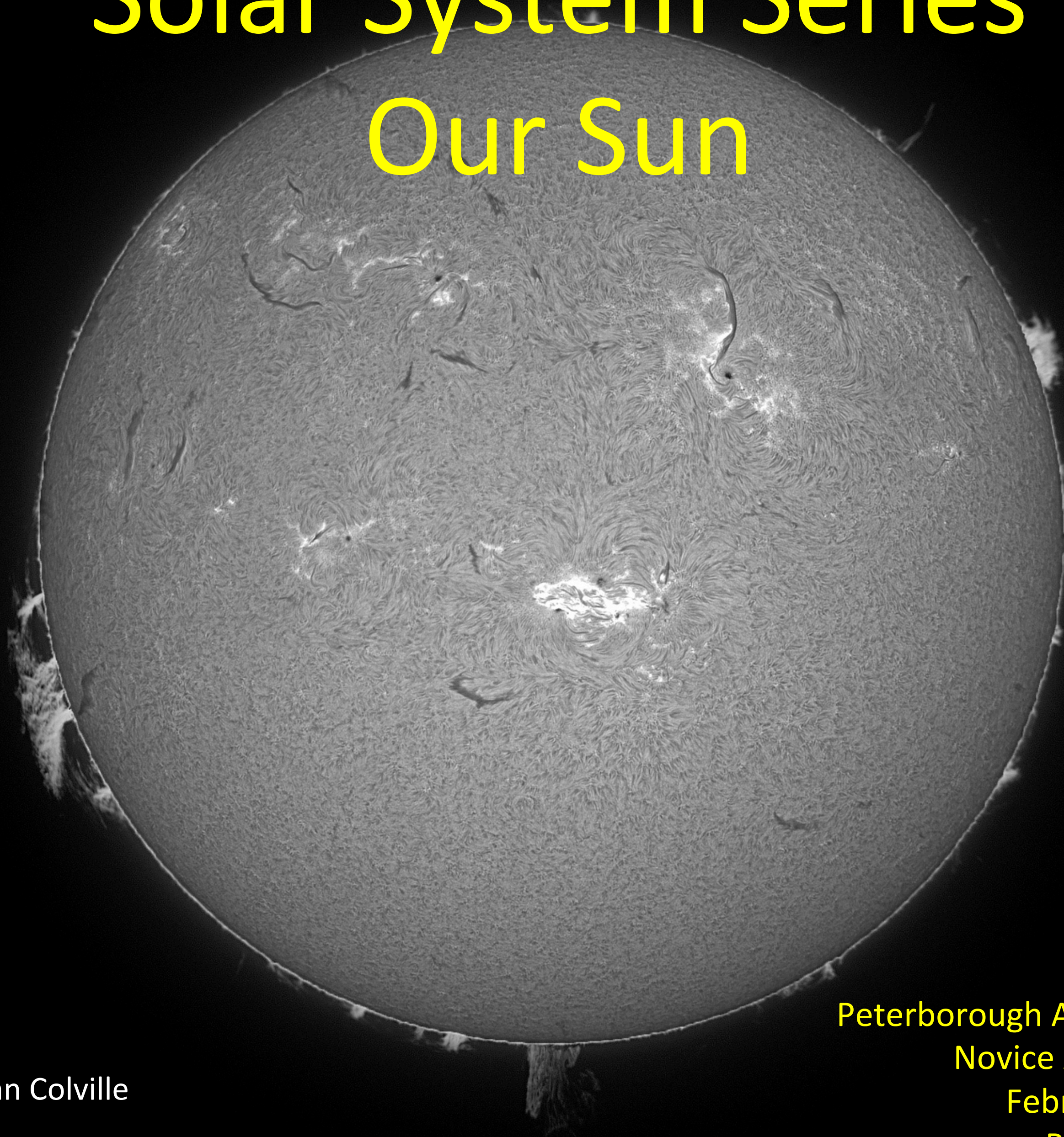


Image courtesy Brian Colville

Peterborough Astronomical Association
Novice Astronomy Class
February 7, 2025
Brett Hardy

