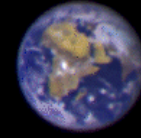


A composite image showing the Earth on the left and the Moon on the right against a black background. The Earth is partially visible, showing blue oceans, white clouds, and brown landmasses. The Moon is a smaller, grey, cratered sphere in the lower right.

The Moon

A look at our nearest
neighbor in Space!

What is the Moon?



- A natural satellite
- One of more than 96 moons in our Solar System
- The only moon of the planet Earth



Location, location, location!



- About 384,000 km (240,000 miles) from Earth
- 3,468 km (2,155 miles) in diameter (about $\frac{1}{4}$ the size of Earth)

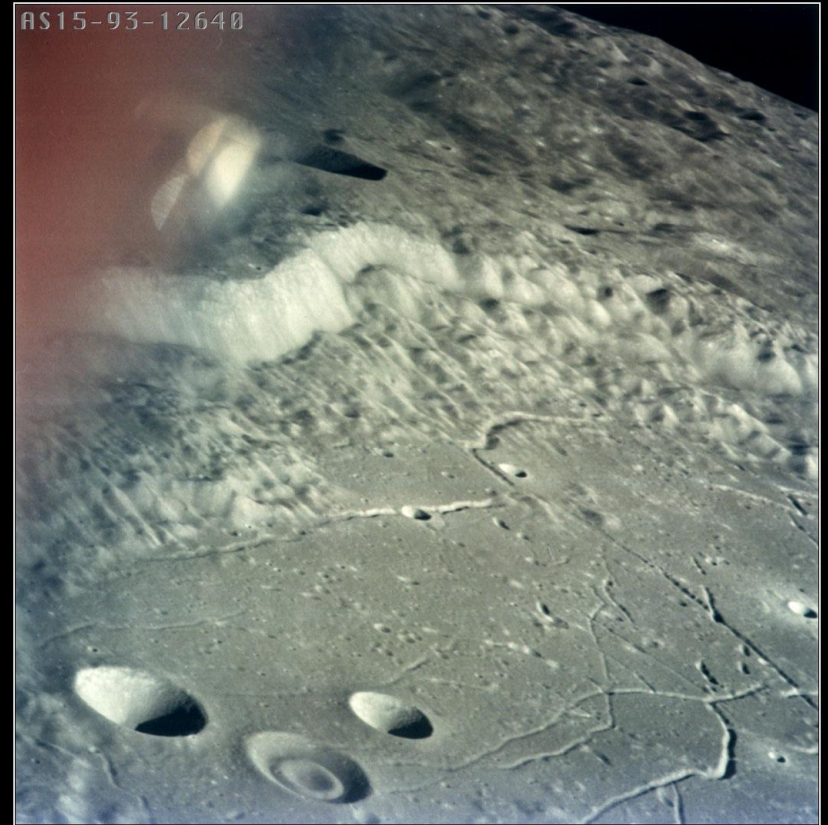
The Moon's Surface



- No atmosphere
- No liquid water
- Extreme temperatures
 - Daytime = 130°C (265°F)
 - Nighttime = -190°C (-310°F)
- $1/6$ Earth's gravity

Lunar Features - Highlands

- Mountains up to 7500 m (25,000 ft) tall
- Rilles (trenchlike valleys)



