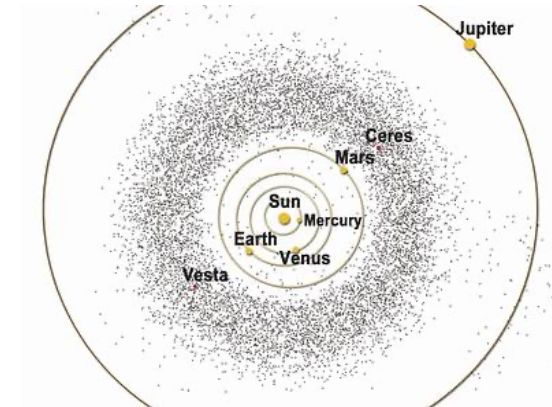


Journey Through Our Solar System

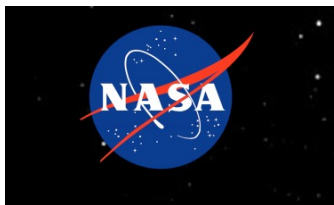
Part 1: The Planets



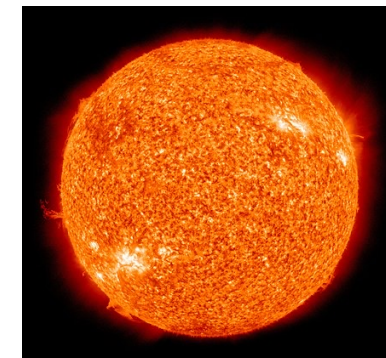
Part 2: Asteroids and Planetary Defense



Part 3: The Sun



Much credit to NASA



January 12, 2022

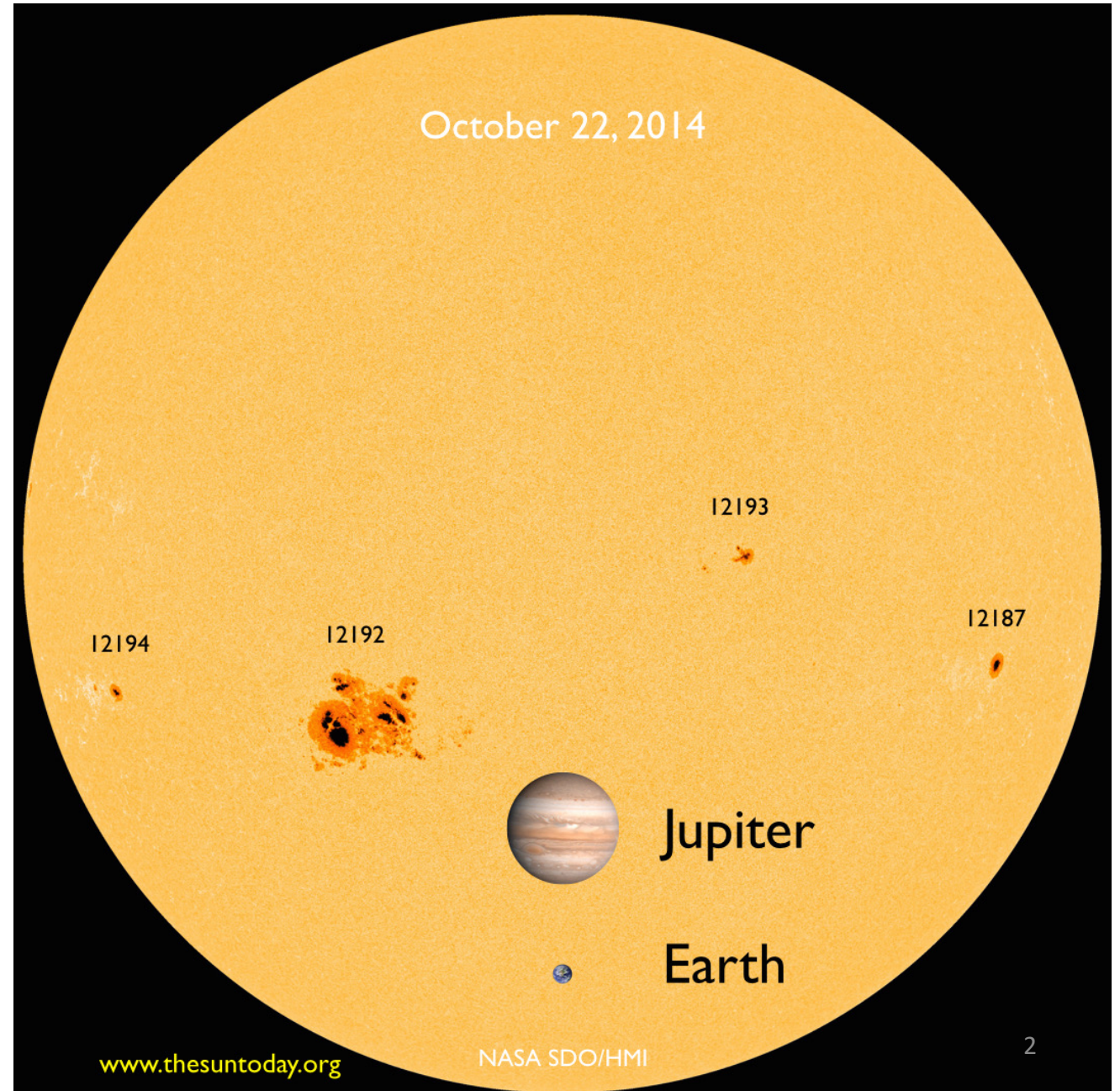
Meet Sol

Composition: gas ball

Size: average star

