INTERMEDIATE SCIENCE 9

UNIT 1: SPACE

CHAPTER 1: SPACE EXPLORATION

INTERMEDIATE SCIECNE 9

- **Unit 1: Space**

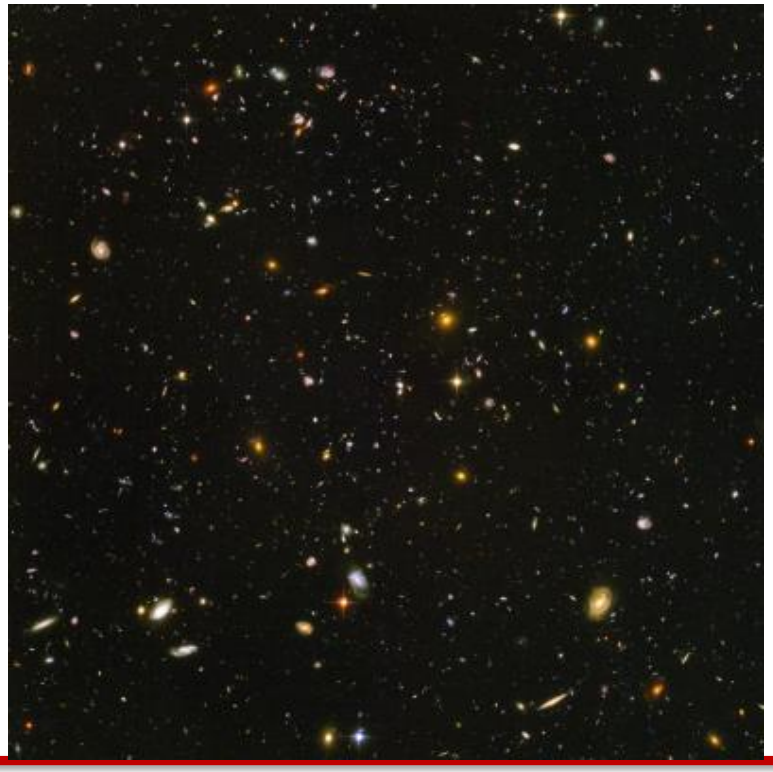
SECTION 1: INTRODUCTION TO SPACE

What is Astronomy?

- **Astronomy** refers to a branch of science that deals with celestial objects, space, and the universe as a whole.

What is the Universe?

- **Universe** contains space and *celestial bodies*

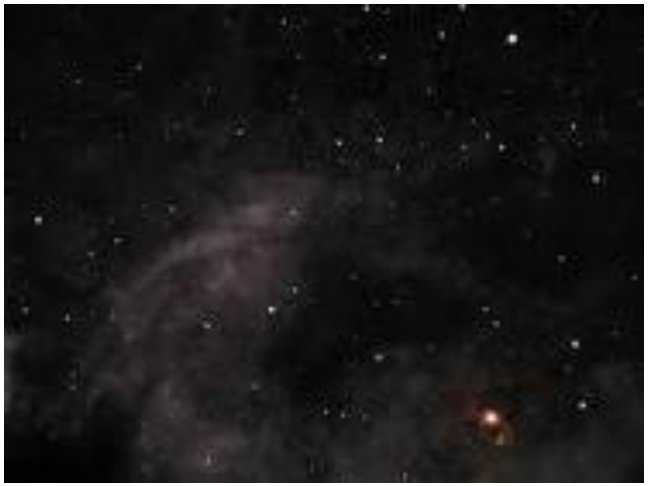


MOVIE

- THE KNOWN UNIVERSE BY AMNH

What is Space?

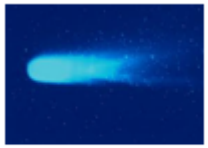
- **Space** refers to the vacuum beyond the Earth's atmosphere.



What is a Celestial body?

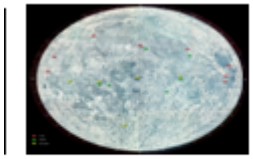
- **Celestial body** is any natural body outside of the Earth's atmosphere such as planet, a moon , a comet, an asteroid or a star.

Planets



comet

star



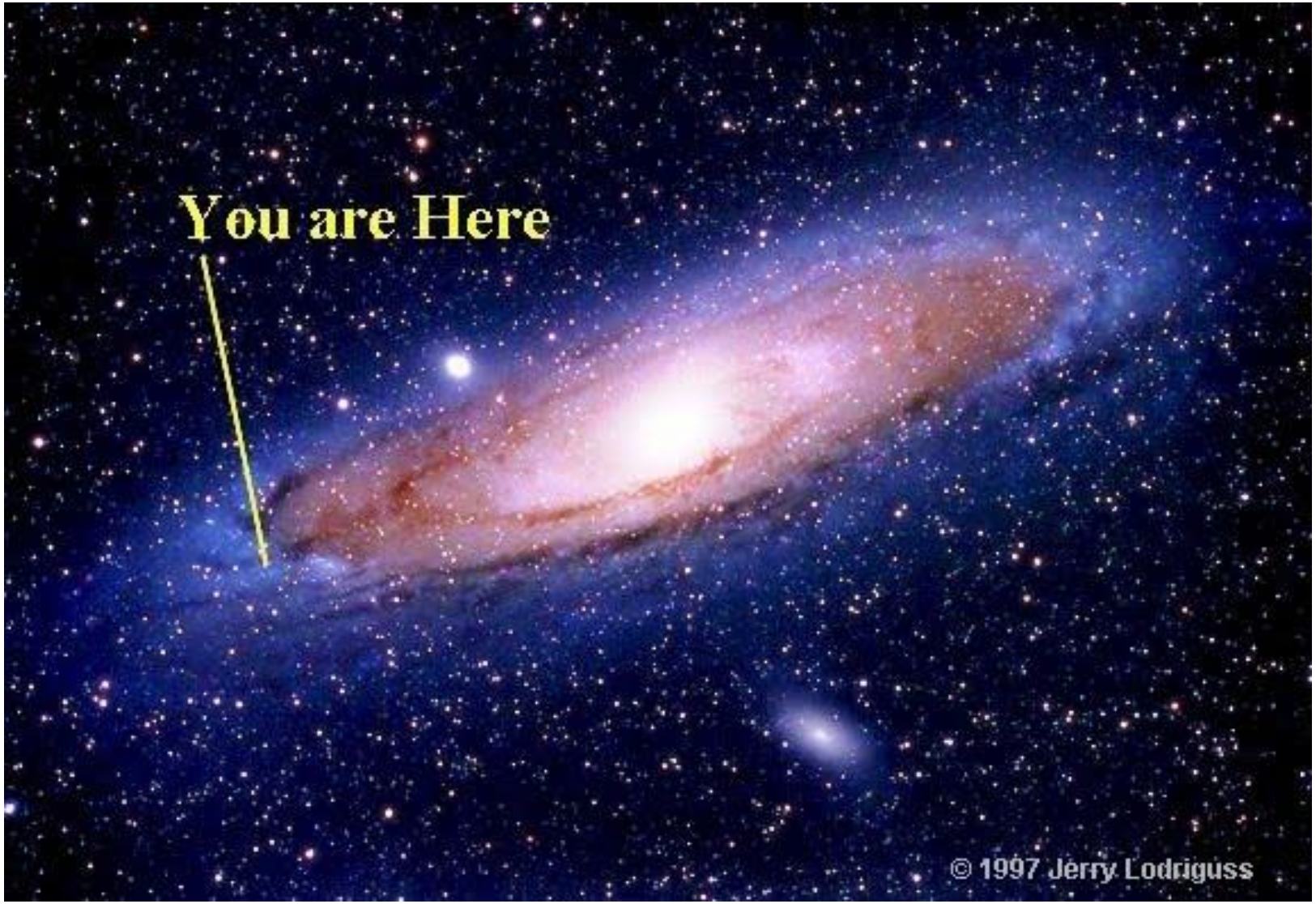
moon

asteroid

What is a Galaxy

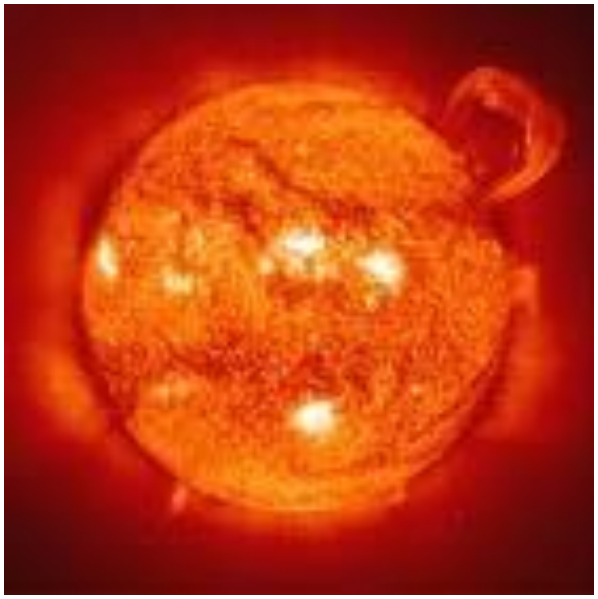
- **Galaxy** is an enormous collection of gases, dust, and billions of stars held together by gravity.

Milky Way Galaxy: Contains 200 to 400 billion stars


You are Here
© 1997 Jerry Lodriguss

What is a Star

- **Star** refers to a celestial body of hot gases with a nuclear furnace at its core. Therefore, it gives off light and heat.



