

Neighborhood



MOON



SUN



MARS



JUPITER



PLUTO



VENUS



EARTH



NEPTUNE



SATURN



MERCURY



URANUS

Observing

Observing the Sun

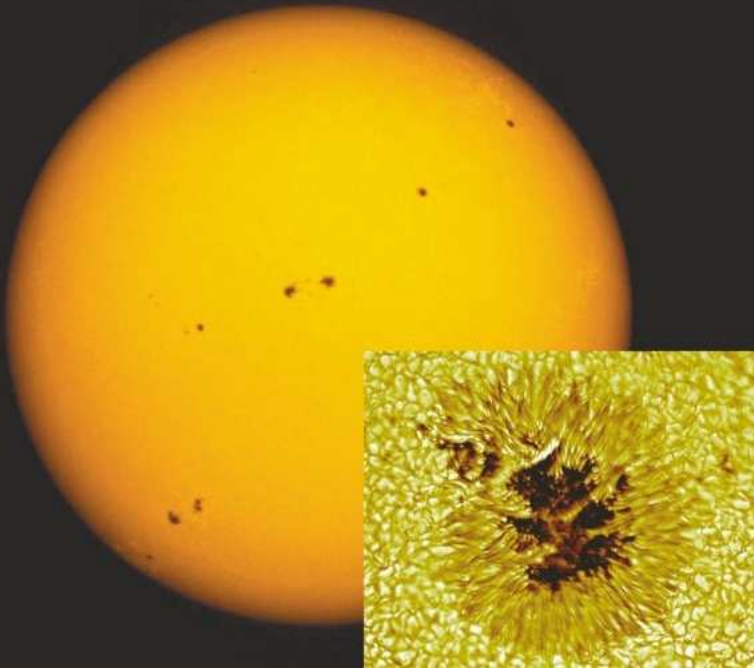
WARNING: Extremely DANGEROUS unless you take the NECESSARY precautions. You can absolutely damage your eyesight viewing the Sun using a telescope, binoculars or looking through a camera viewfinder or lens.

“White-light” observing

Observing the Sun Safety

Must have a special solar filter that completely covers the front of the telescope!

thousandoaksoptical.com



Solar Eclipse Viewing

Obviously, you can glance at the Sun but **DO NOT** stare at it!

For a Partial Solar Eclipse and up until totality of a Total Solar Eclipse, you need special viewing glasses!

However, at the moment of totality of a Total Solar Eclipse, you view and enjoy the eclipse with your naked eyes. Totality lasts only for a few minutes.



Can use to observe any large sunspots

Partial



Total—Totality





Eclipse through the trees.
(Pinhole camera effect)

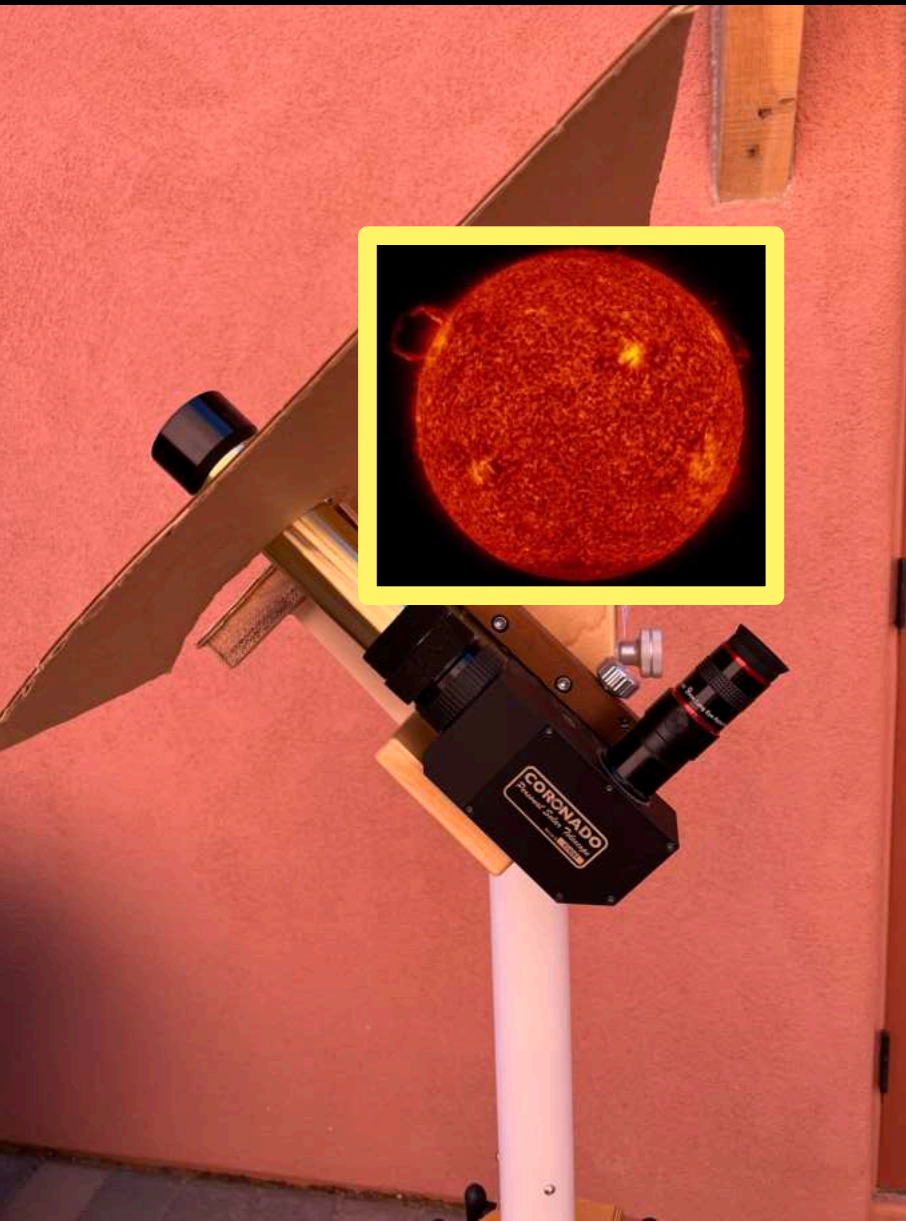
Sun as seen
through a
SPECIAL
Hydrogen-
Alpha filter*
telescope