Lunar Features - Craters

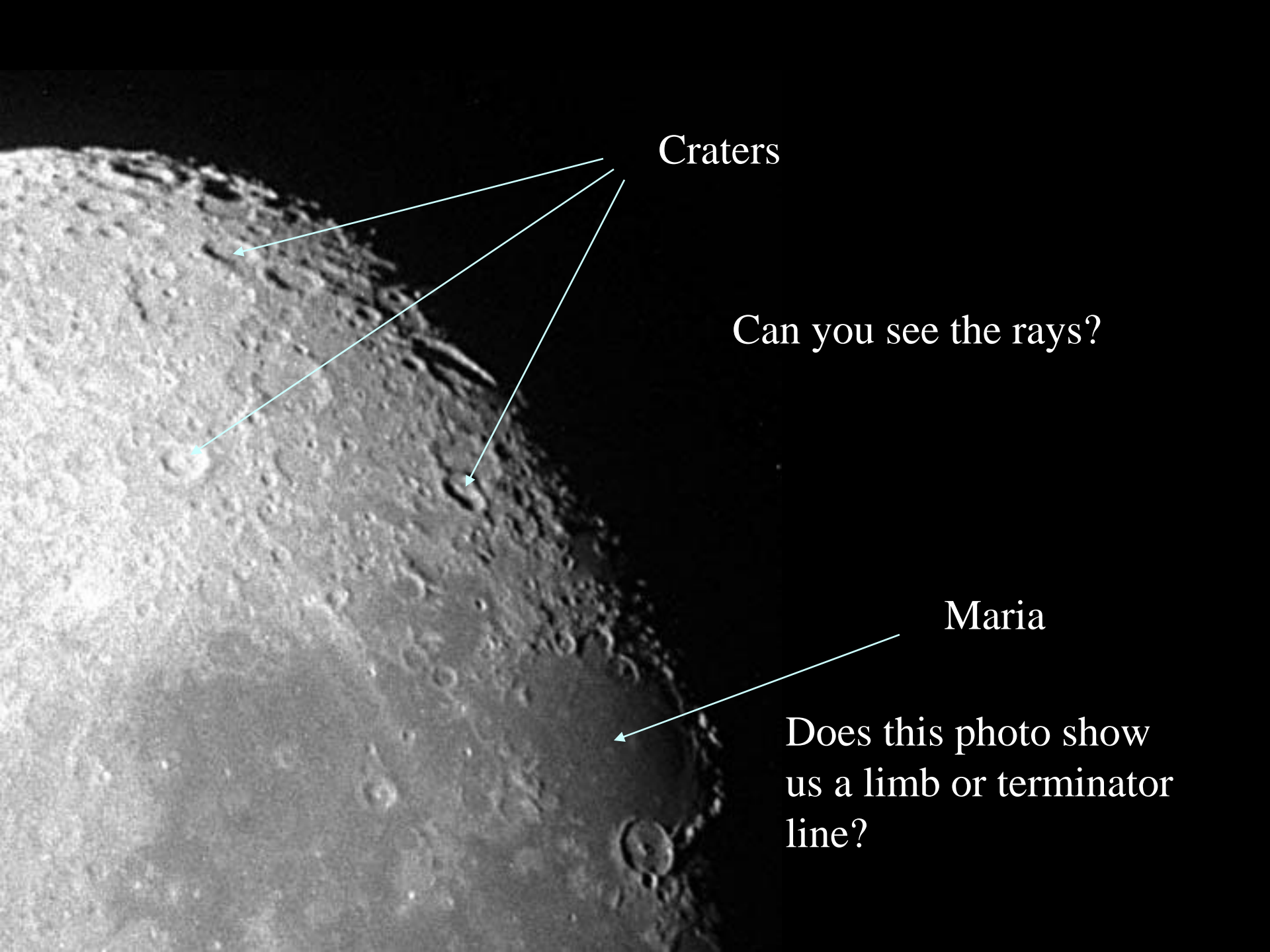
- Up to 2500 km (1,553 miles) across
- Most formed by meteorite impact on the Moon
- Some formed by volcanic action inside the Moon



Lunar Features - Maria

- Originally thought to be “seas” by early astronomers
- Darkest parts of lunar landscape
- Filled by lava after crash of huge meteorites on lunar surface 3-4 billion years ago
- Mostly basalt rock





Craters

Can you see the rays?

Maria

Does this photo show
us a limb or terminator
line?

Movements of the Moon



- Revolution – Moon orbits the Earth every $27\frac{1}{3}$ days
- The moon rises in the east and sets in the west
- The moon rises and sets 50 minutes later each day
- Rotation – Moon turns on its axis every 27 days
- Same side of Moon always faces Earth

Far Side of the Moon

- First seen by Luna 3 Russian space probe in 1959
- Surface features different from near side
 - More craters
 - Very few maria
 - Thicker crust