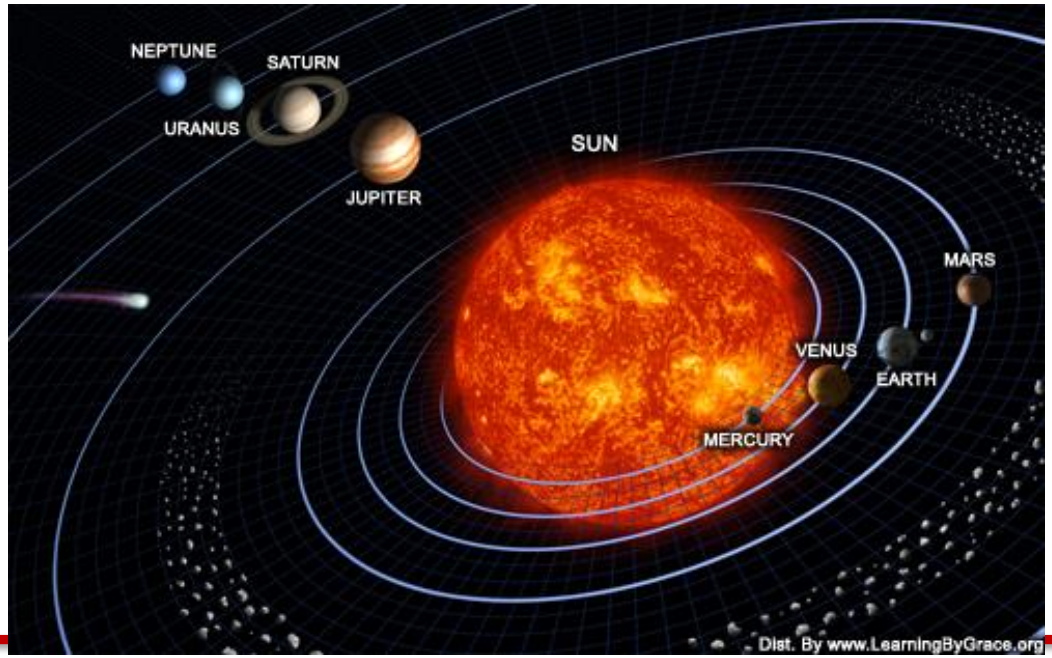
Our Sun is one of the billions of stars that make up the Milky Way.

What is a Planet

- **Planet** refers to a celestial body moving in an elliptical orbit around a star

What is a Solar System

- **Solar System** is everything that centers around the sun. That includes eight planets as well as some smaller objects such as asteroids, comets and meteoroids.



“What I Know - Want to Know - Learned”

What do you know or want to learn about the solar system and stars in this unit.

INTERMEDIATE SCIECNE 9

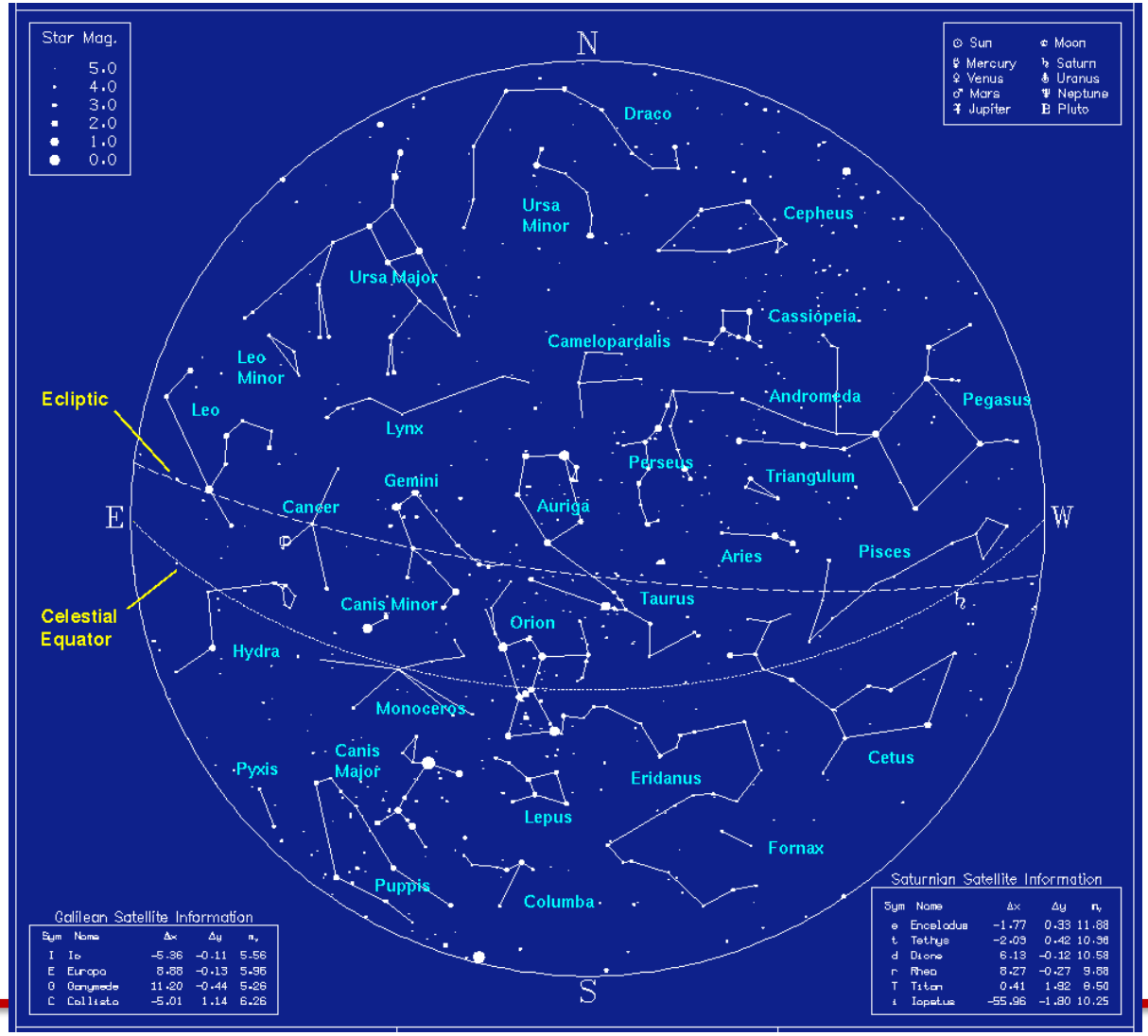
- **Unit 1: Space**

SECTION 2: CONSTELLATIONS

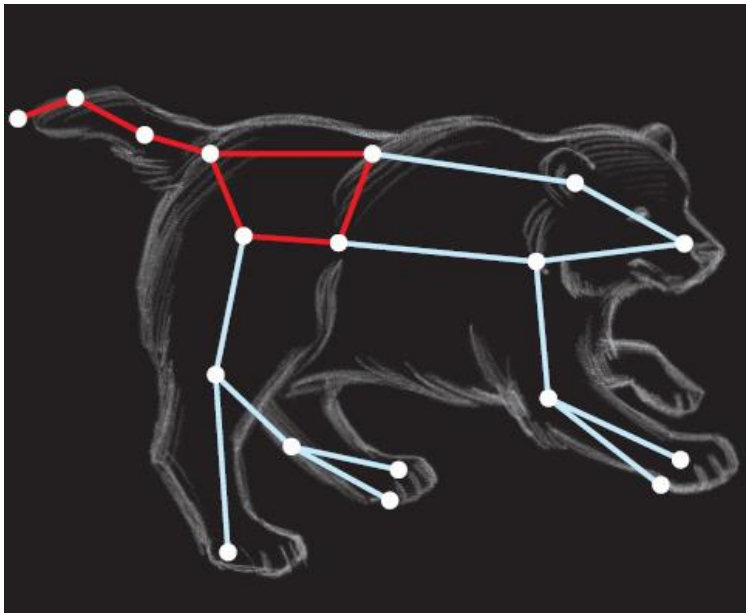
Constellations

- Constellation refers to a distinctive pattern in the night sky formed by a group of stars; the pattern often looks like a familiar object, such as an animal.

The International Astronomical Union lists 88 constellations.