- 865,000 miles = 100x
Earth

Sunspots 1,000 to
100,000 miles

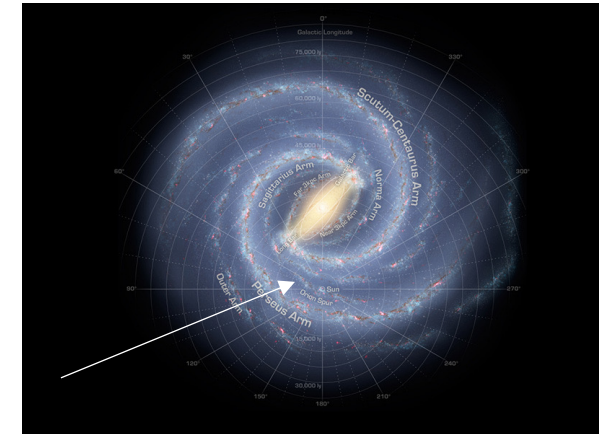


Basic Facts About The Sun

Location:

The Milky Way Galaxy, which orbits its center every 230 million Earth years

Closest star: Alpha Centauri, 23 trillion miles away
(4.35 light years) 200,000 yrs @ 15,000 mph



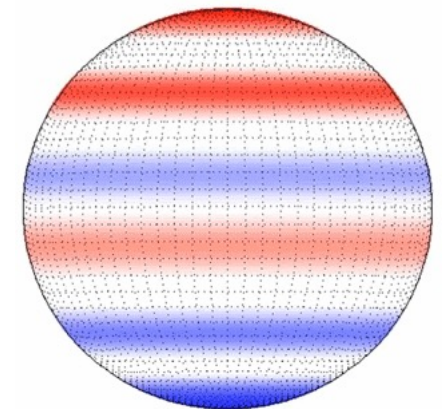
Main features:

All gas/plasma

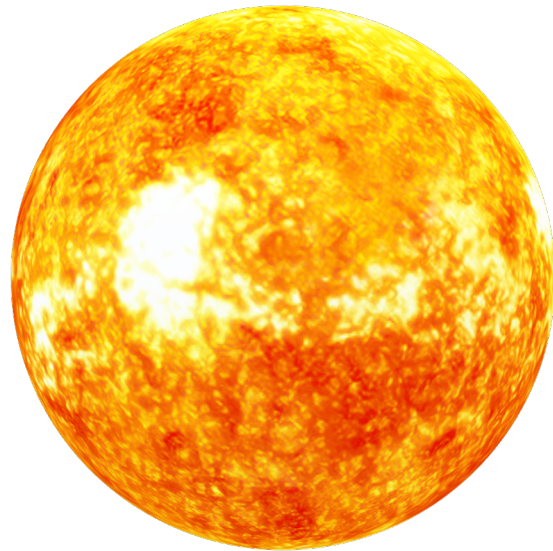
Gravity

Sunlight, flares, sunspots and solar wind

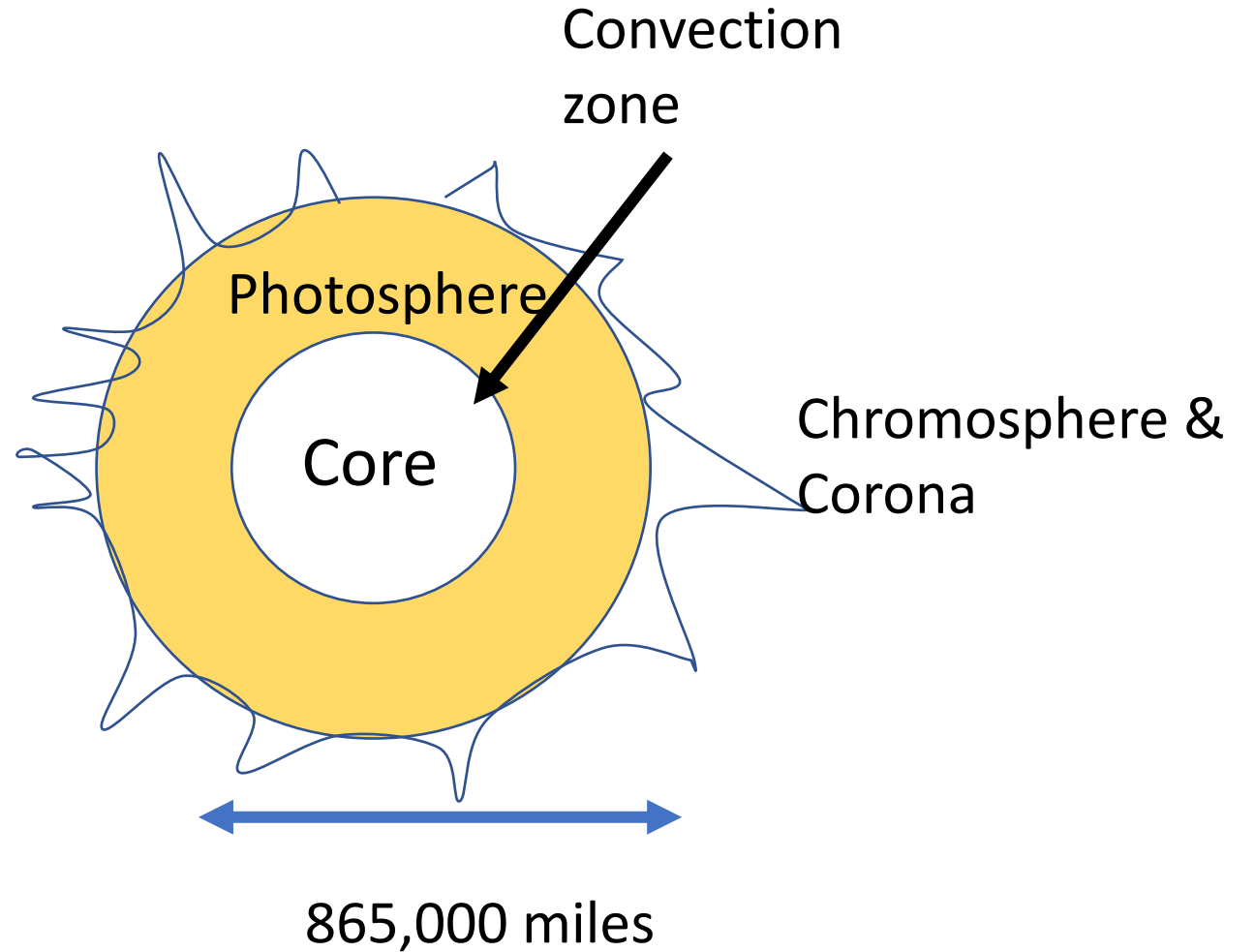
The Sun's bands rotate



Nomenclature of the Sun

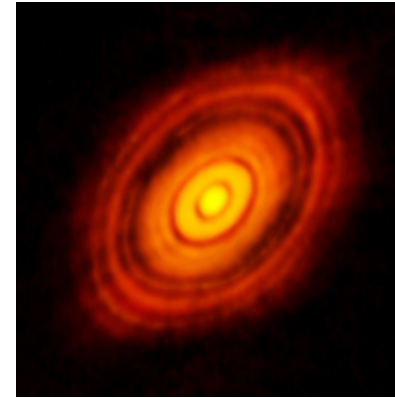


Yellow filter



History of the Sun

- **4.6 billion years ago** the Solar System was a disk of gas and dust
- **Gravity** coalesced this disk into The Sun and objects orbiting The Sun