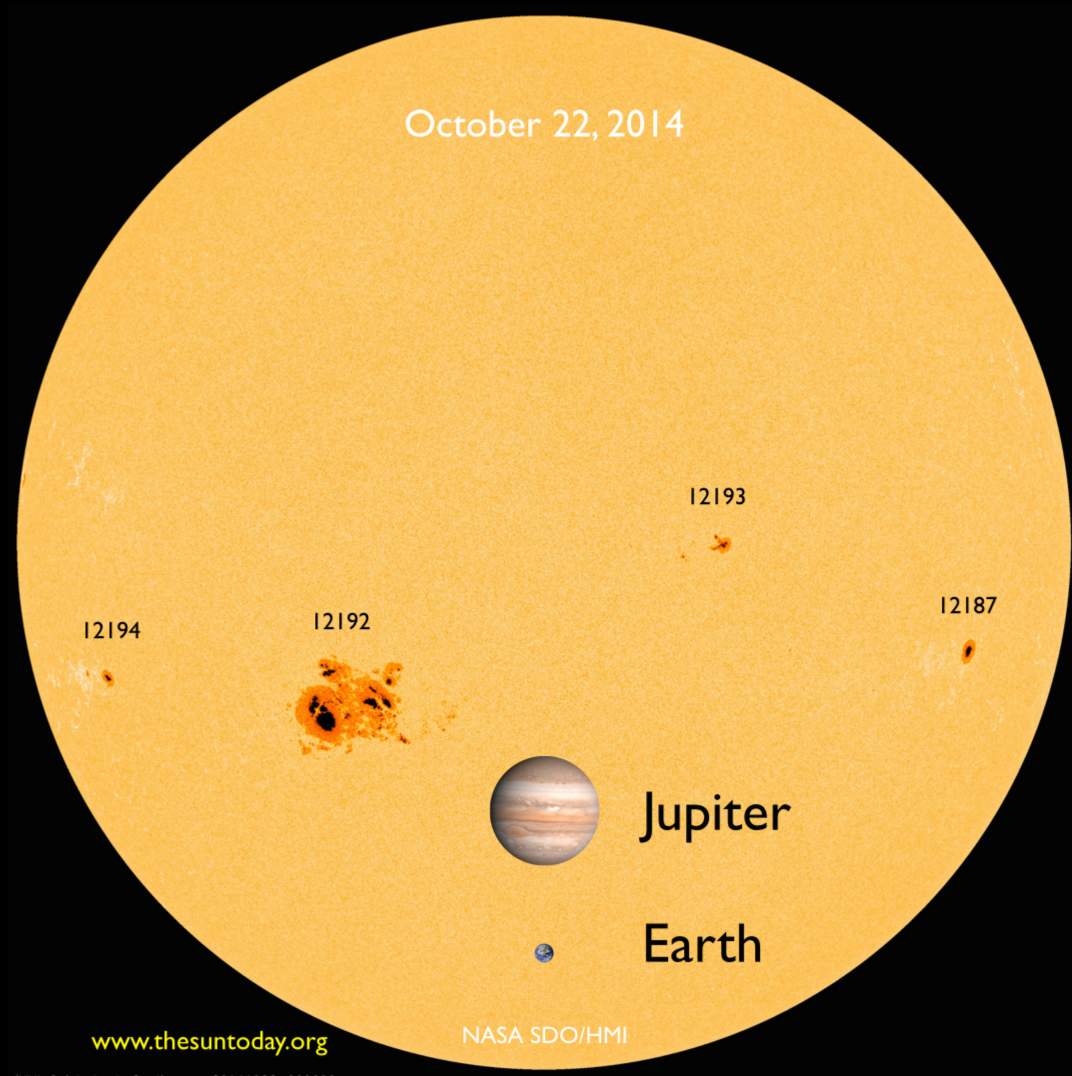
A Star is Born

- Enormous cloud of hydrogen gas and dust
- Star forming region

NASA, ESA & M. Livio

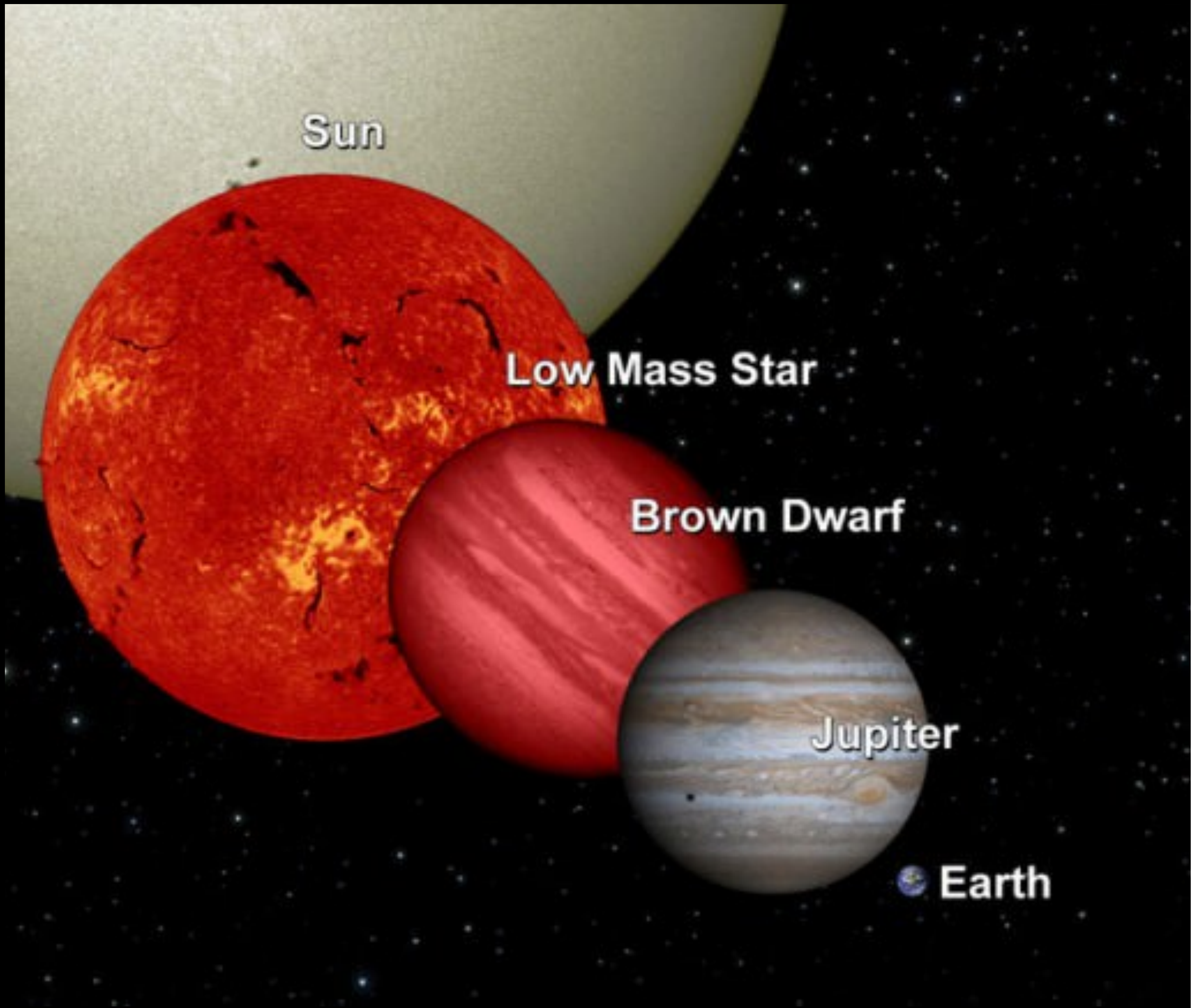
Our Sun

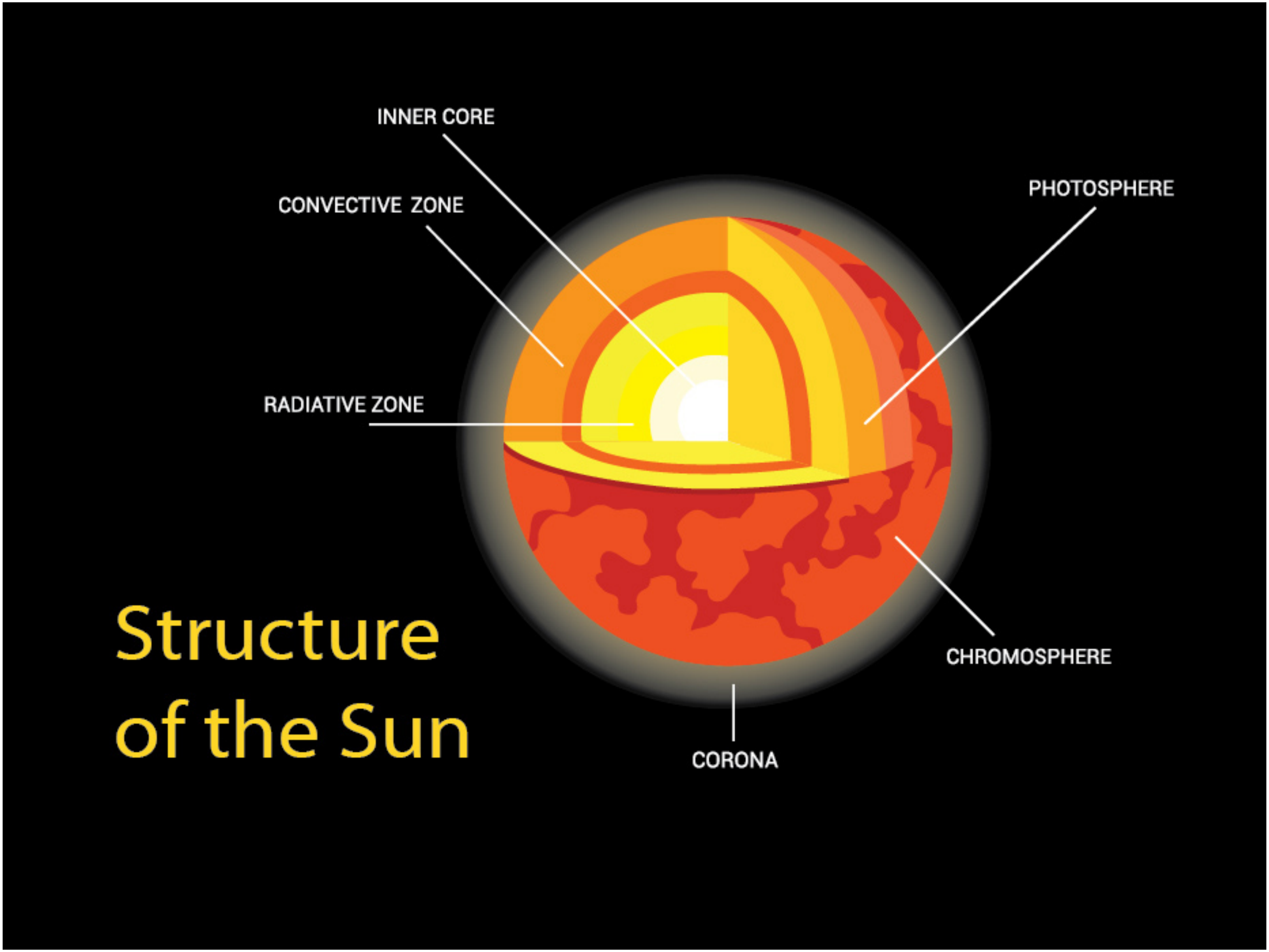
- Age: ~ 4.5 billion years
- Composition: hydrogen (72%) & helium (26%) plasma
- Yellow dwarf
- Nuclear fusion
- Most massive object in solar system
- Mass: 99.8%
- Diameter: 1,392,000 km (864,938 mi)
- 1.3 million Earth's would fit inside
- Distance to galactic centre: 26,000 light years
- 230 million years to orbit Milky Way
- Distance to Sun from Earth: 150 million km (93 million mi) – 1 AU
- Fleet of spacecraft constantly monitoring our Sun: SOHO, Solar Orbiter, Parker Solar Probe, etc.