Ursa Major, the Great Bear

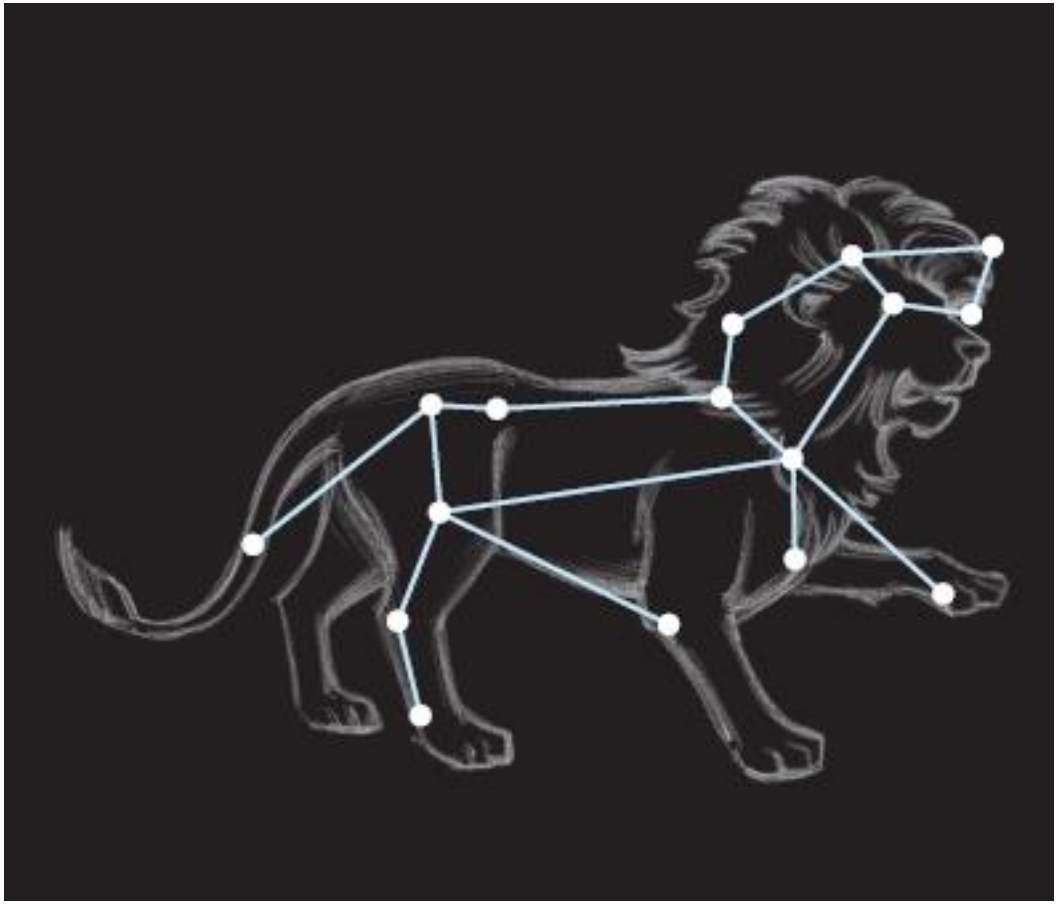


Ursa means bear in Latin

Cassiopeia the Queen,

Orion the Hunter

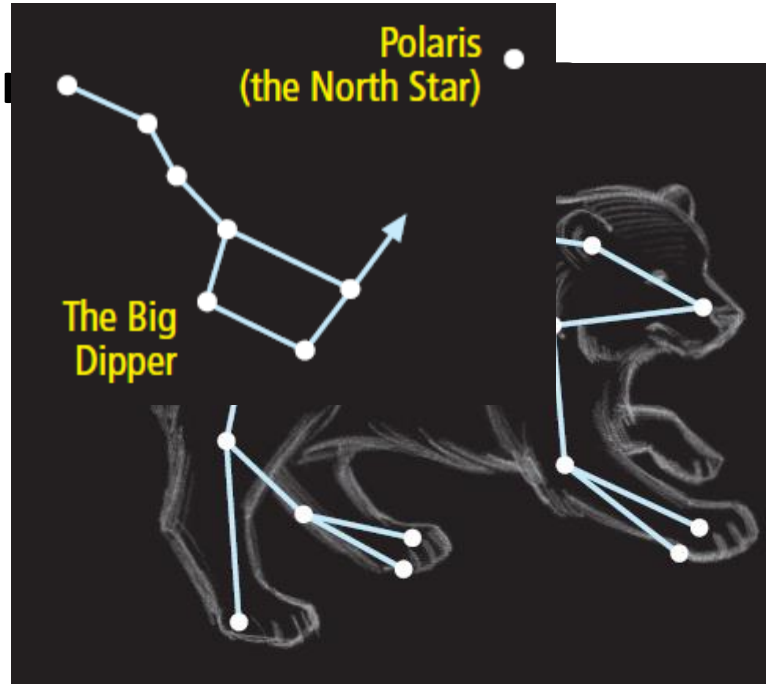
Leo the Lion



Asterisms

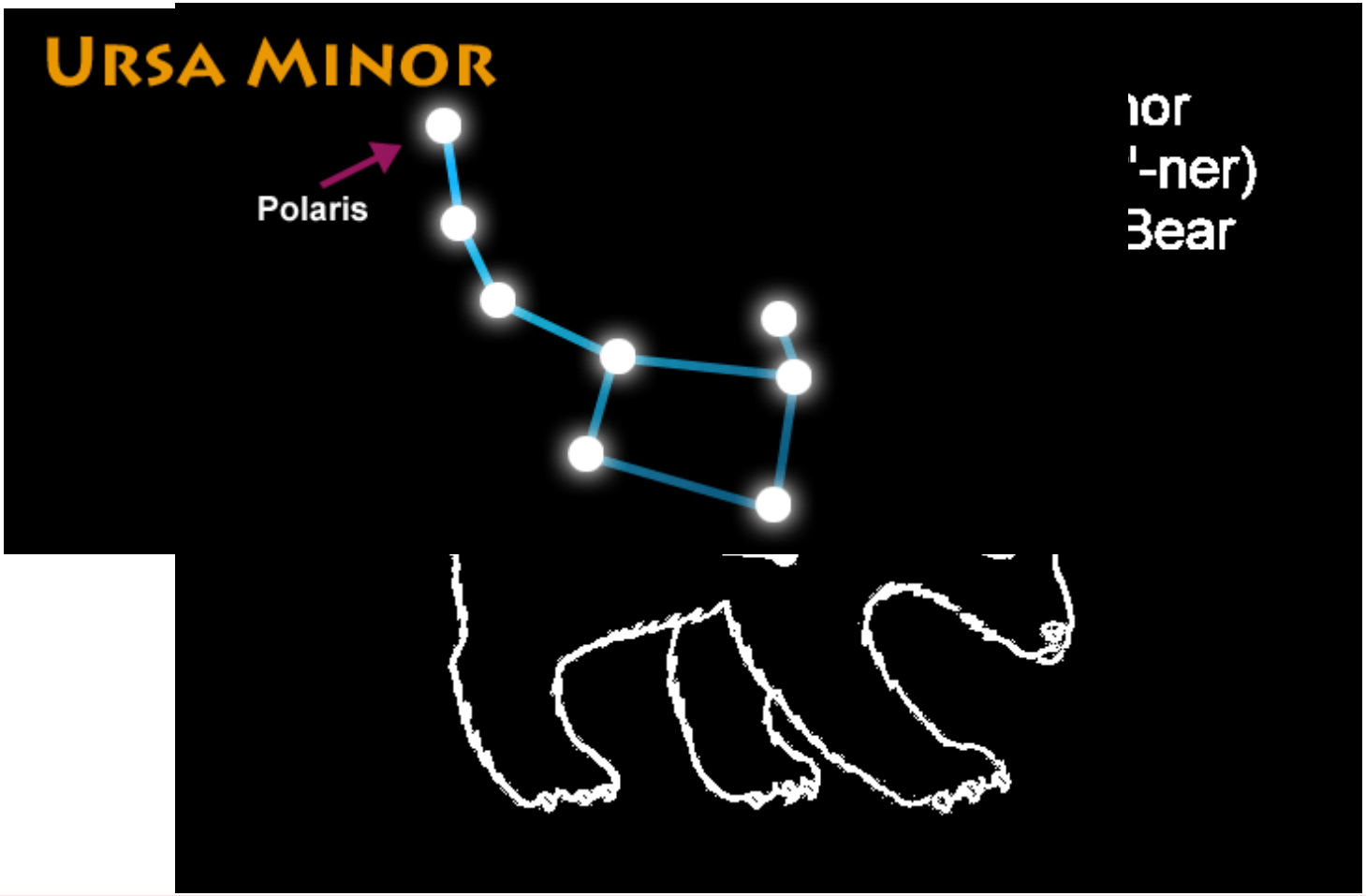
- **Asterism** refers to a star pattern that is not a constellation; may consist of a small group of stars within a constellation or individual stars from different constellations.

Exa

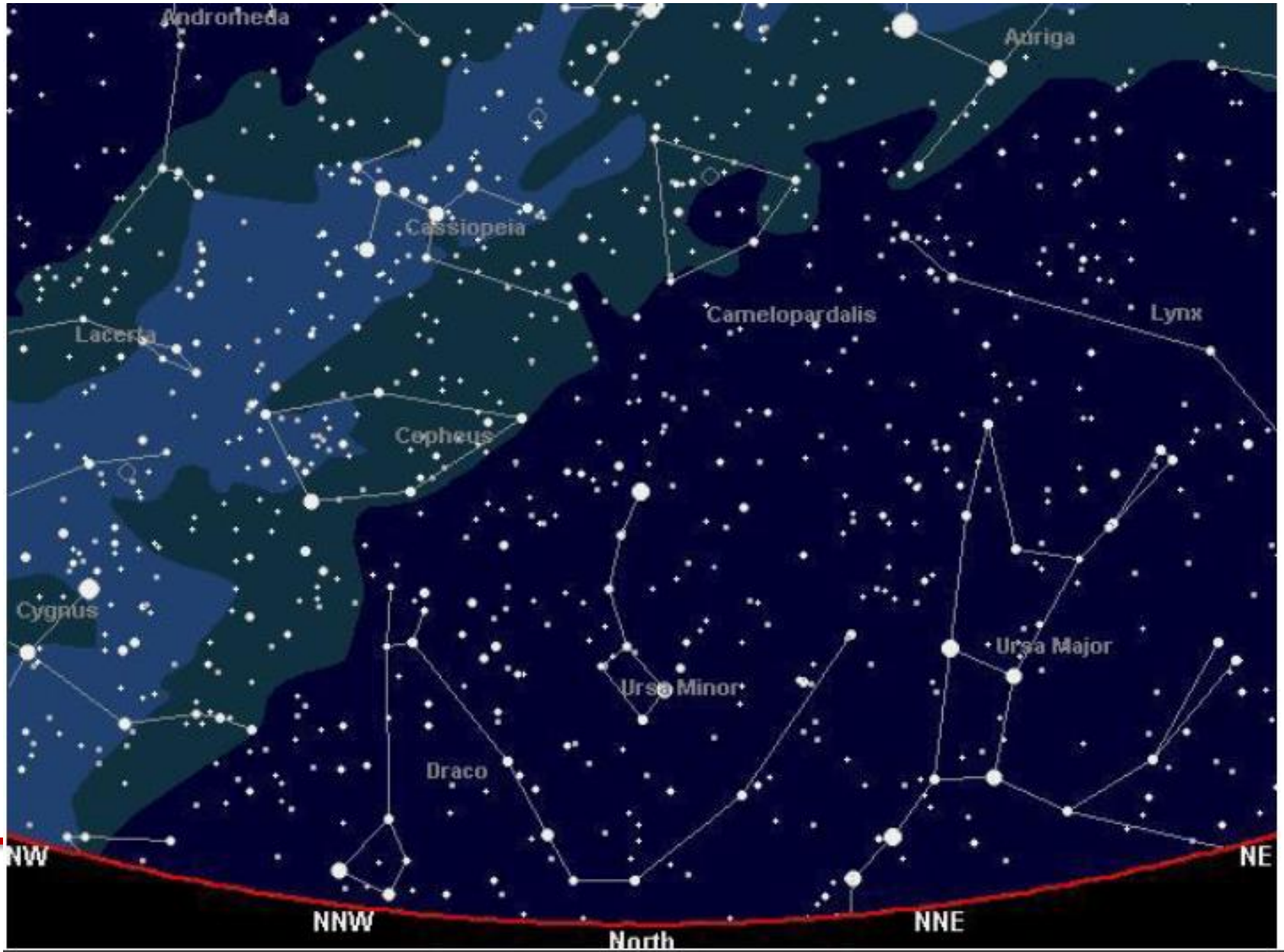


The Big Dipper's two end stars in the bowl are called "pointer stars" because they point toward the North Star, Polaris