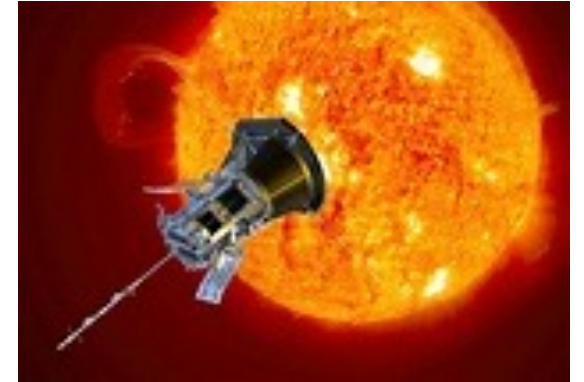
HL Tau Proto-planetary system

Alternate “facts”



NASA's Parker Solar Probe Touched The Sun!

- **Launched 2018:** 93 million miles to The Sun
- **Sampling:** dove into the Sun's corona in 2021
- **Now:** orbiting Sol, observing, analyzing, reporting
- **Goal:** examine our closest star and its influence on the solar system
- **Found thus far:**
 - The surface isn't smooth: Spikes and valleys
 - Nature of solar wind, flares, magnetic fields
- **Final dive:** 2025 at 3.8 million miles burn at 2,500 F degrees



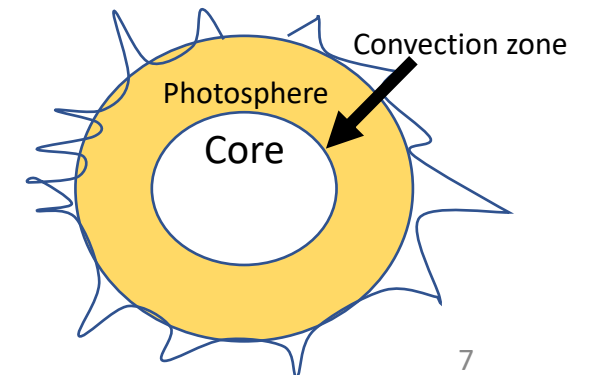
How are sunlight and heat created? (1)

- In the Core **Nuclear fusion**: gravity forces 2 Hydrogen nuclei (protons) to fuse into Helium, releasing mass= energy $E = MC^2$
 - Core is 86,000 miles thick, 27 million degrees Fahrenheit and 8 times denser than Gold

DEEP! HOT! DENSE!

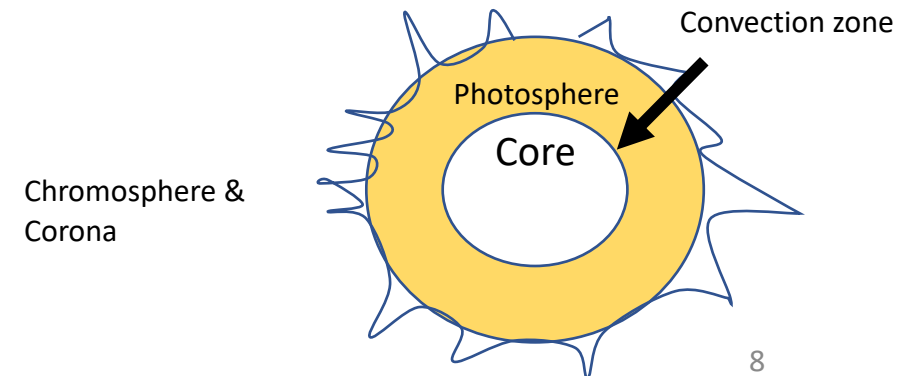
- **High energy particles radiate** from Core through the Convection Zone
 - 170,000 years (estimate) to reach the Corona
 - Temperature only 3.5 million Fahrenheit