Our Sun

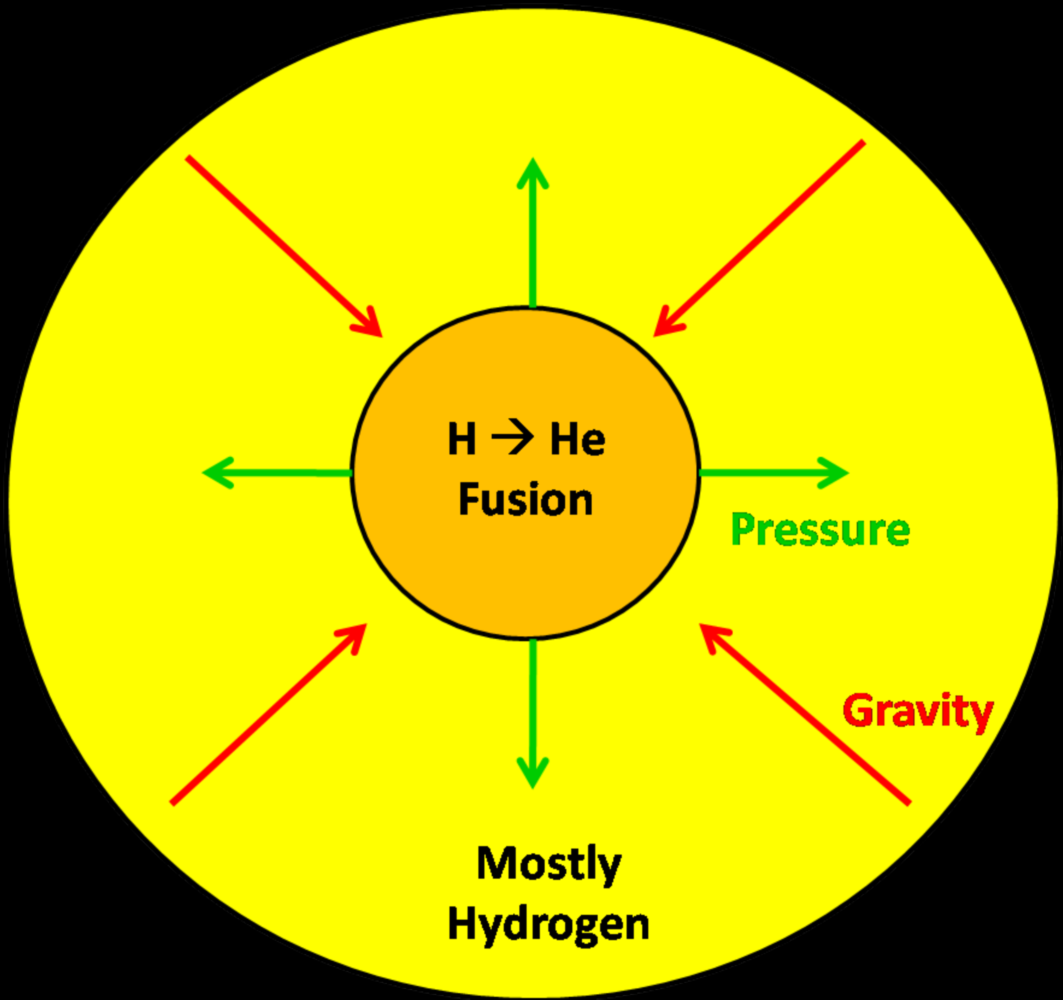
- G-type main-sequence (G2V)
- Yellow dwarf
- Red dwarfs
- 50 % & > Sun’s mass
- Brown Dwarfs
- > 0.07 mass of Sun
- Emit IR