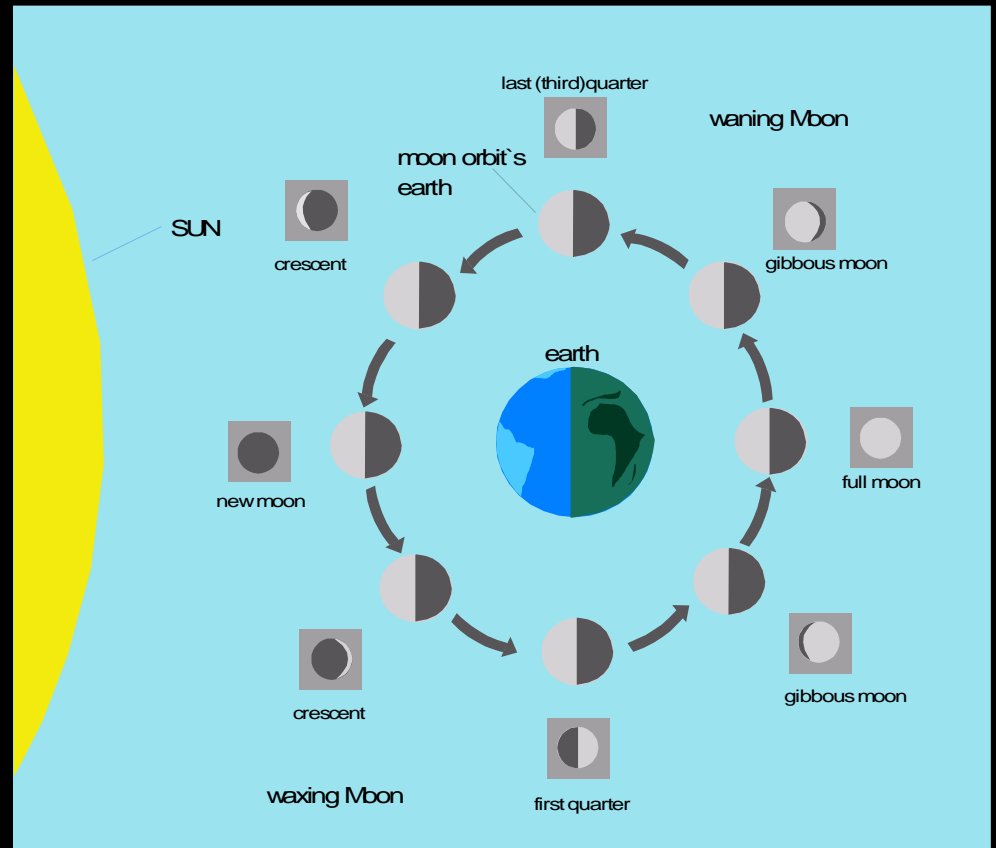


It's Just a Phase

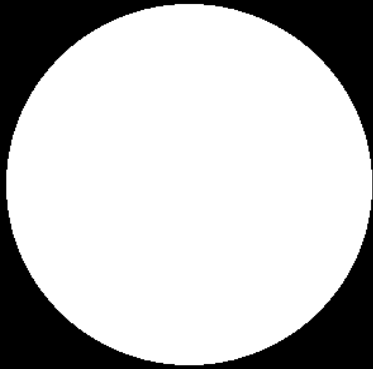
- Moonlight is reflected sunlight
- Half the moon's surface is always reflecting light
- From Earth we see different amounts of the Moon's lit surface
- The amount seen is called a "phase"

Waxing and Waning

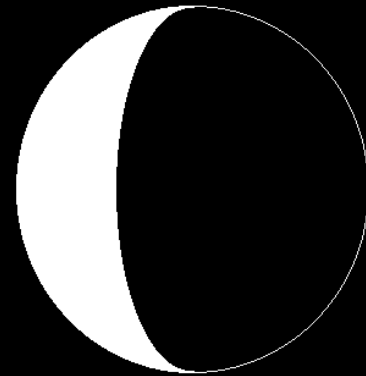
- New moon
- Waxing Crescent moon
- First Quarter moon
- Waxing Gibbous moon
- Full moon
- Waning Gibbous moon
- Third Quarter moon
- Waning Crescent moon
- New moon