Chromosphere &
Corona



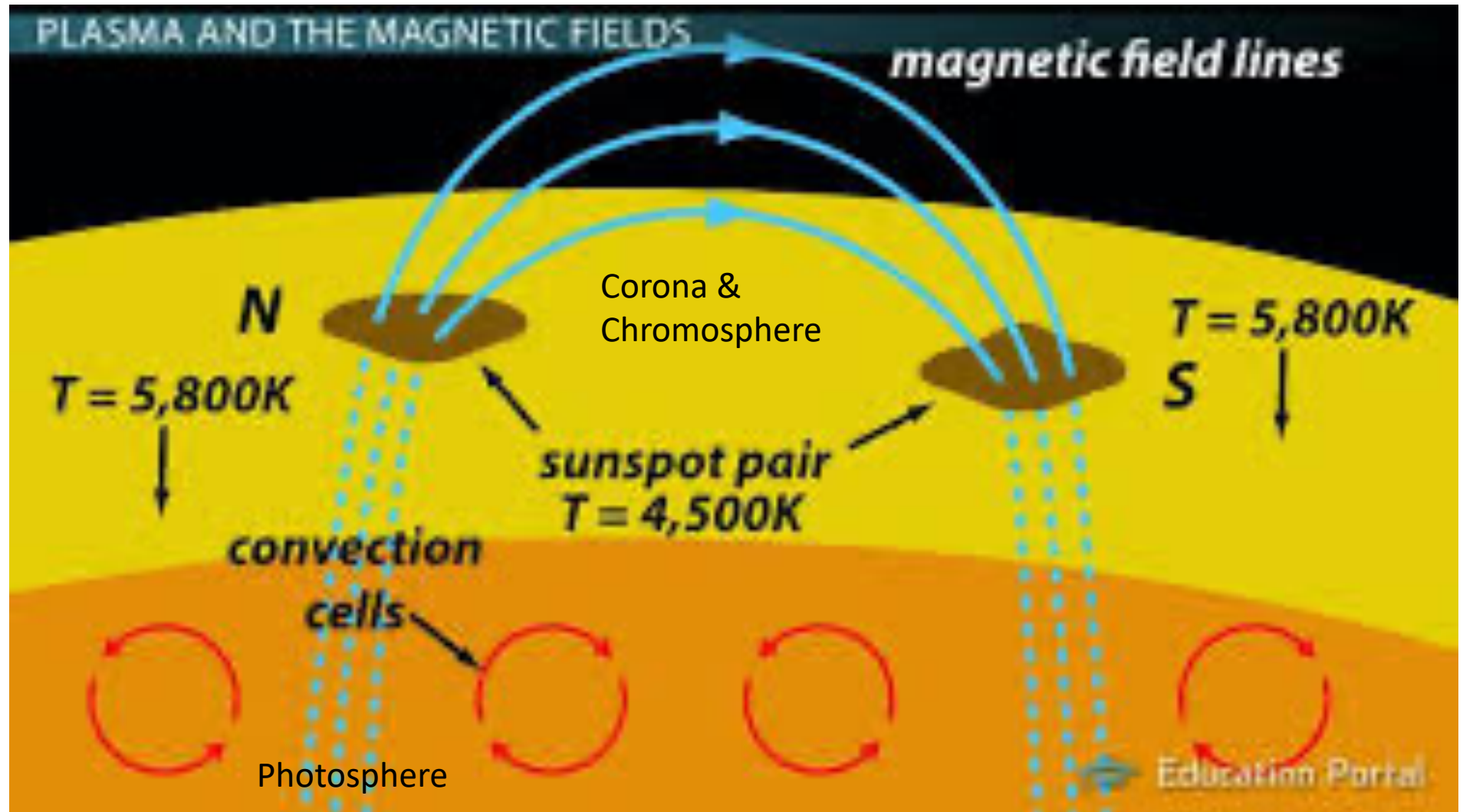
How are sunlight and heat created? (2)

- From the Convection Zone **Photons, Helium, Hydrogen and some heavier elements including gold** move to the Photosphere (surface)
- To the Corona
- Into space where energy and particles radiate in all directions
- Bringing us sunlight, climate, falling star dust



Sunspots

- Convection cell pairs
- **Magnetic Storms:** 2 million MPH
- **Temp** 1,300K cooler
- **Life:** days to months
- **Size:** 1,000 to 100,000 miles