Ursa Minor, the little Bear



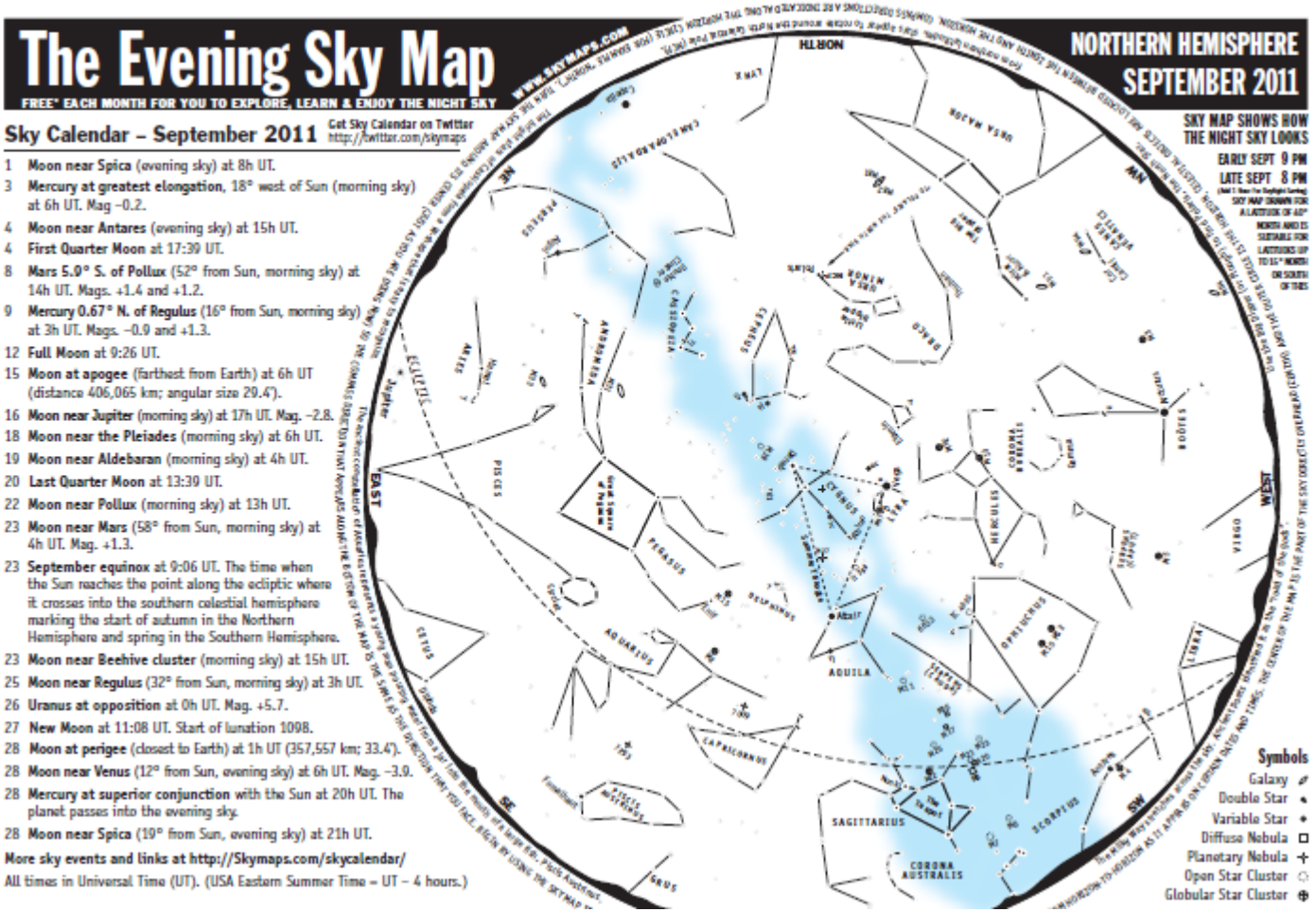
The Night Sky In the Northern Hemisphere



Movie

- The Universe The constellations 5

Night Sky Map for students



STUDENT ACTIVITY

- Show students the Space Theatre Planetarium

- Draw your own constellation in the night sky

STUDENT ACTVITY

- Download program **Stellarium**

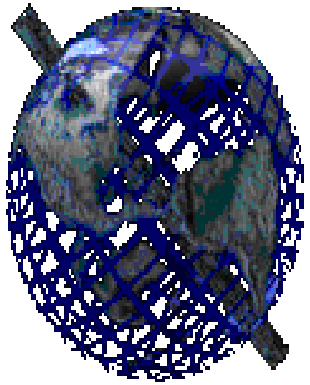
STUDENT ACTIVITY

- CONSTRUCTING A CONSTELLATION PAGE 353 IN TEXTBOOK.

INTERMEDIATE SCIECNE 9

- **Unit 1: Space**

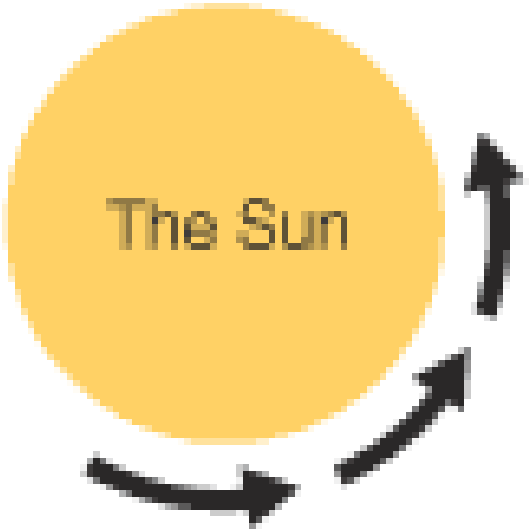
SECTION 3: Movement of Celestial Bodies

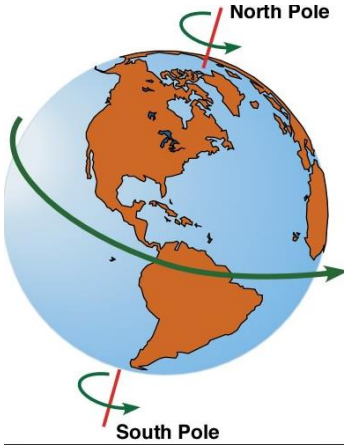


Celestial Bodies Rotate

Rotation : move or cause to move in a circle around an axis or center

Planets, suns and moons revolve on a central axis.

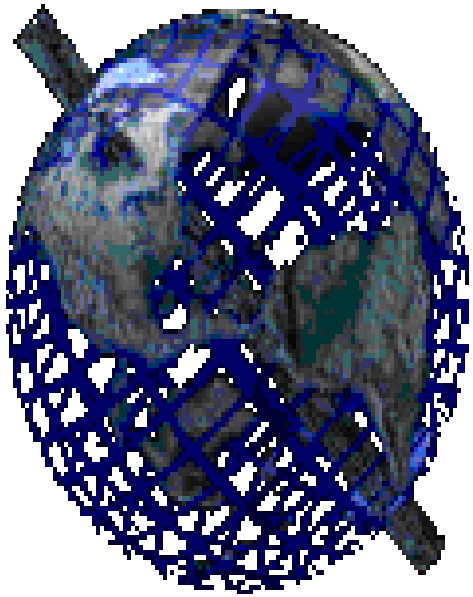


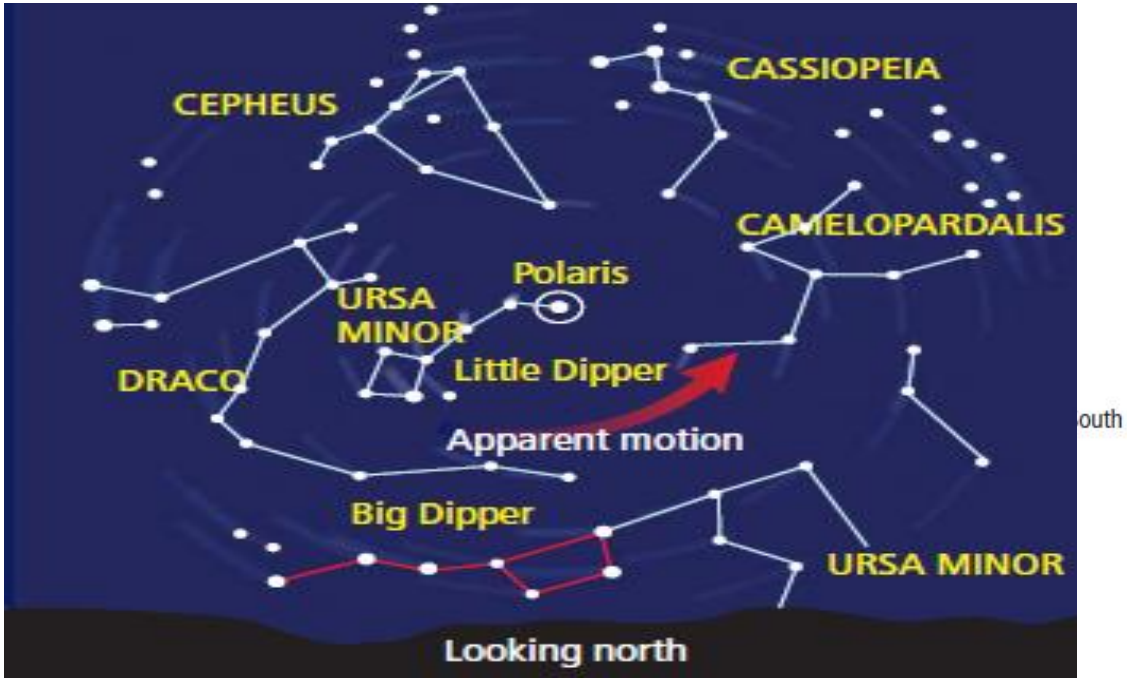


The Earth is tilted at 23 degrees on its axis and rotates from west to east.