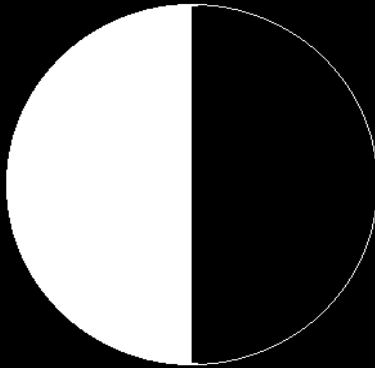
FOUR MAIN SHAPES



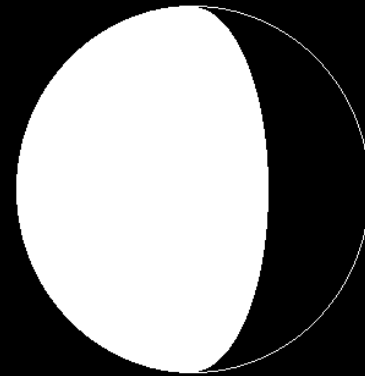
FULL



CRESCENT

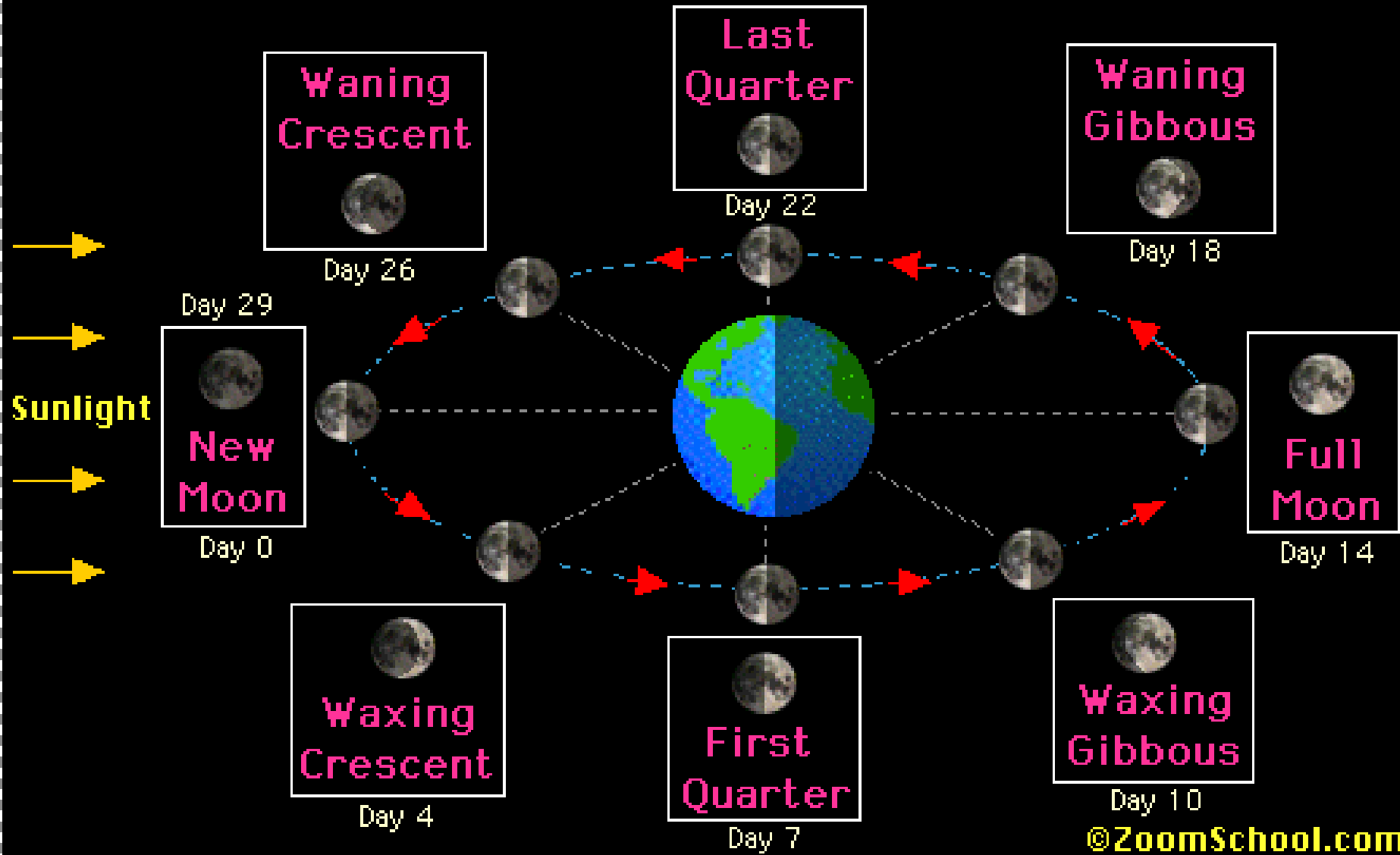


QUARTER



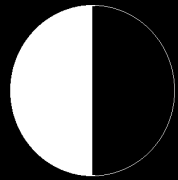
GIBBOUS

The Phases of the Moon



Earth

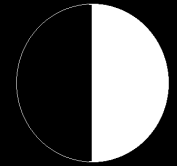
Plane of earth's orbit



Moon



Moon



Plane of lunar orbit

©2004 K
BOO LLC
September 2, 1994
Bill Vande
Jenny Vande

Lunar Eclipses



©2000 J.C. Casale

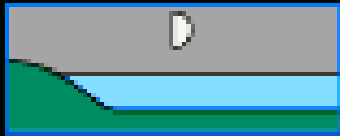
- Moon moves into Earth's shadow – this shadow darkens the Moon
 - Umbra
 - Penumbra
- About 2-3 per year
- Last up to 4 hours

Solar Eclipses

- Moon moves between Earth and Sun
- Moon casts a shadow on part of the Earth
- Total eclipses rare – only once every 360 years from one location!