- Can see
- Prominences
 - Spots
 - Filaments

***NOT** the same
hydrogen-alpha
filter used in
astrophotography
for nebulae!!!!

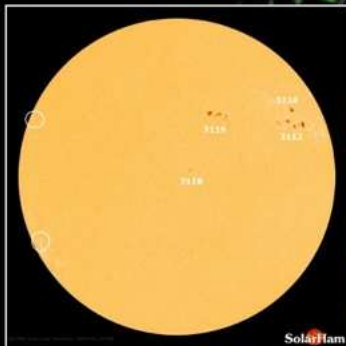


Small 40mm PST Hydrogen-Alpha Solar Telescope

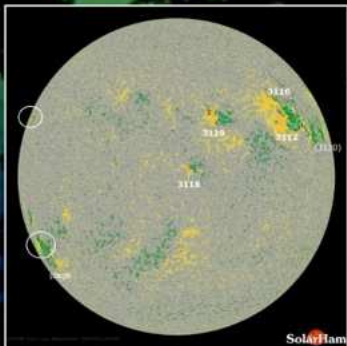


Space Weather for October 12, 2022

UTC Time 17:00:39 Wed



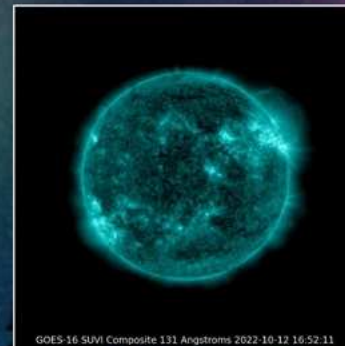
HMI Intensity
Analysis | Latest | Movie



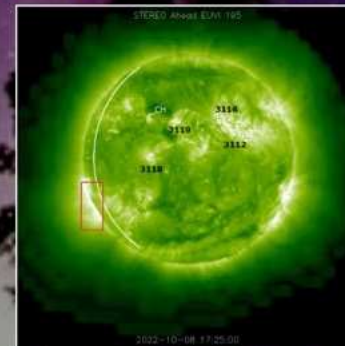
HMI Magnetogram
Latest | Movie



Coronal Holes
Analysis | Movie



AIA 131 (Latest)
Movie



STEREO-A (Farside)
Latest Image

Latest Imagery: [SDO](#) | [AIA](#) | [GOES-16](#) | [GONG](#) | [STEREO](#) | [LASCO](#)

Video: [SDO](#) | [SOHO](#) | [STEREO](#) | [Helioviewer](#) | [YouTube](#)

Solar Indices (Oct. 12 @ 00:35 UTC)

SFI	SSN	AREA
150	72	600
▼ 13	▼ 62	▼ 260

[WWV](#) | [Flux Data](#) | [Last 30 Days](#)