INNER CORE
CONVECTIVE ZONE
PHOTOSPHERE
RADIATIVE ZONE
Structure
of the Sun
CHROMOSPHERE
CORONA

Nuclear Fusion

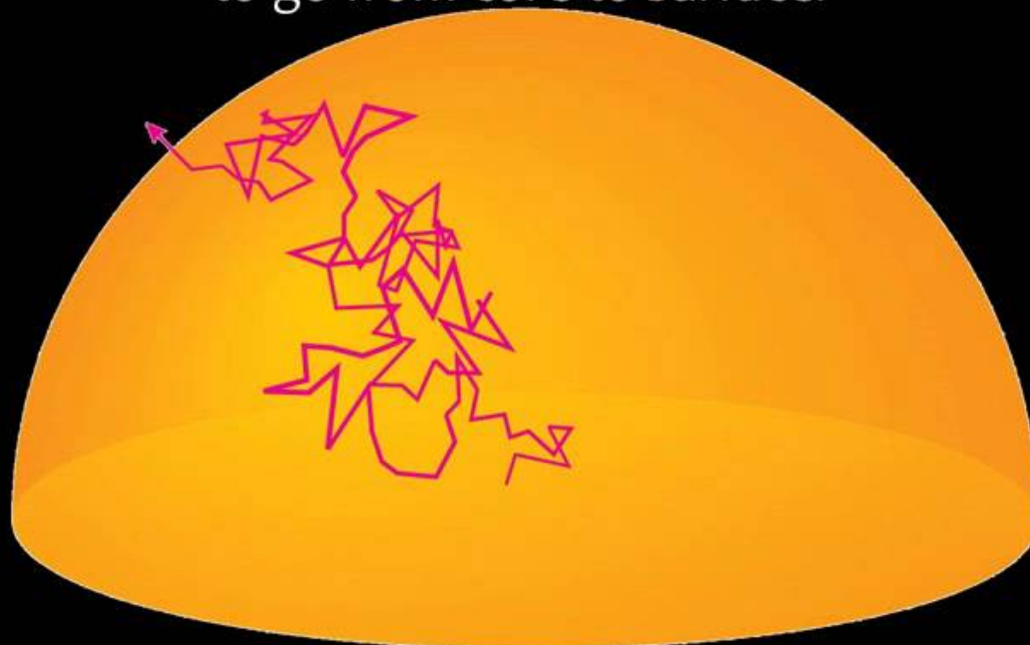
- Nuclear fusion begins in the core
- Two hydrogen atoms fuse
- Produces helium, heat and light
- Inward force of gravity = outward force of fusion



Energy takes a long time to reach the Sun's surface

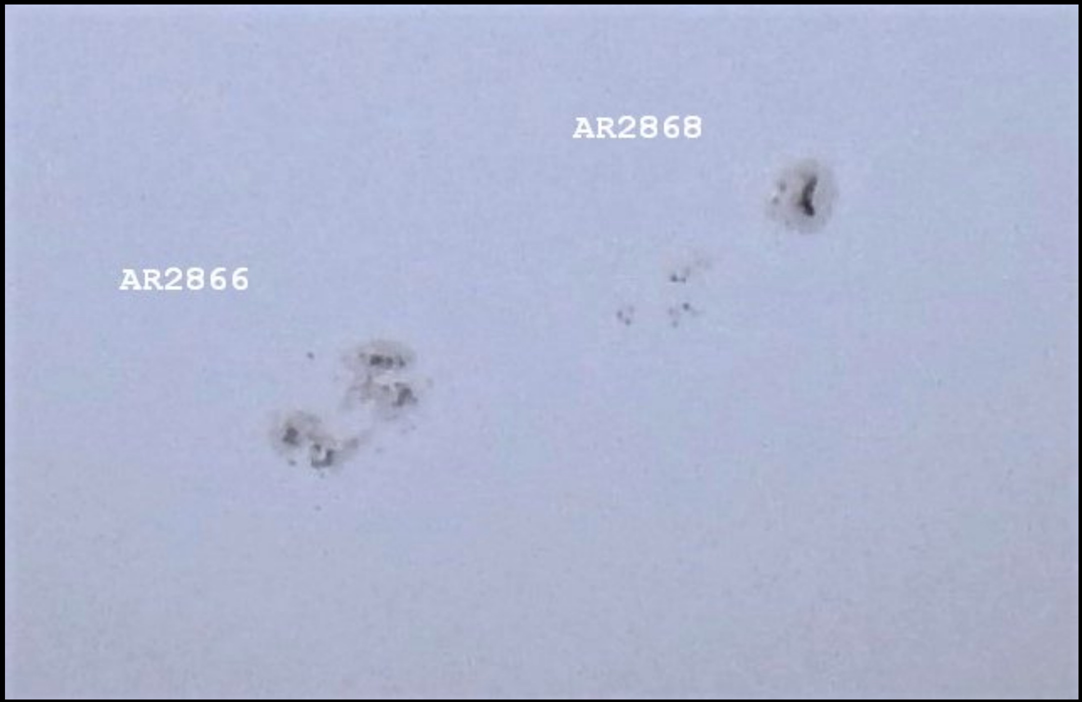
Photons "collide" with electrons and get deflected in random directions.

It takes hundreds of thousands of years for a photon to go from core to surface!