The Tides

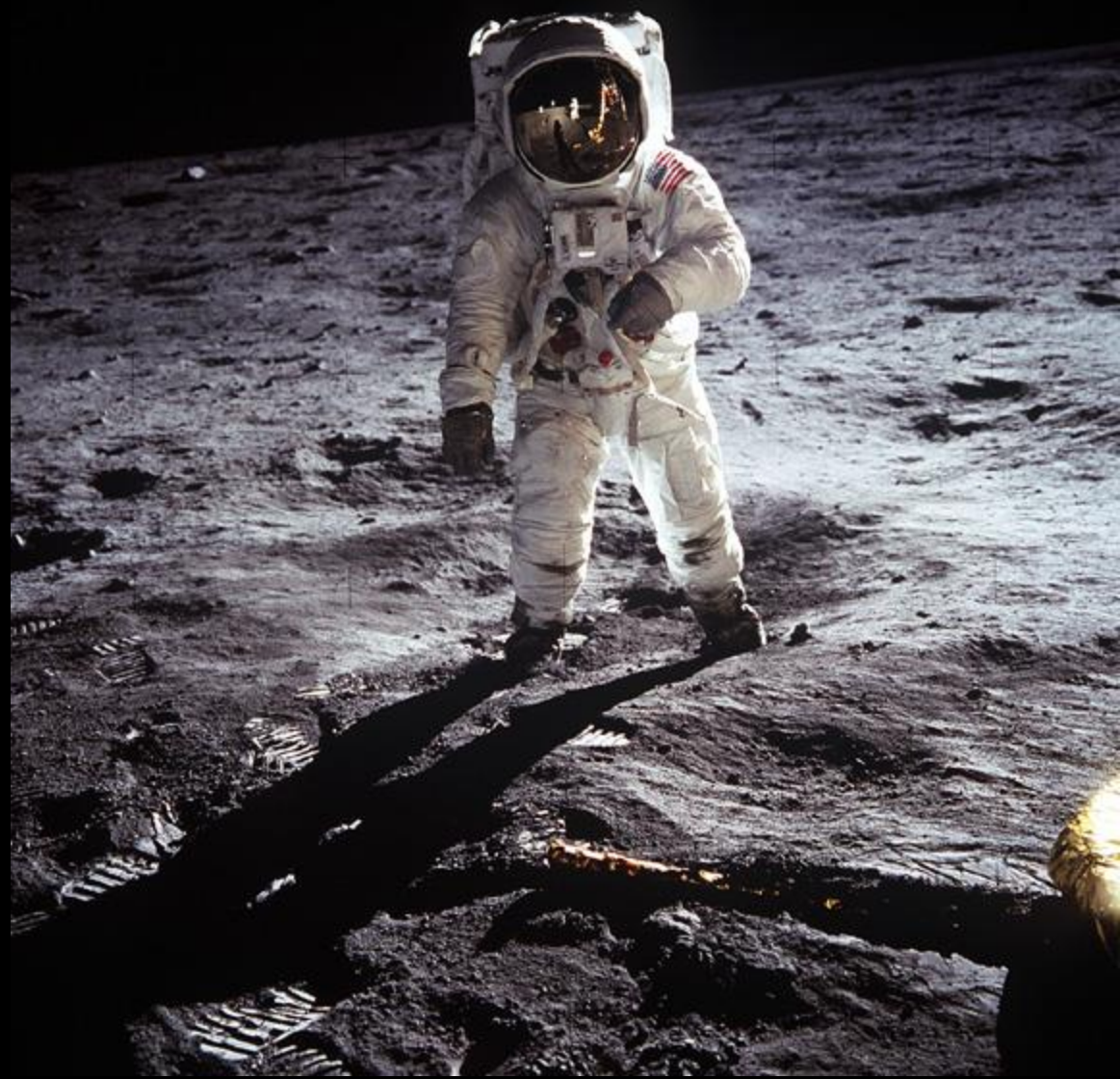


- Tides caused by pull of Moon's gravity on Earth
- High tide –
 - Side facing Moon and side away from Moon
 - Every 12 hours, 25 ½ minutes
- Low tide –
 - On sides of Earth

Exploring the Moon

- 1950s to 1960s - probes
- Neil Armstrong
First man on the Moon
– July 20, 1969
- Six Apollo missions (1969-1972)
 - 382 kg (842 lbs) rocks
- 12 Americans have walked on the moon