As viewed from the North Star Polaris, the Earth turns counter-clockwise

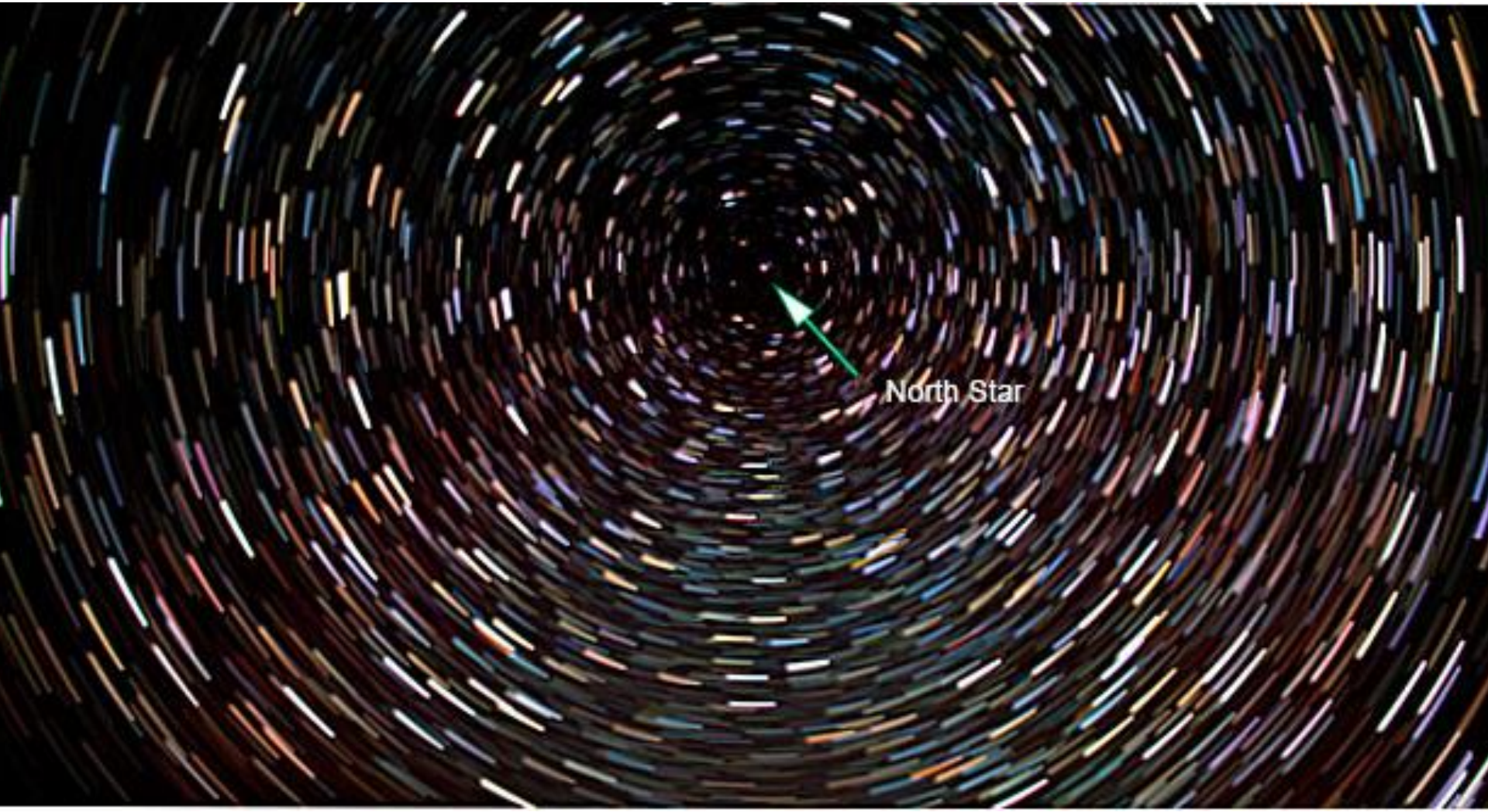
Every 24 hours, the Earth rotates once on its axis. This rotation is what caused night and day.

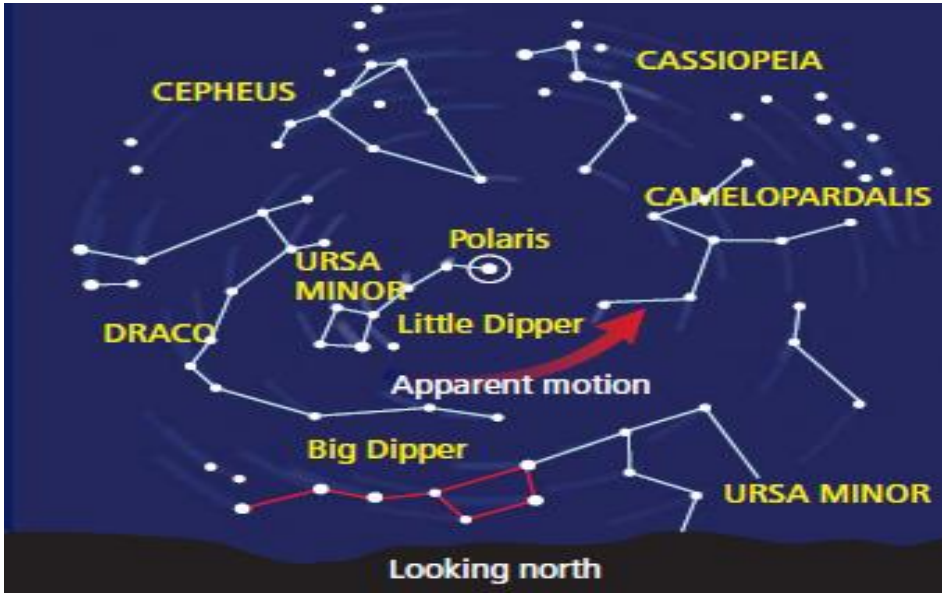




The stars in the sky seem to move from east to west. The Earth's rotation on its axis toward the east causes this gradual motion.

However, they seem to revolve around a common point. the stars appear to rotate is the North Star—Polaris. If you were to extend Earth's axis out into space, it would point at Polaris.


North Star



Circumpolar constellations refers to a constellation that never appear to set or dip below the horizon. Examples:

Ursa Major
Ursa Minor
Cassiopeia

How long is one day on other planets?

One day is the time it takes a planet to spin around and make one full rotation

Planet	Day Length
Mercury	1,408 hours
Venus	5,832 hours
Earth	24 hours
Mars	25 hours
Jupiter	10 hours
Saturn	11 hours
Uranus	17 hours
Neptune	16 hours

Does the Moon Rotate on its axis?

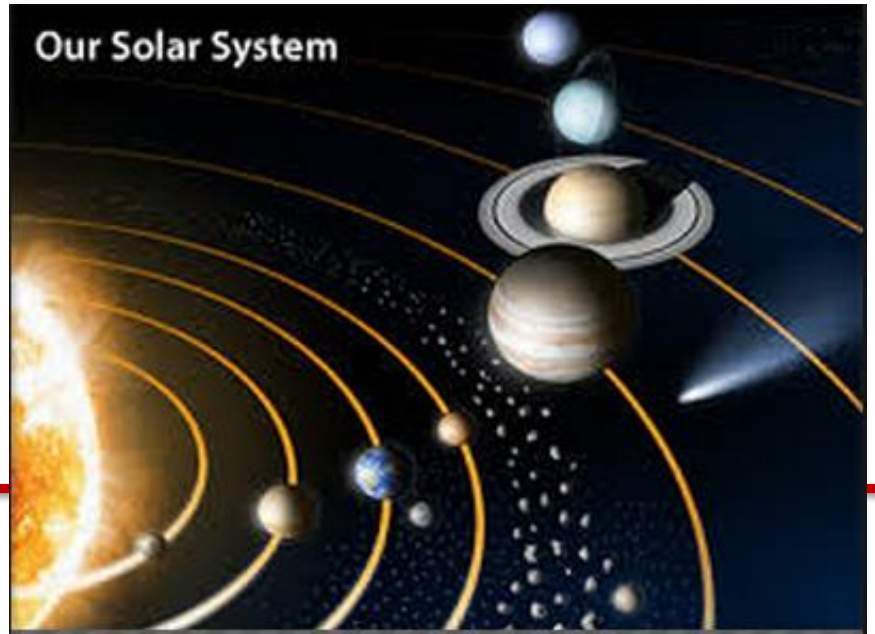
The Moon does rotate. It takes approximately 27 days for the moon to rotates axis . If you stood on the Moon, the stars would rise and set, just like they do on Earth, except that a lunar day is a month long, the same as the Moon's orbital period. The Moon rotates at just the right speed so that it always keeps one face pointed toward the Earth

Celestial Bodies revolve

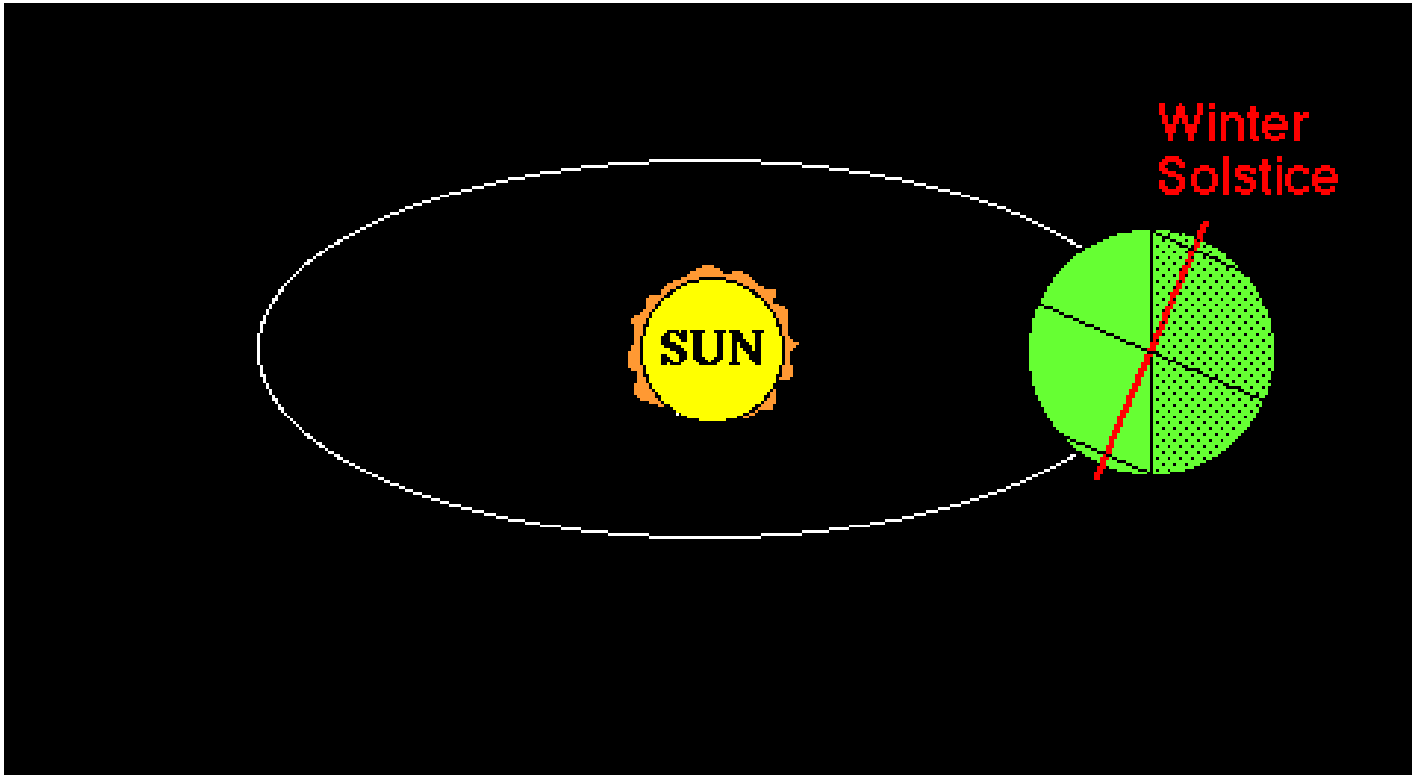
Revolution is the movement of one object around a center or another object