Sun Spots

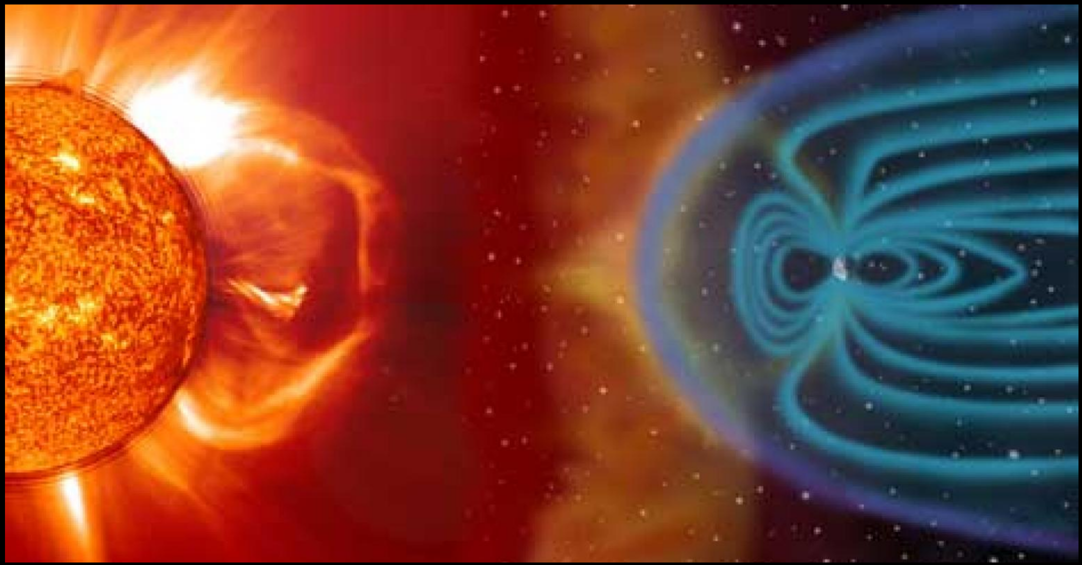
- Magnetic disturbance
- ~ 2,000° C cooler
- Last for days or weeks
- Umbra and penumbra
- Massive
- Produce UV and soft X-ray emissions
- Influence Earth's upper atmosphere
- 11 year cycle
- Solar maximum 2025



Rick Stankiewicz

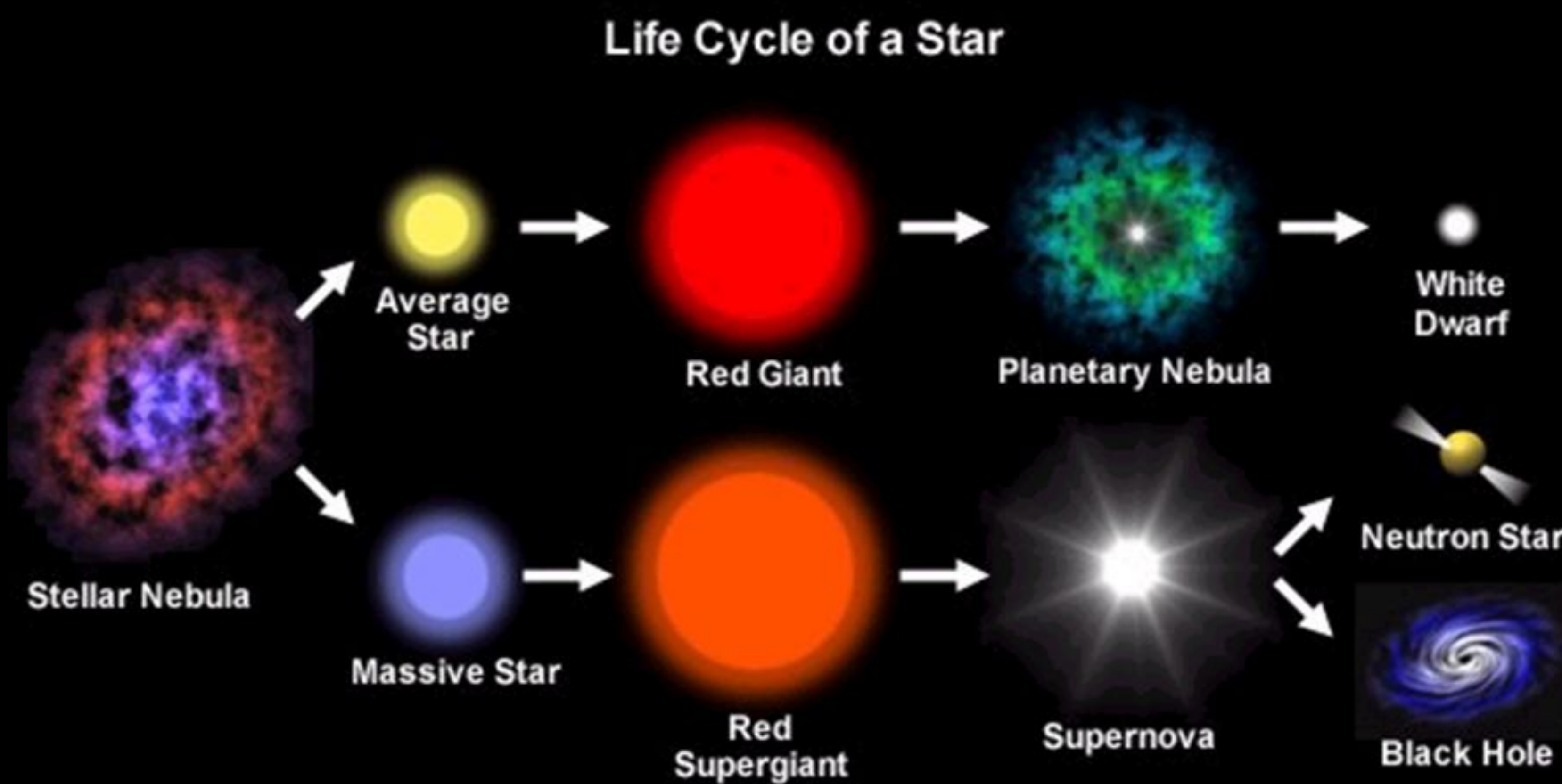
Space Weather

- Solar wind, flares and coronal mass ejections (CME) affect planets
- High speed magnetic and charged particles
- 250 - 750 km/s
- Aurora, communication, electrical grids
- Solar & Heliospheric Observatory (SOHO)
- Advanced Composition Explorer (ACE)
- Parker Solar Probe
- Space weather
    - spaceweather.com