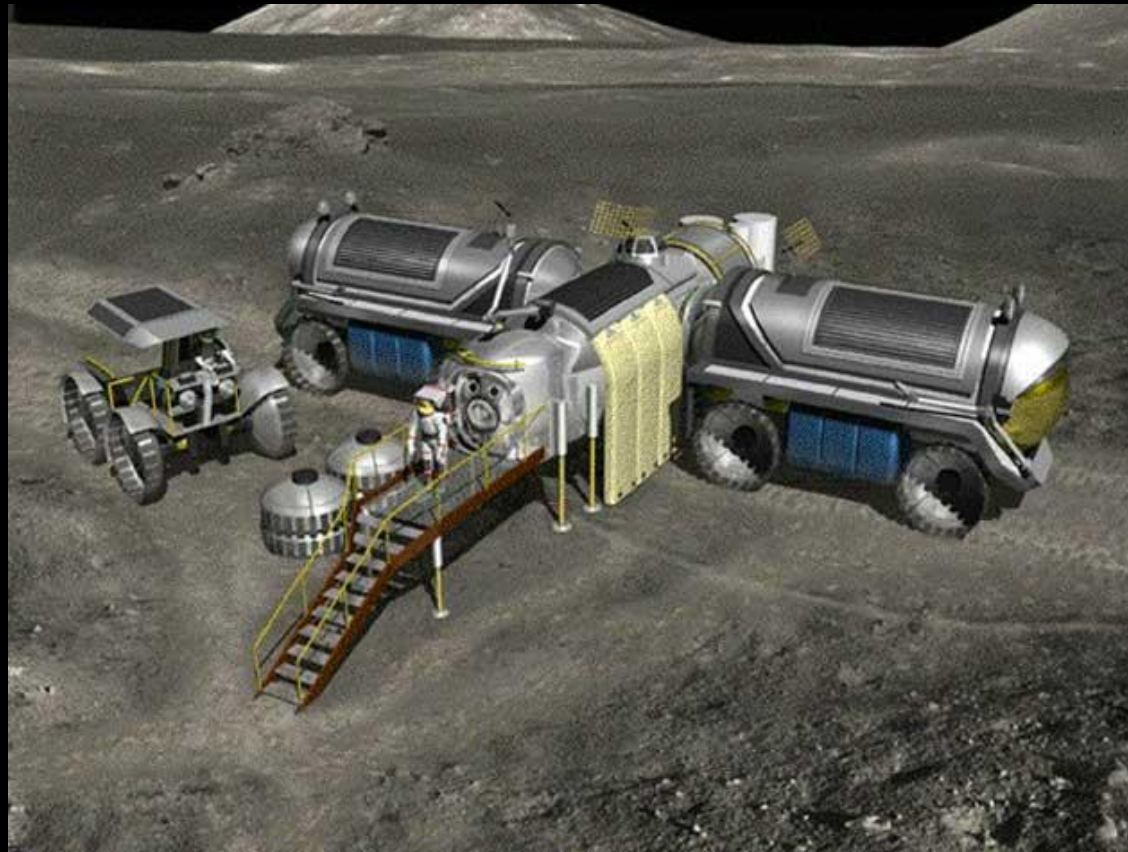






When will we return?

Moon base of the future?



- What would you need to live there?

The Lunar Challenge



Day 8 Moon 18-6-02

Name this phase!



Full Moon

What time does this phase rise and set?



Craters

Name these features.

Maria

Name these features.

Does this image show us the near side or far side of the moon?



Far Side

How can you tell?

Is this line the limb or terminator?

Limb

Terminator

Is this line the limb
or terminator?






Name this phase!

First Quarter

A photograph of a waxing crescent moon, showing a thin, bright arc of light against a dark, black background. The moon's surface is covered in numerous small, dark spots representing craters. The lighting is from the right, creating a bright, glowing edge on the right side of the crescent.

Name this phase!

Waxing Crescent

A full moon is shown against a black background. The moon's surface is covered in numerous craters of various sizes and darker, smoother regions known as maria. The lighting is from the upper left, creating a slight gradient across the surface.

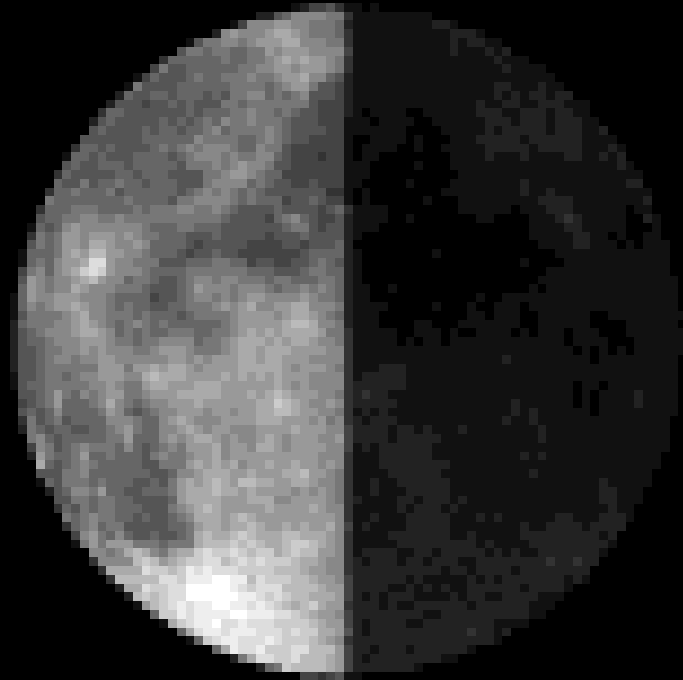
Does this image show the near side or the far side of the moon?