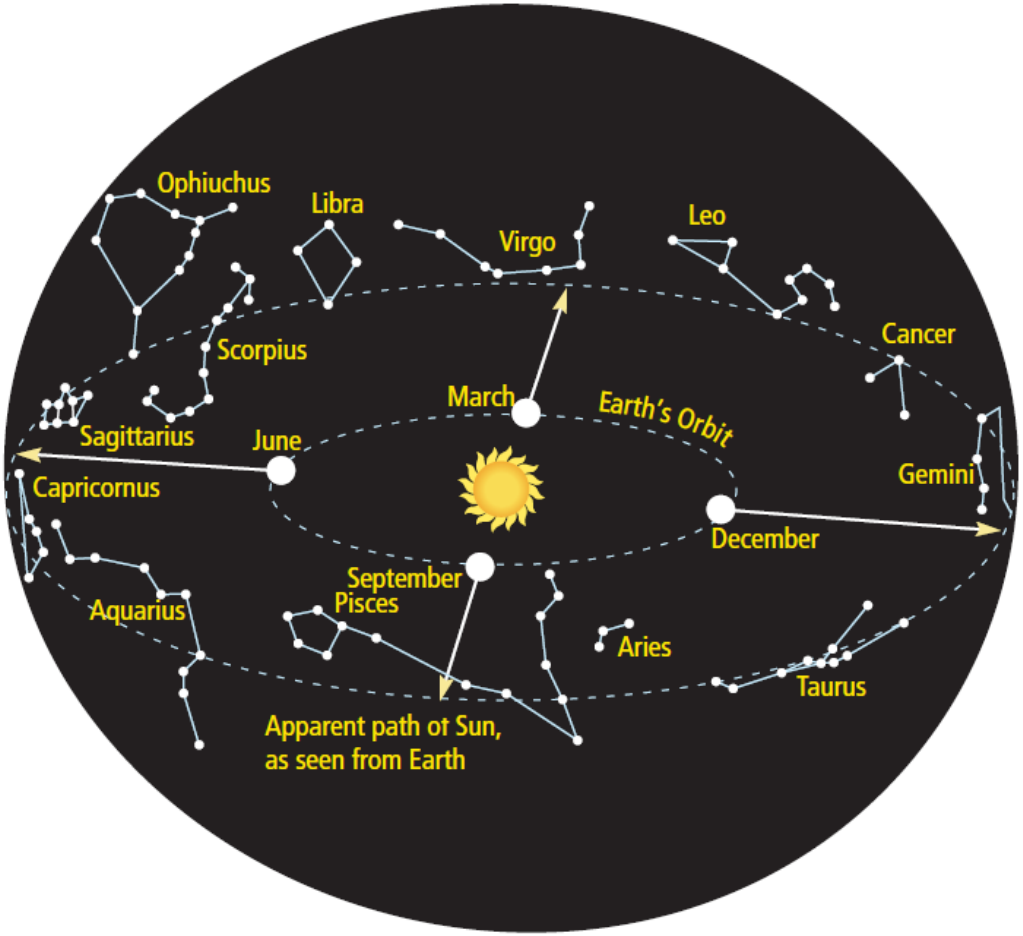
Orbit is a regular, repeating path that one object in space takes as it revolves around another one. All orbits are elliptical, which means they are an ellipse, similar to an oval. These orbits result from gravitational forces

Planets, comets, asteroids and other objects in the solar system orbit the sun



Planet Earth also revolves around the sun. It takes 365.25 days for the Earth to make a complete revolution around the sun.



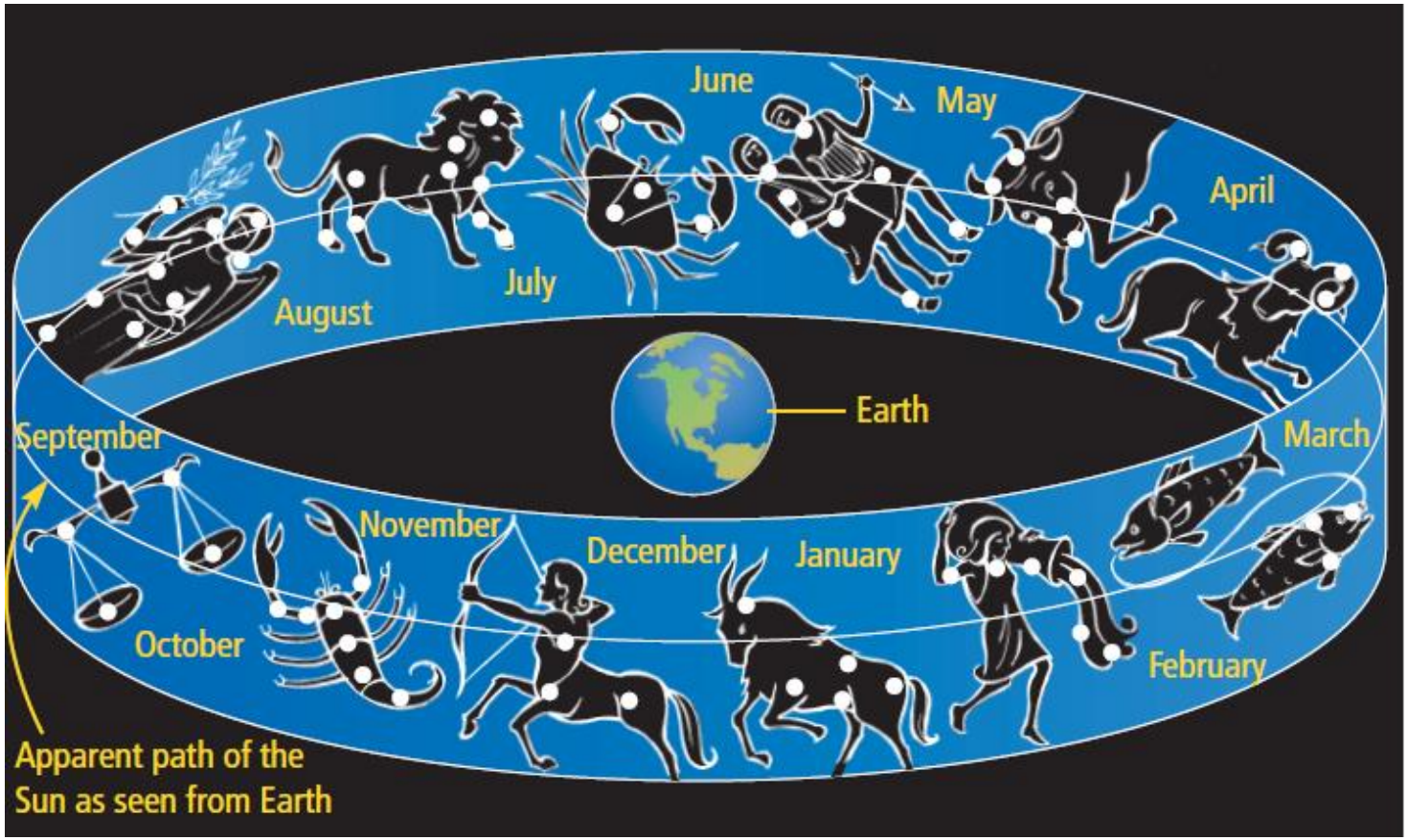


Because Earth moves around the Sun every year, we see a different part of the sky every season . Some constellations are visible all year long but change positions, and some constellations are visible in certain seasons only,

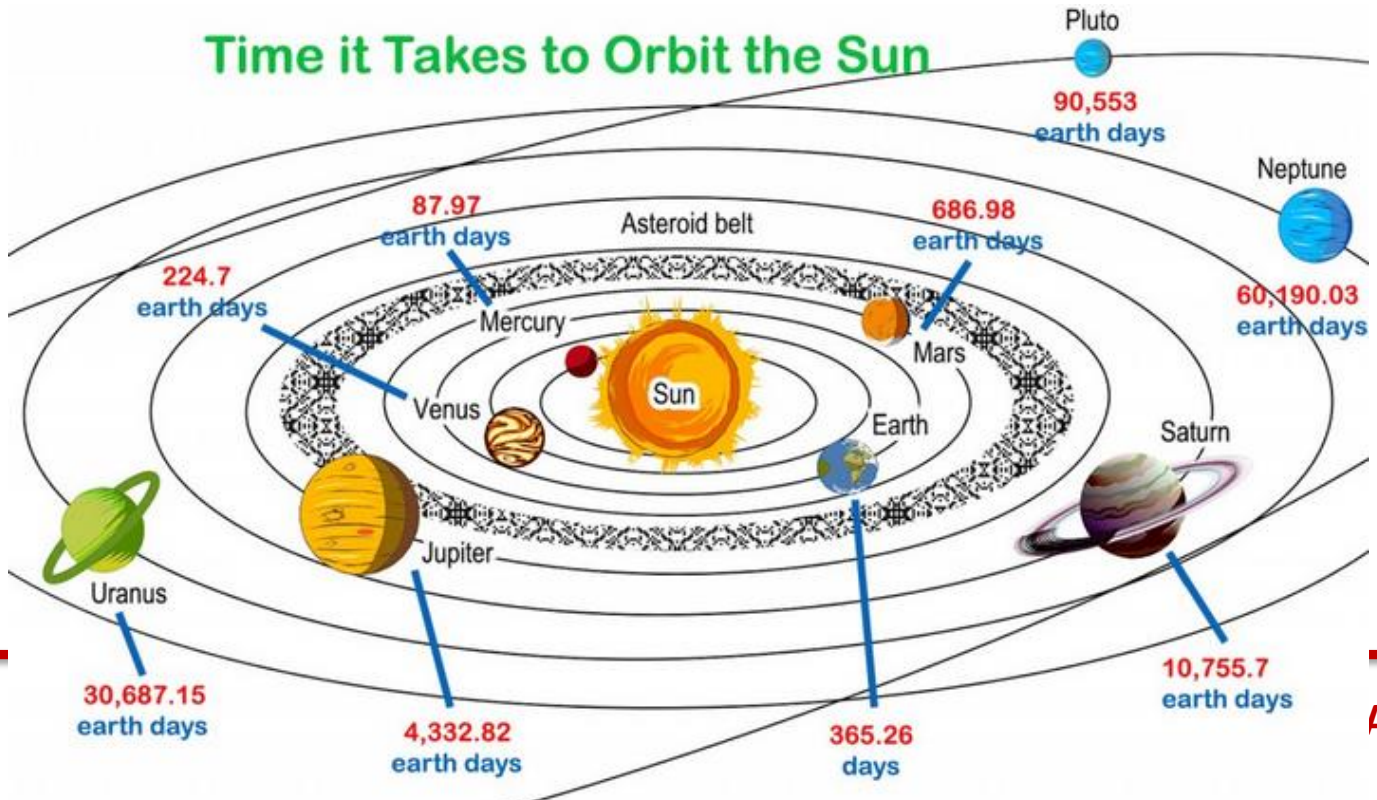
How long is one revolution for the planets?