Cycle 25 Progression

Solar Flare Detection

Data provided by NOAA/SWPC

GOES-16 X-Ray Flux

Click to expand data



X-Rays

87.8

Current

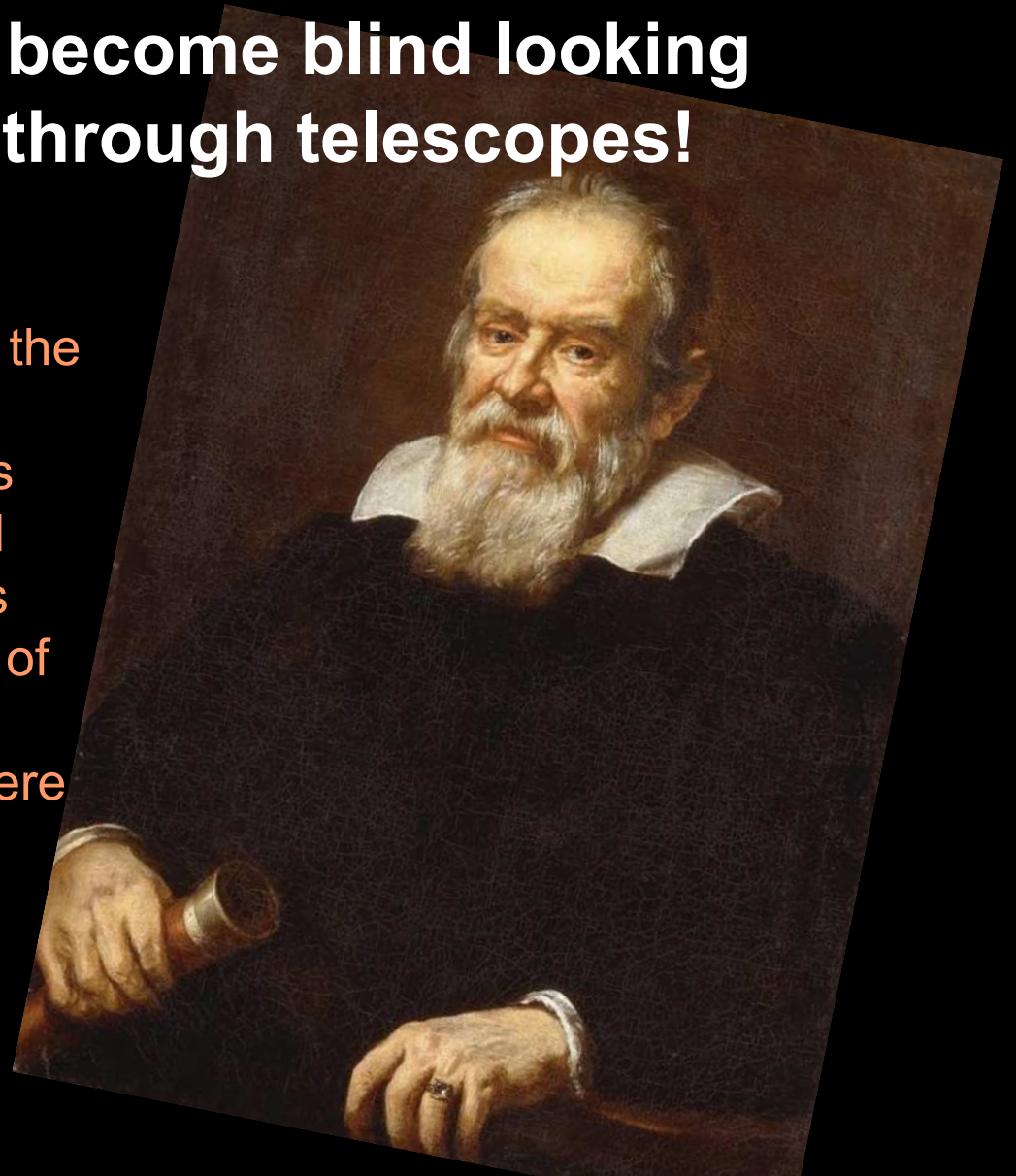
Solar Demon

Solar SOFT

Galileo Urban Legend

He DID NOT become blind looking at the Sun through telescopes!

Galileo became blind at the age of 72, from a combination of cataracts and glaucoma. This had NOTHING to do with his telescopic observations of the Sun a quarter of a century earlier, which were initially made only near sunrise and sunset, and later by projection.



Sun Facts

Diameter: **865,000** miles

or **110** times Earth's

Volume: **1,300,000** times Earth's

Surface Temp: **10,000 F**

Sunspot Temp: **6,300 F**

Core Temp: **27,000,000 F**

Comp: **92.1% Hydrogen**

7.8% Helium

0.061 Oxygen

Axis points close to δ -Draconis

(Altair), a third magnitude star



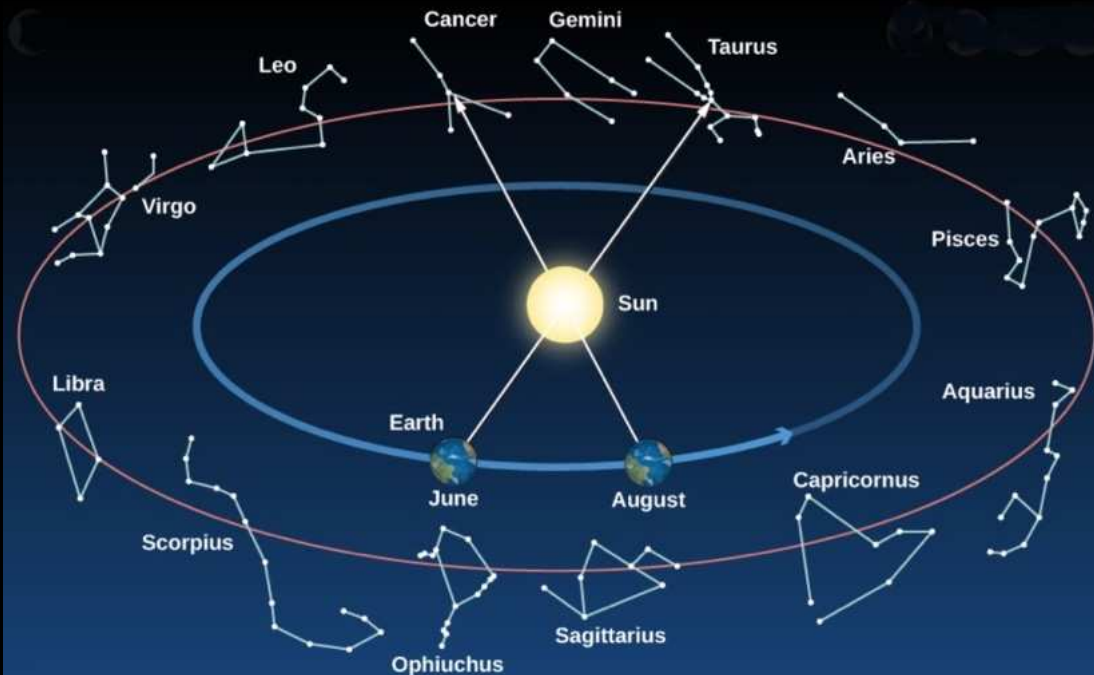
Ecliptic

This is where to find the Sun, Moon and Planets

If you could see the stars when the Sun is out, you would notice that the Sun slowly moves along the same path, through the same constellations, in a year's time, completing a circle that is called the Ecliptic. This is a perspective thing created because the Earth circles the Sun.