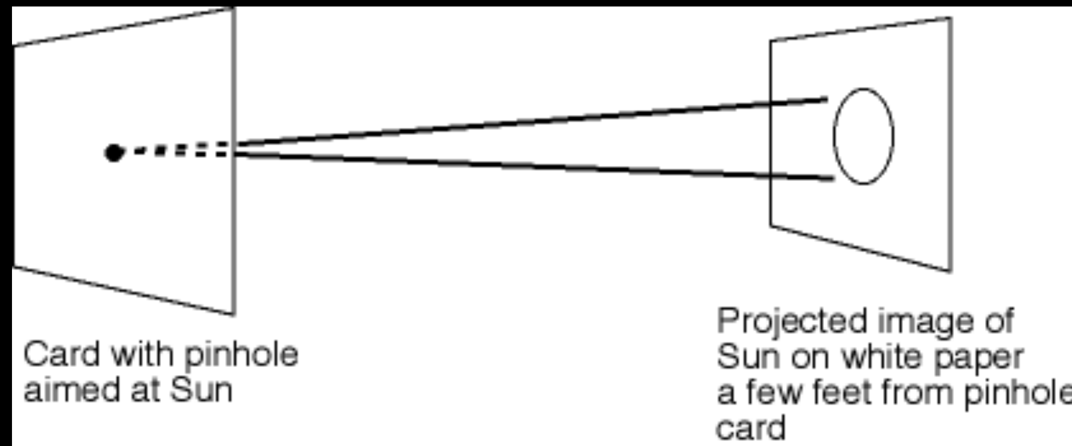
Life Cycle

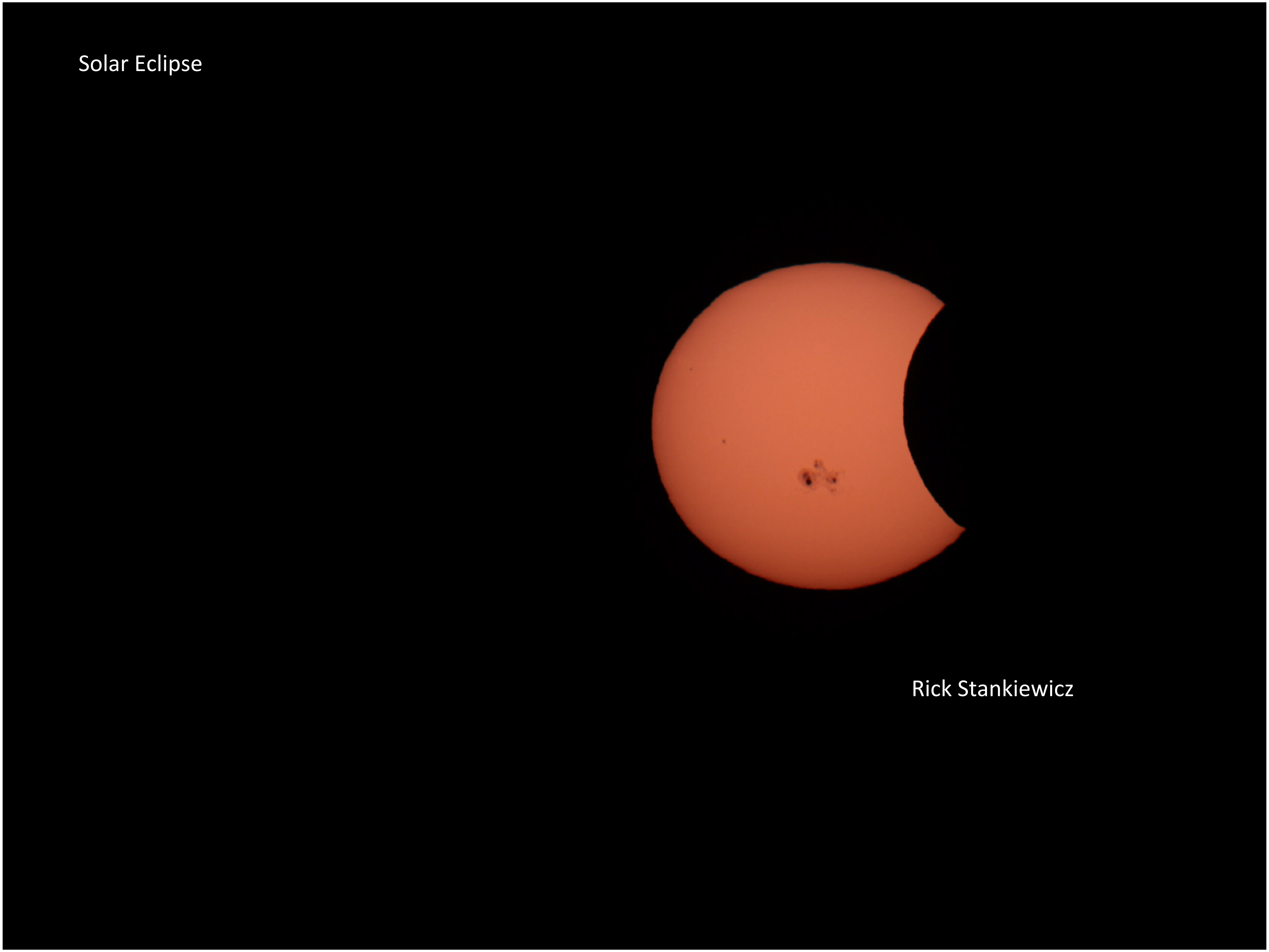
- Size matters



Solar Observing

Warning!