Planet	Distance from Sun (millions of km)	Orbital Velocity (km per second)	Period of Revolution
Mercury	58	48	88 days
Venus	108	35	225 days
Earth	150	30	1 year
Mars	228	24	2 years
Jupiter	778	13	12 years
Saturn	1 429	10	29 years
Uranus	2 875	7	84 years
Neptune	4 504	6	165 years

As the earth revolves around the Sun, it appears that the sun is moving against the background stars. the Sun follows the same path through the sky every day. We call this path the **ecliptic.** Along this path lie the 12 **zodiacal constellations**



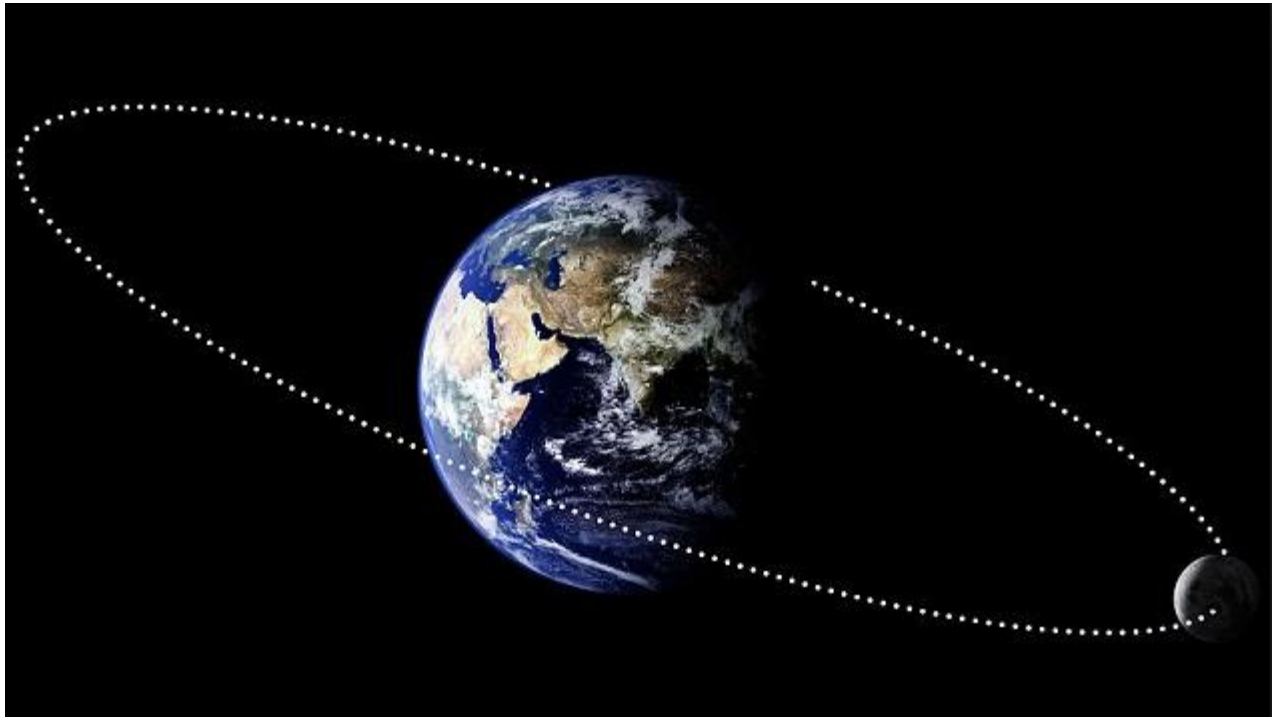
The length of a year on any given planet is determined by how long it takes for that planet to make one revolution around the sun. Since every planet travels at a different speed and has a different orbital path in regard to size and shape, the length of a year can vary greatly from planet to planet. If you had lived on a different planet your whole life, then you would be a different age due to the orbital differences. Listed below are the planets year lengths in earth days from shortest to longest.



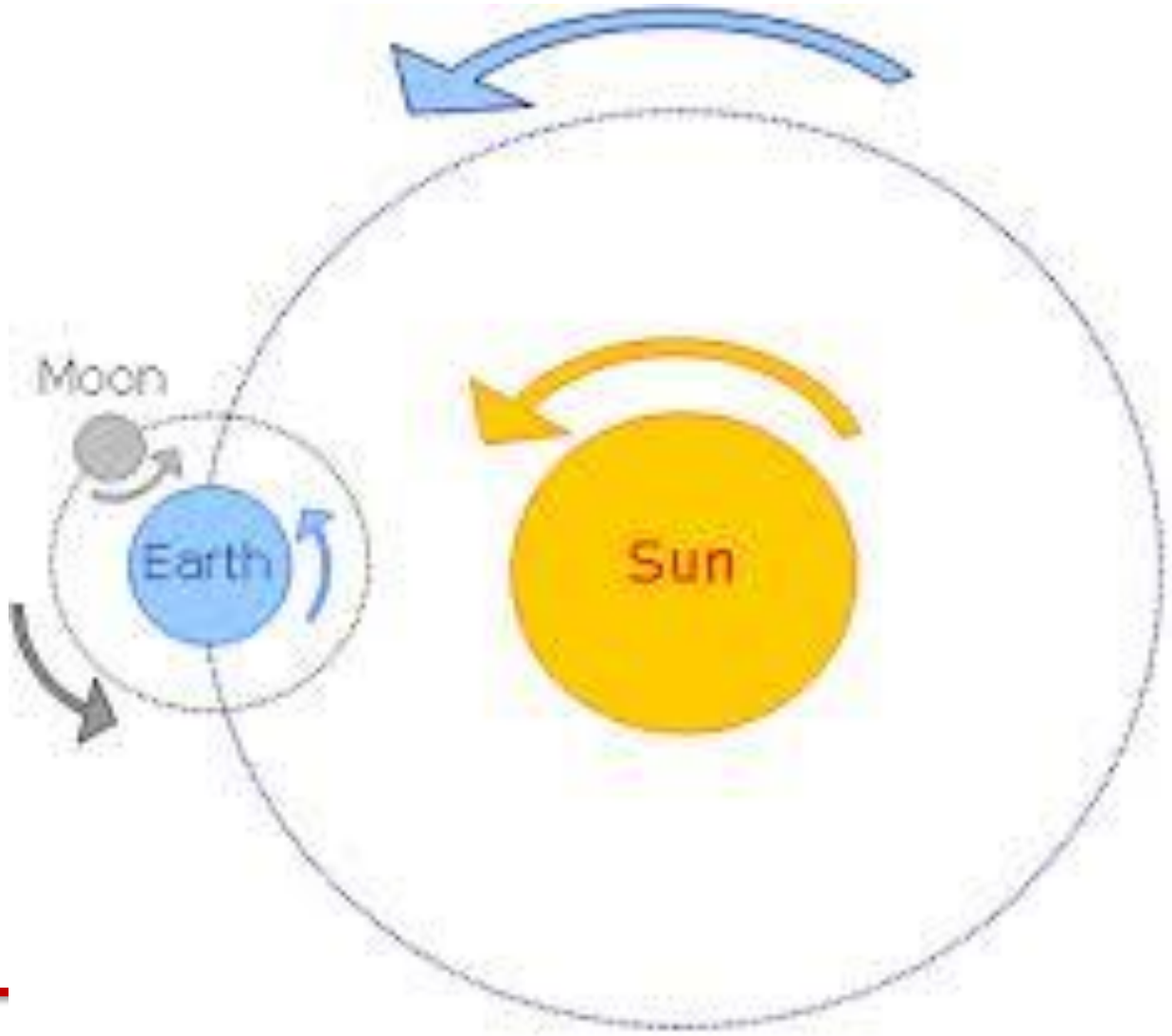
ACE

Does the Moon Revolve?

The moon orbits the earth.



Summary For The Movement of Celestial Bodies



READ CHECK

- PAGE 361

Do questions 1,2,3,4

CORE LAB

- by completing CORE LAB 10-3B “Strolling Through the Solar System.” pp. 382-383
- TR pp. 4-14, 4-15, 4-16
- BLM 4-12

INTERMEDIATE SCIECNE 9

- **Unit 1: Space**

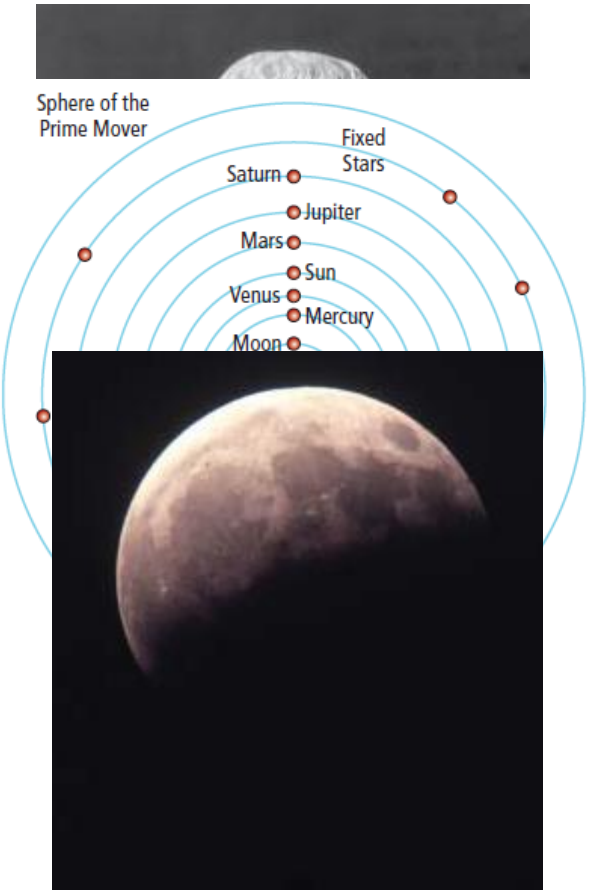
SECTION 4: EARLY EXPLORERS

Explorers of the Celestial Bodies

- **1. Aristotle**

Geocentric universe has Earth at the centre and the Sun, Moon, planets, and stars revolving around it

He observed the shadows created on the Moon during a lunar eclipse. Since those shadows had curved edges, Aristotle concluded that Earth must be a sphere



2. Ptolemy

Retrograde Motion: an apparent switch in the celestial body from eastward to westward motion, as viewed from the earth

He believed that each planet revolved around a point on its orbit, called an epicycle, to explain its motion through the heavens.