All of our **Planets and the Moon** are always very close to the Ecliptic because all of these bodies orbit the Sun in nearly the same plane as Earth.

The Sun passes through the 12 constellations of the **Zodiac**, a band above and below the Ecliptic. Only a section of the ecliptic stretches across the sky each night and its position in the sky changes throughout the night and year.



Where is the Ecliptic?

• Jupiter

• Mars

• Saturn

• Venus

• Mercury



Seeing...

...is a measure of how turbulent/clear the atmosphere appears when viewing celestial objects through a telescope, especially Solar System objects. Our turbulent atmosphere causes momentary to prolonged blurry imagery.

One scale is from 1 to 10 where 10 indicates perfect steadiness.

Another scale is 1 to 5 where 1 is perfect steadiness.

Atmosphere is more turbulent closer you get to the horizon.

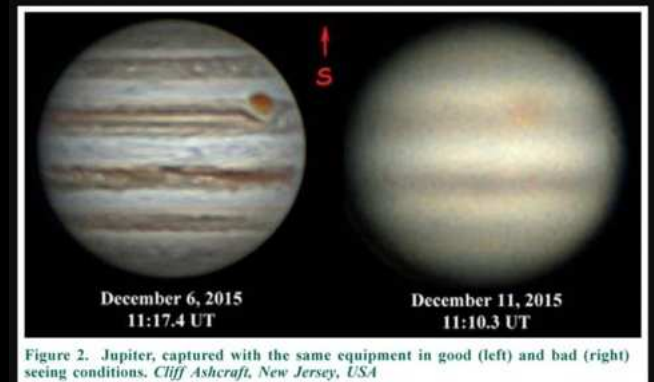


Figure 2. Jupiter, captured with the same equipment in good (left) and bad (right) seeing conditions. Cliff Ashcraft, New Jersey, USA

Usually, we rely on **MOMENTS OF CLARITY** to clearly see details which can be frequent fractions of a second clear imagery.



Hovering the cursor/arrow over the colored squares pops up information.

Cloud cover is reported in 10% increments.

Transparency and Seeing are reported from Good to Average to Poor

Darkness is reported as a limiting magnitude.

cleardarksky.com

Observing the Moon

Note: When viewing a relatively bright Moon through a telescope (not a crescent), you will need to reduce the intensity/brightness of the light by using a light filter or polarizing filters that screw into the bottom of most eyepieces.

In a telescope, when the Moon is bright, it is intense...use a filter to reduce that intensity—a NDF or 2 polarizers.

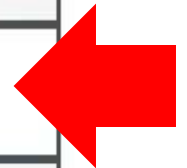


Single Neutral Density Filter

These filters screw into the bottom of any eyepiece.

NDF Numbers and Transmission

Optical Density	ND.number	Fractional Transmittance
0.0		100%
0.3	ND 0.3	50%
0.6	ND 0.6	25%
0.9	ND 0.9	12.5%
1.2	ND 1.2	6.25%
1.5	ND 1.5	3.125%
1.8	ND 1.8	1.563%



Terminator+

Shadows
near the
terminator
(edge)
provides nice
contrast and
great views!