Near Side



Name this phase!

**Waning
Gibbous**



Name this
phase!

Third Quarter

From what direction does
the moon rise?

The East



©1998 F. Espenak

Name this phase!



Day 8 Moon 18-6-02

Waxing Gibbous

A thin, bright crescent moon is shown against a black background. The moon is positioned vertically, with its curved edge facing left. The text is overlaid on the right side of the moon's curve.

Name this phase!

Waning Crescent

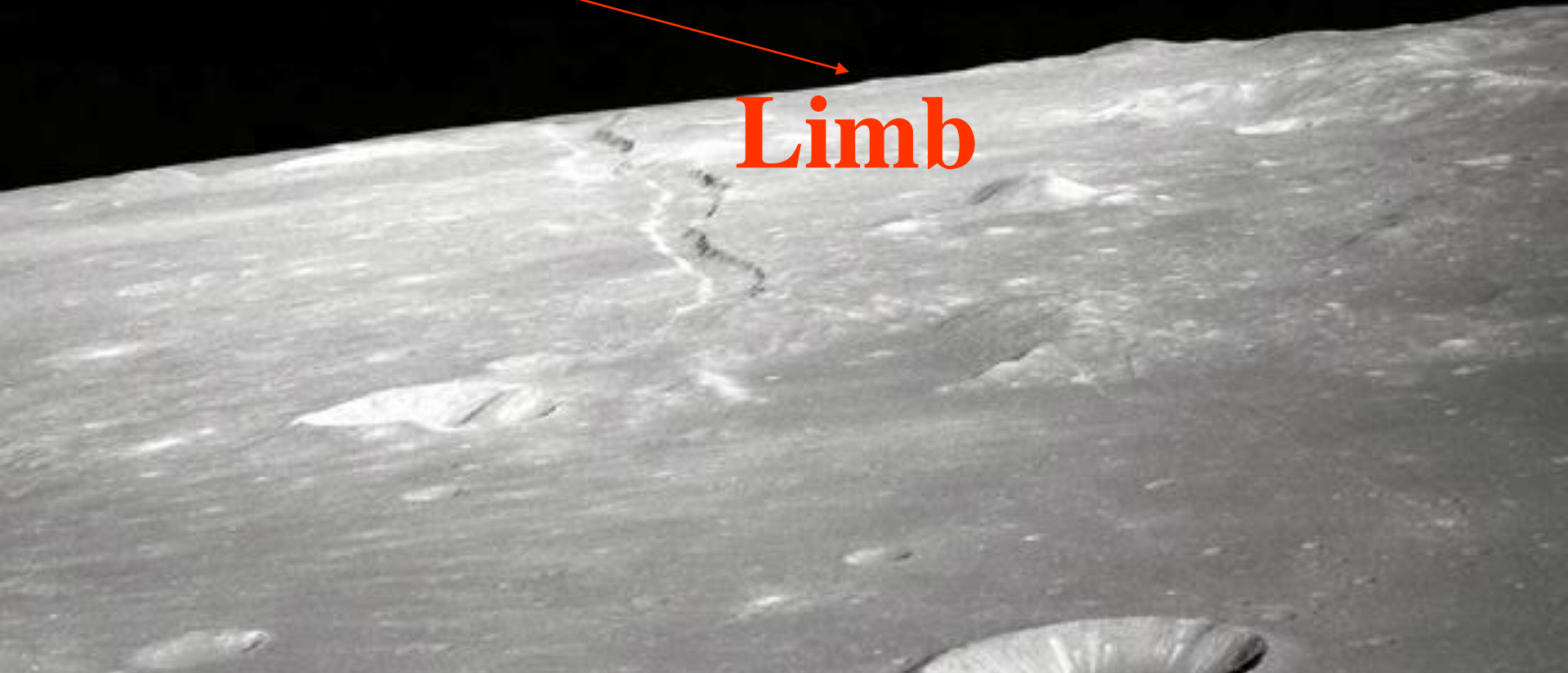
What might be happening in this image?



Lunar Eclipse

Is this line the limb or
the terminator?