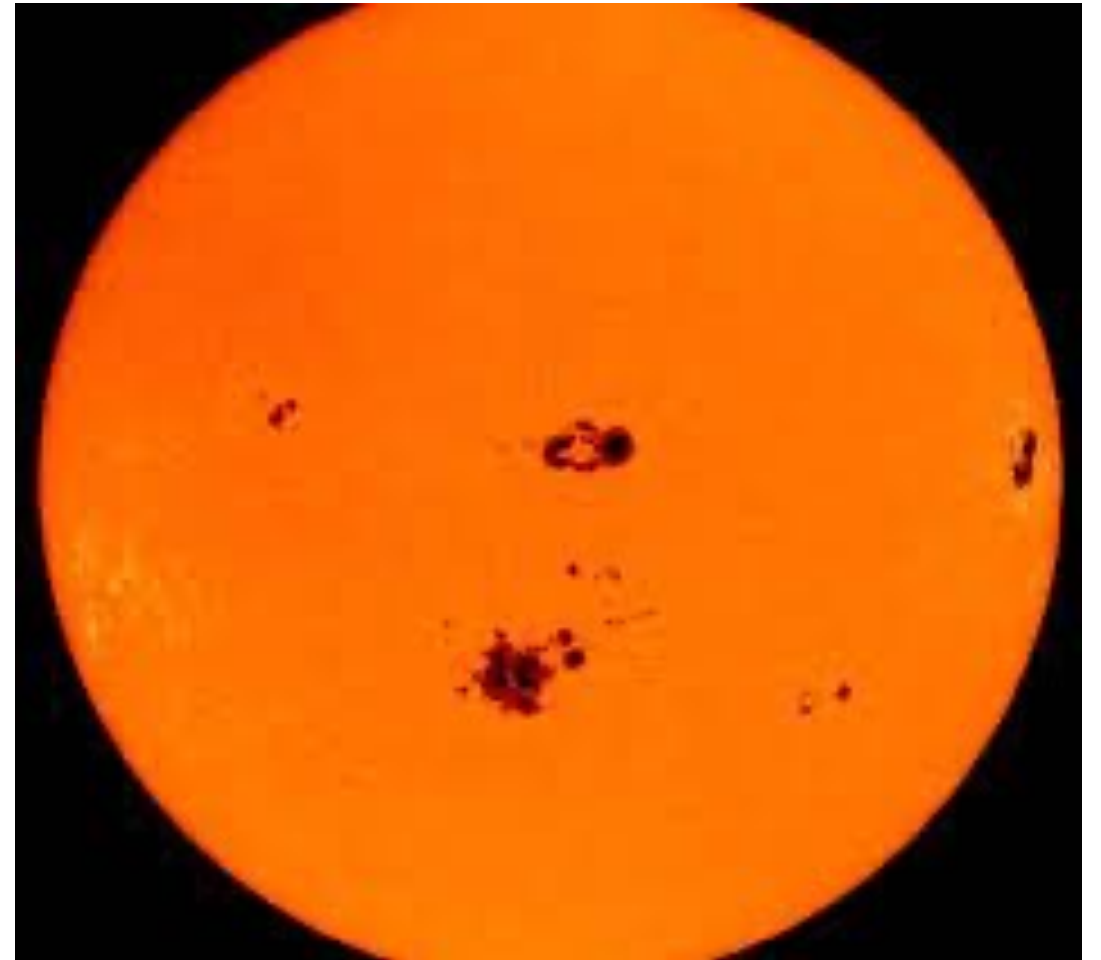
Sunspot Activity

11 Year Solar Activity Cycle:

Last Minimum 2 yrs (Dec. 2019)

Next Maximum 3.5 yrs (July 2025)

1859: The Carrington Event



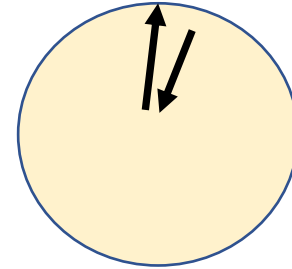
If that happened today...radio & satellite transmissions/GPS, airplanes, corroded oil& gas pipelines, power grids, computers!

When charged particles from the Sun's magnetic field hit the Earth



The Future of The Sun

- **Is the Sun stable?** Outward pressure from nuclear fusion off-sets gravity



- **But how long will it shine?**
 - Five billion years but...
 - Ever increasing intensity of the solar radiation will **end life on Earth** 😓

Still much to learn

- **the sunspot cycle**
- **coronal heating**
- **the bands of solar rotation**
- **solar flares and ejections**
- **the fast solar wind**
- **predict solar flares**

I hope you are enlightened!