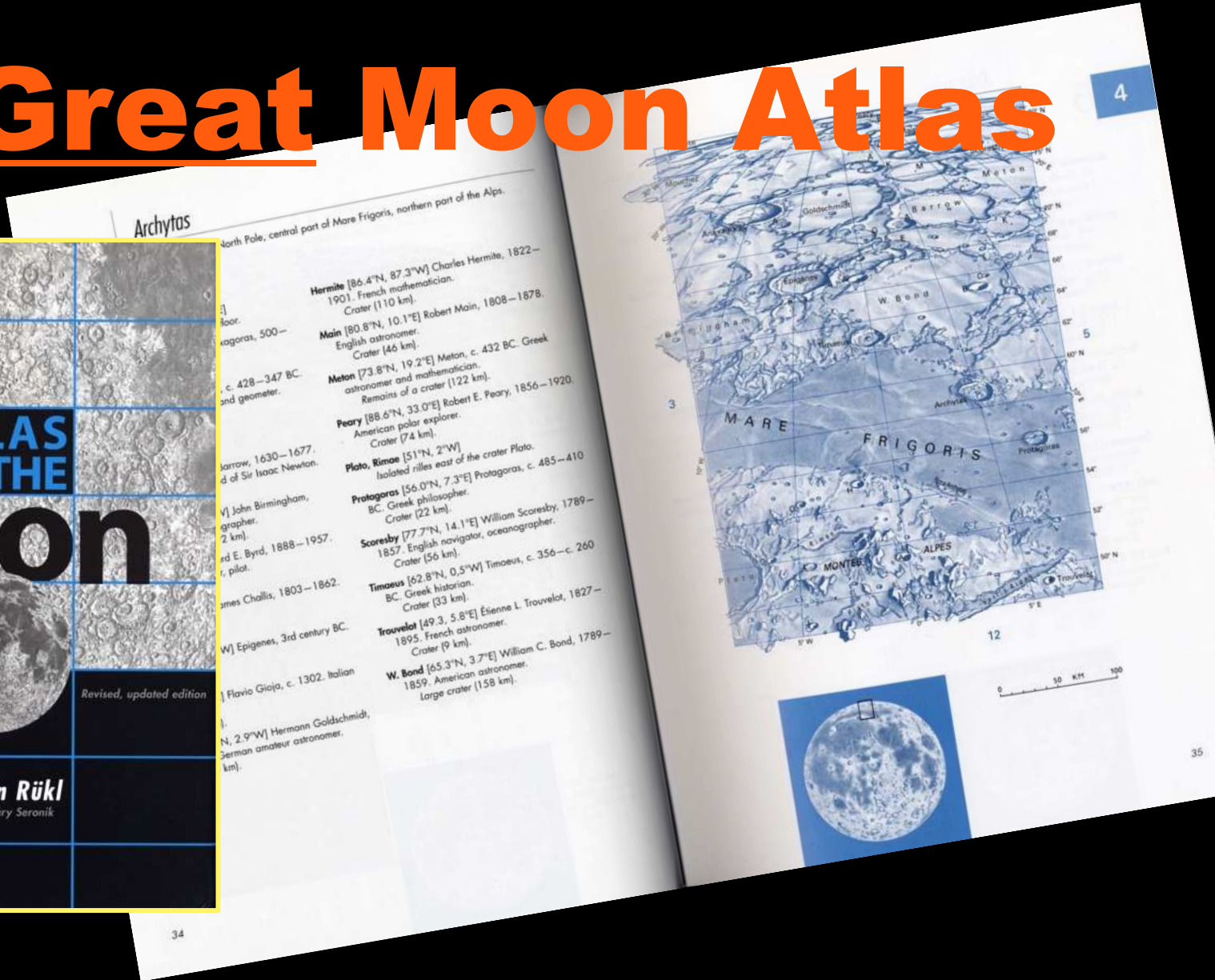
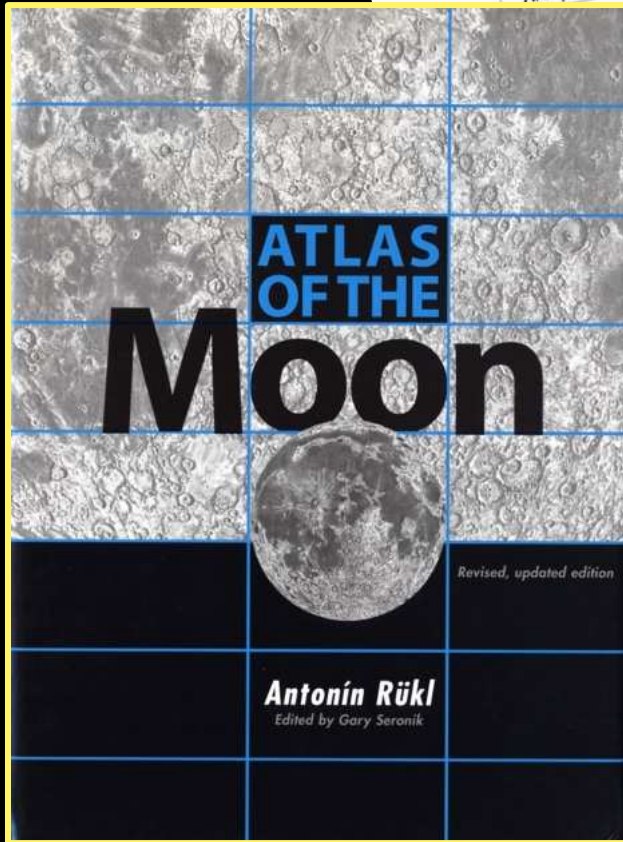
Use higher
magnifications on
steady nights and
enjoy the ride!



Straight
Wall



A Great Moon Atlas



Archytas
North Pole, central part of Mare Frigoris, northern part of the Alps.

Hermite [86.4°N, 87.3°W] Charles Hermite, 1822–1901. French mathematician. Crater (110 km).

Main [80.8°N, 10.1°E] Robert Main, 1808–1878. English astronomer. Crater (46 km).

Meton [73.8°N, 19.2°E] Meton, c. 432 BC. Greek astronomer and mathematician. Remains of a crater (122 km).

Peary [88.6°N, 33.0°E] Robert E. Peary, 1856–1920. American polar explorer. Crater (74 km).

Plato, Rimae [51°N, 2°W] Isolated rilles east of the crater Plato.

Protagoras [56.0°N, 7.3°E] Protagoras, c. 485–410 BC. Greek philosopher. Crater (22 km).

Scoresby [77.7°N, 14.1°E] William Scoresby, 1789–1857. English navigator, oceanographer. Crater (56 km).

Timaeus [62.8°N, 0.5°W] Timaeus, c. 356–c. 260 BC. Greek historian. Crater (33 km).

Trouvelot [49.3, 5.8°E] Étienne L. Trouvelot, 1827–1895. French astronomer. Crater (9 km).

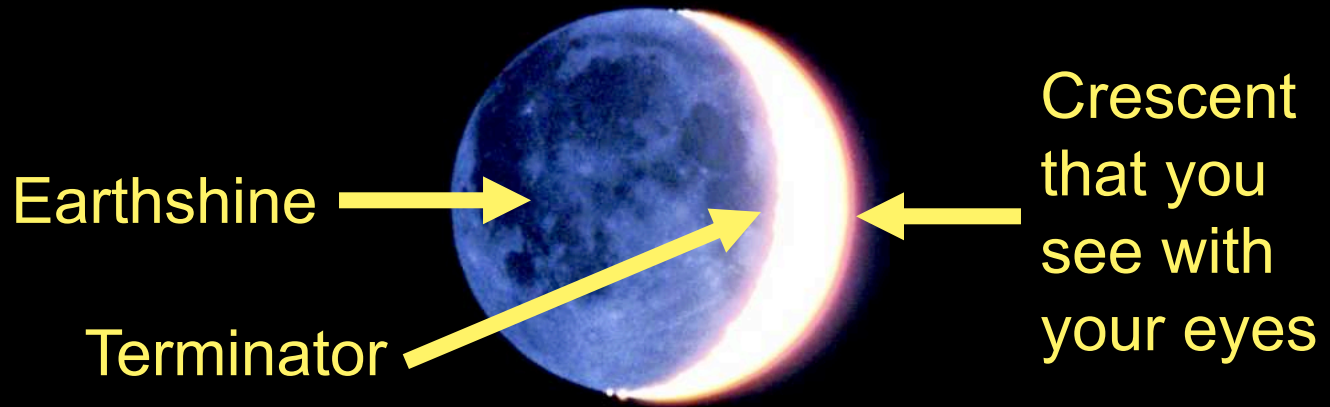
W. Bond [65.3°N, 3.7°E] William C. Bond, 1789–1859. American astronomer. Large crater (158 km).