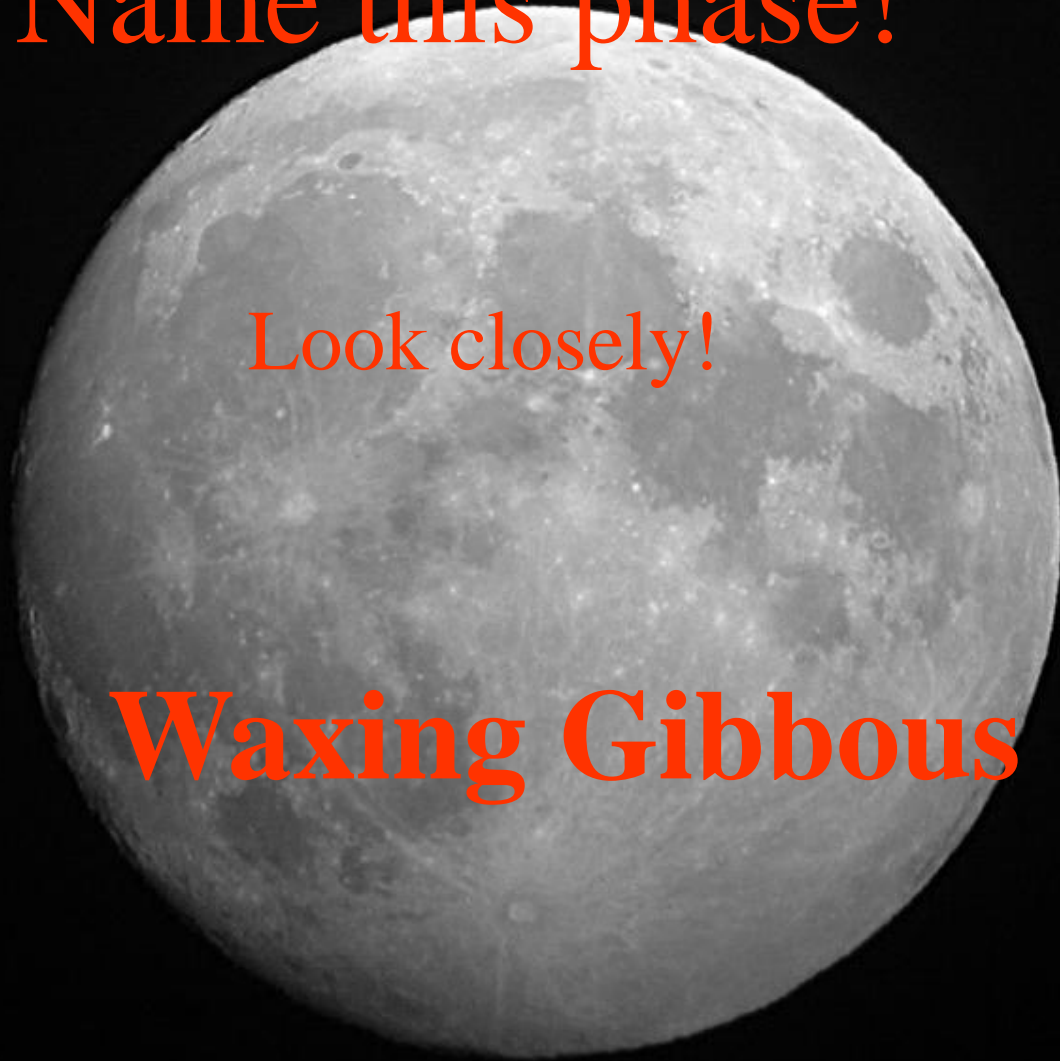
Limb



Name this phase!

Look closely!

Waxing Gibbous



True or False:

The Far Side and the
Dark Side of the moon
are the same thing.

False!



Name this phase!



Full Moon

Name this phase!

New Moon

Does the moon rise or set in the west?

It sets in the west.





Name this phase!

Waning Gibbous



Name this
phase!

Waning Crescent

Name this phase!



Waning Gibbous

The Mythical Moon



© David Miller/DMI







© David Miller/DMI



© David Miller/DMI





© David Miller/DMI



© David Miller/DMI





© Willie Holdman



The Lunatic: Leesa Hubbard

Photo resources

<http://www.nasm.si.edu/apollo/AS15/a15images.htm>

http://nssdc.gsfc.nasa.gov/photo_gallery/photogallery-moon.html#apollo

<http://clementine.cnes.fr/index.en.html>

<http://cass.jsc.nasa.gov/pub/research/clemen/clemen.html>

<http://spaceflightnow.com/news/n0108/15mooncreate/>

<http://seds.lpl.arizona.edu/nineplanets/nineplanets/pxmoon.html>

More photo resources

http://www.nrl.navy.mil/clementine/clemovies/clemovies_index.html

<http://www.solarviews.com/eng/moon.htm>

<http://news.bbc.co.uk/1/hi/sci/tech/620649.stm>

http://skyandtelescope.com/observing/objects/eclipses/article_99_1.asp

<http://lunar.arc.nasa.gov/results/ice/eureka.htm>

http://www.space.com/scienceastronomy/solarsystem/moon_nss_020604.html