Solar Eclipse
Rick Stankiewicz


Totality
Rick Stankiewicz

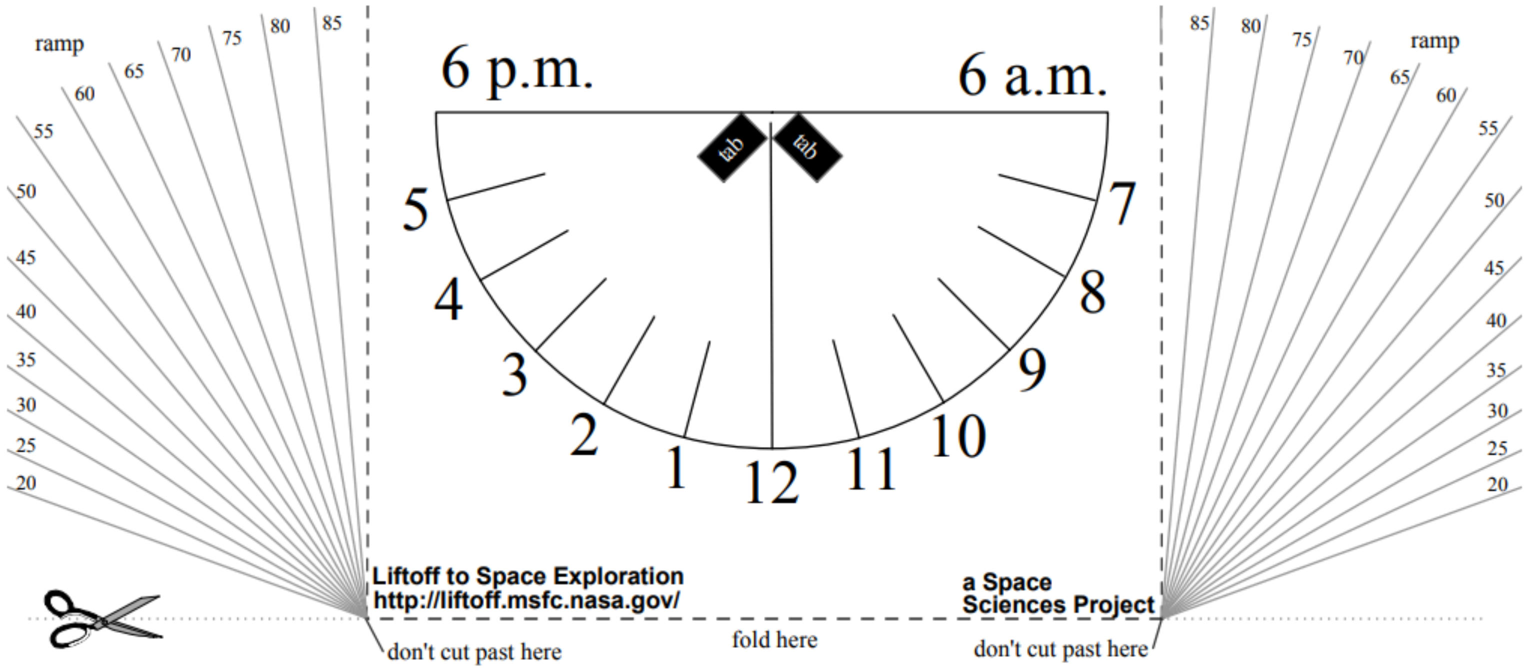
Totality

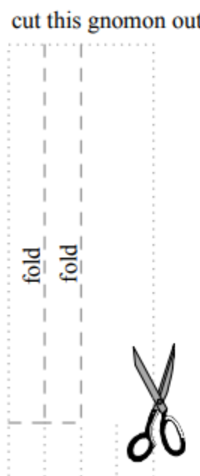
Rick Stankiewicz

Planetary Transits

- Mercury & Venus

Build Your Own Sundial





Instructions: Northern Hemisphere

Part I: Gnomon

1. Cut out your gnomon shown to the left.
2. Cut the three dotted lines at one end of the gnomon.
3. Folder the gnomon in half and then fold the folded gnomon in half.

Part II: Sundial

1. Cut along the dotted lines on each end of the sundial page but don't cut all the way across. Stop at the stop marks.
2. Fold the remaining dashed lines. - - - -
3. Fold each ramp side along the line which is closest to your latitude. (You can look this up on our web page.)
4. Tape the folded ramps to the back side of the folded paper so that the side labeled "ramp" is vertical.
5. Depending on the time of the year, you tape the gnomon on different sides of the sundial face. If it is after the Spring Equinox, you tape it on the numbered side. If it is after the Fall Equinox, you tape it on the back or un-numbered side.
6. When taping the gnomon on, you match the tabes with the sundial face.
7. Aim your sundial North.

Novice Astronomy Class
The Basics for a Night of Visual Observing
March 7, 2025