Flavio Gioja, c. 1302. Italian

Hermann Goldschmidt, [N, 2.9°W] Hermann Goldschmidt, German amateur astronomer. (km).

VDOC.PUB for a free PDF download

Waxing Crescent



Lunar Eclipse





Lunar Halo

High cirrus clouds,
containing tiny ice
crystals refract
Moonlight similar to
water droplets
creating a rainbow.

Observing the Planets

SS Observing Tips

- 1 Cities and Light Pollution no problem.** You can observe the Moon and planets in large cities—light pollution is not a hindrance—dark adapted eyes is not required. As long as you can see your target, the view through the telescope should be fine.
- 2 Best Higher Up.** The Moon and planets will look their best through a scope starting about $\frac{1}{4}$ of the way up the sky from the horizon. The atmosphere around the horizon is very thick which means that there is a lot more turbulence in it—it's rare to have good imagery here.
- 3 Magnification.** The Moon and planets can take a lot of magnification, but a turbulent atmosphere can limit this severely—sometimes using more than 100x is useless.
- 4 More is Better!** The more you observe, the greater chance of hitting a good night with good seeing.
- 5 Moments of Clarity** is what you normally get for clear views of the Moon or planets.

Not really needed.



Color Filters for observing the Planets

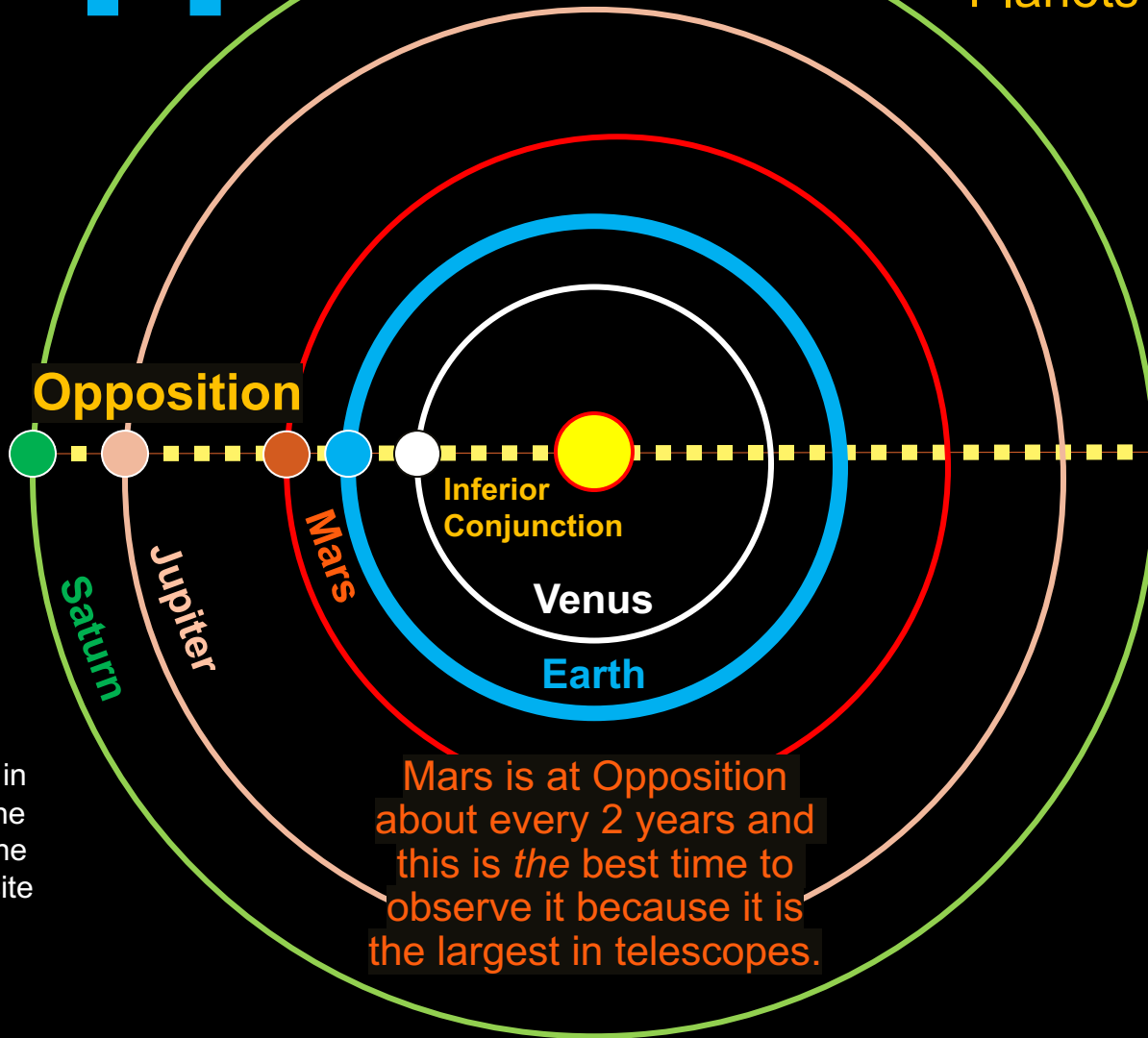
But the decision
remains with you.

Opposition+

Favorable times to Observe the Planets

Superior planets are closest to Earth and thus appear their largest at Opposition

A planet is at **Opposition** when it rises in the east as the Sun sets in the west—opposite the Sun.



Mars is at Opposition about every 2 years and this is *the* best time to observe it because it is the largest in telescopes.

**MARS 2022
Opposition
December 8**
Mars reaches opposition on 8 December 2022. The planet will present with a maximum apparent size of 17.2 arcseconds
Magnitude -1.9

Phases of Venus

Magnitude -2.98 to -4.92 — always the brightest “star” in the sky



Will cast shadows and can get “eerily” bright.

Mars

Magnitude +1.86 to -2.94
Diameter 4,200 miles
Distance 142 million miles

*Comes close
every 2 years*



E

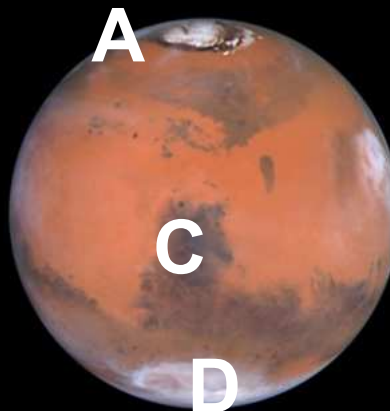
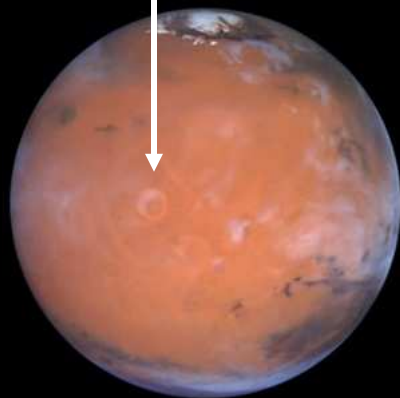
E

A

C

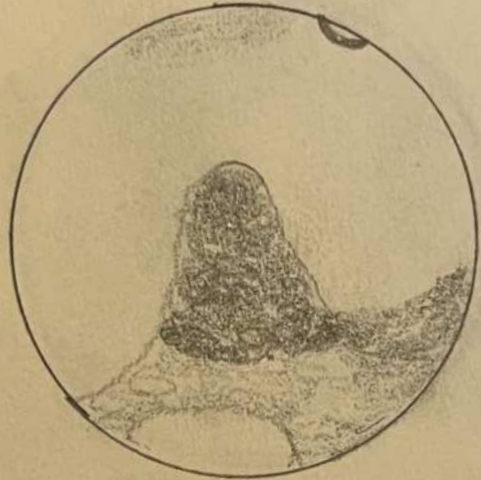
D

- A. North Polar Cap
- B. Southern Polar Cap
- C. Syrtis Major
- D. Hellas
- E. Olympus Mons
- F. Clouds



DAILY ROTATION

Mars Drawing



JUNE 14, 2001

1:00 - 1:15 AM

seeing 5/10

central Meridian 288°

Mars Facts

**MARS 2022
Opposition
December 8**
Mars reaches
opposition on 8
December 2022.
The planet will
present with a
maximum apparent
size of 17.2
arcseconds
Magnitude -1.9

Real Estate

The total surface area of Mars is the same as the total land area on Earth.

Atmosphere

Mostly Carbon Dioxide and at a surface pressure 1/100 that of Earth or an altitude of 20 miles on Earth. Jets fly around 7 miles.

Uniques

Largest inactive volcano and grand canyon in SS.
(Olympus Mons—Caldera 50 miles & Valles Marineris—2500 miles)

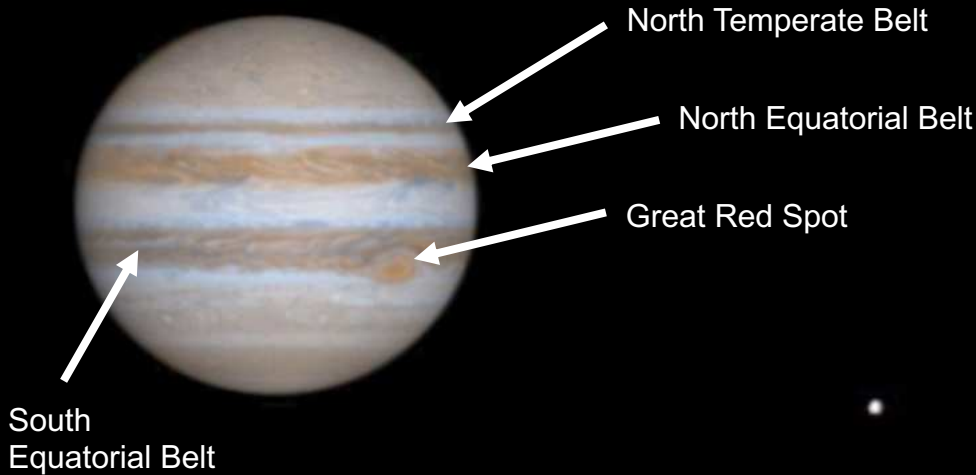
Martians?

None found yet but maybe microbes deeper in the soil.

Jupiter

Magnitude -1.66 to -2.94
Diameter 87,000 miles
Distance 484 million miles

Belts, Great Red Spot, and 4 Galilean Moons



You can see the Galilean moons in well-focused binoculars!

Moons & Diameters

J I • Io 2,255

J II • Europa 1,950

J III • Ganymede 3,270

J IV • Calisto 2,980

Ganymede is the largest moon in the solar system

Transits & Occultations



Jupiter Facts

The King

Jupiter, the planet, was named after the king of the gods, not because it was the brightest planet but because it was the second brightest and unlike Venus, can be seen all night long.

Galilean moons—almost not!

Galileo first proposed to name the 4 Galilean moons of Jupiter, *The Medicean Stars*, after his patron, a Medici.

Jupiter is NOT a failed Sun!

It would take about 80 Jupiter masses to make the smallest star, a red-dwarf.

The Great Red Spot

may have been observed as early as 1665.

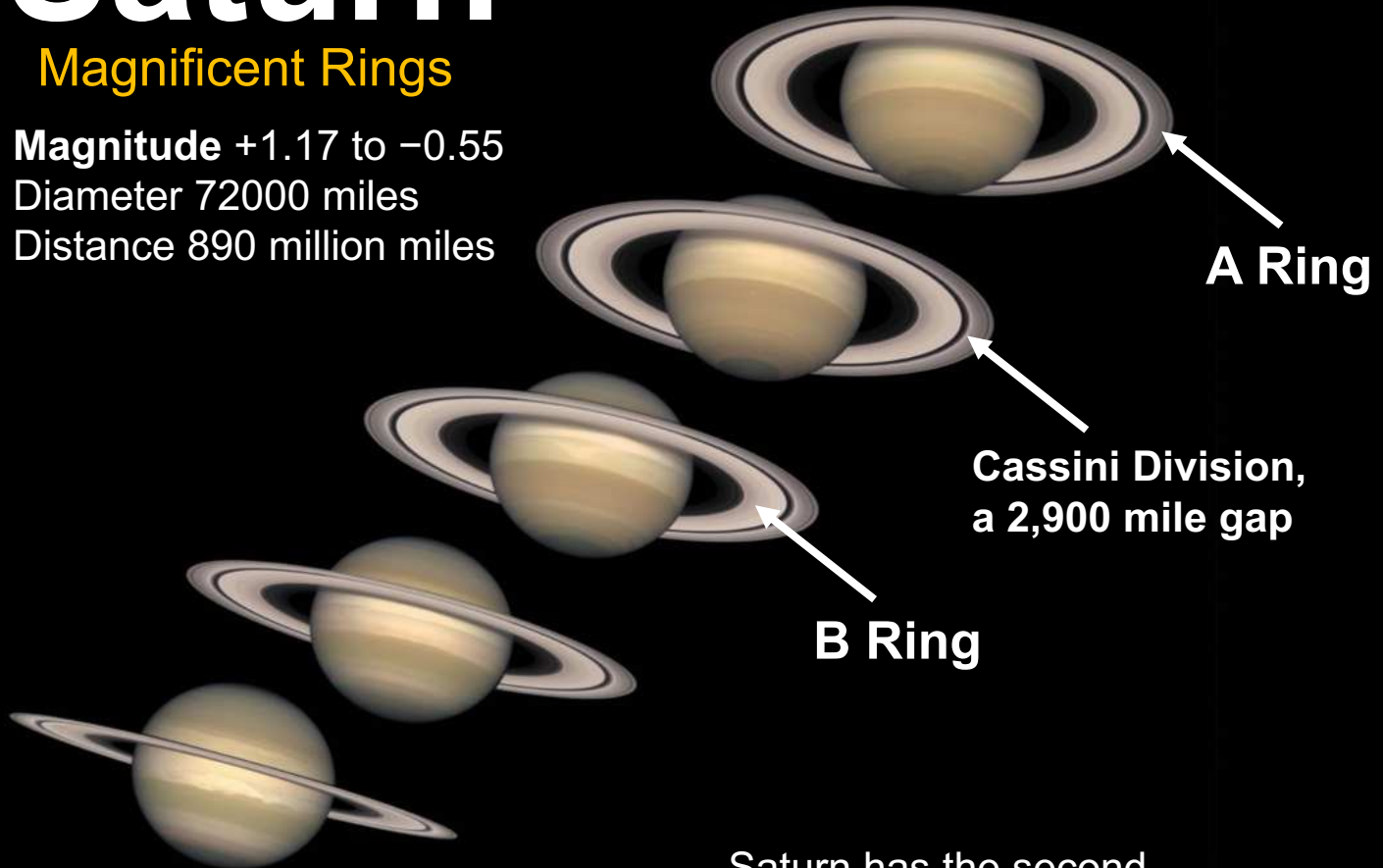
Saturn

Magnificent Rings

Magnitude +1.17 to -0.55

Diameter 72000 miles

Distance 890 million miles



A Ring

**Cassini Division,
a 2,900 mile gap**

B Ring

Saturn has the second largest moon in the solar system, Titan, at 3,200 miles in diameter.

Saturn Facts

Rings

Magnificent! But, all 4 of the gas giants have rings.
Saturn's made mostly of water ice, many the size of ice cubes.
No good theory on formation.

Floats

Yes, all school kids know that Saturn could float in a big ocean.

In Mythology

Saturn is a Roman god known as Cronus in Greek mythology.
He was considered the god of sowing or seed for agriculture.

Titan

Second largest moon in the solar system. Has an atmosphere of methane. Spacecraft landed on this moon.



Mercury

Pluto