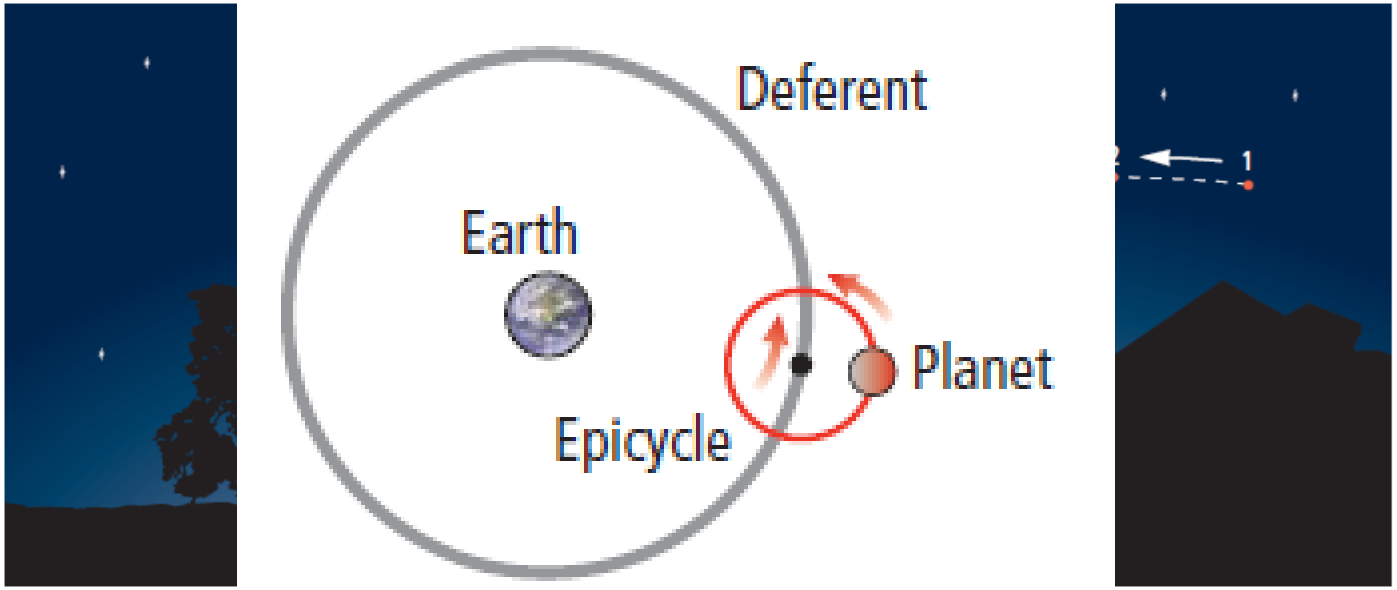


Figure 10.28 Position of Mars compared to the background stars during a period of retrograde motion. Each point represents the planet's new position every 10 days over the retrograde period.

ACE

3. Copernicus

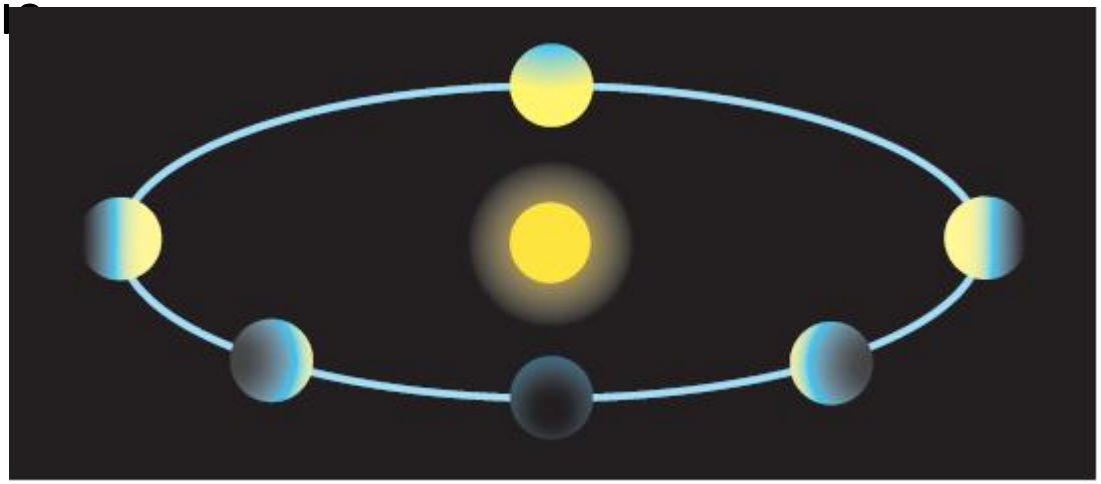
Heliocentric universe the Sun was at the centre and the planets revolved around the Sun.

Sun at the centre of the solar system, the planets moved in circular orbits, or paths around the Sun

4. Galileo Galilei

He was the first person to turn a small telescope toward the heavens and publicly report on what he saw.

Galileo also observed that Venus has phases, like our Moon does. This observation provided evidence for the heliocentri

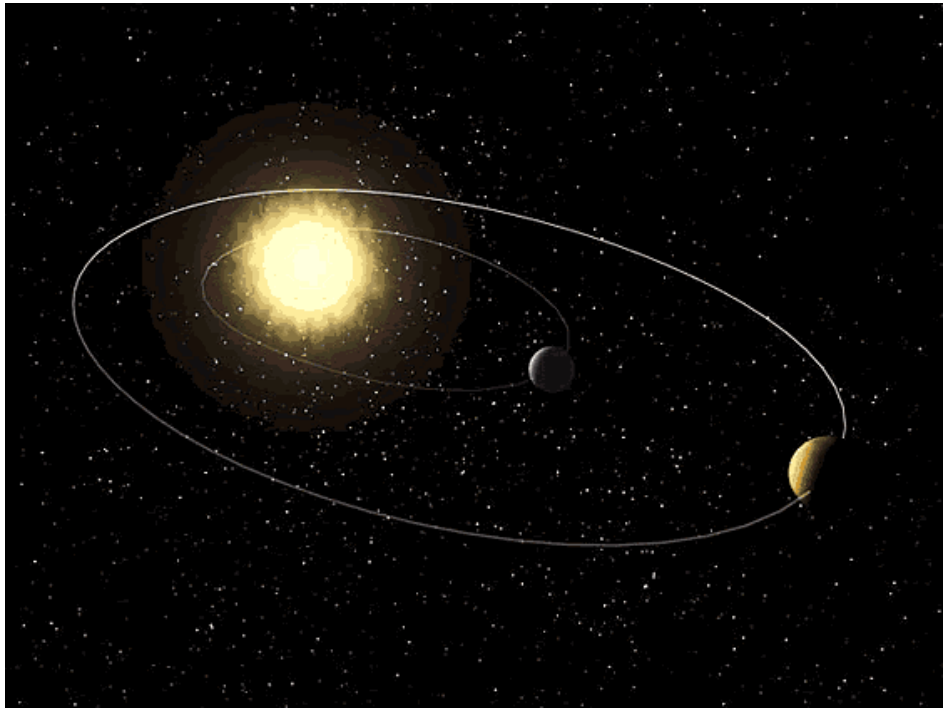


The Church taught that the Sun revolved around Earth, and put Galileo on trial for his theory of a heliocentric universe, found him guilty, and imprisoned him for the rest of his life.

5. Kepler

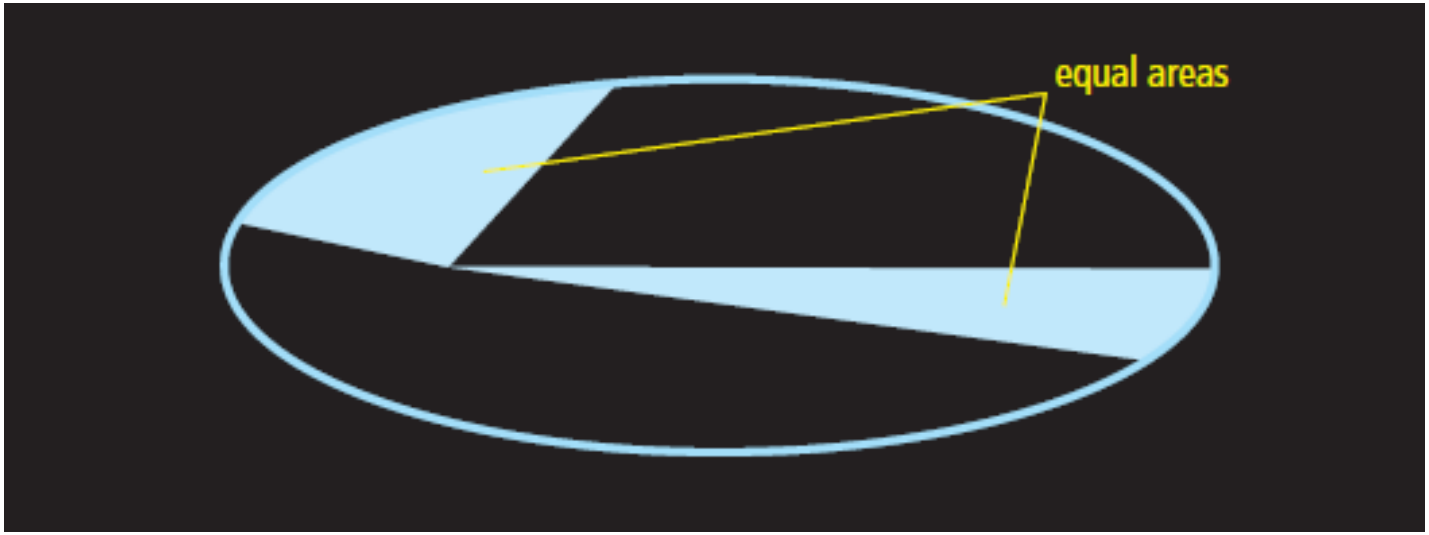
Kepler developed 3 laws of planetary motion:

LAW 1. All planets move in ellipses, with the Sun at one focus.

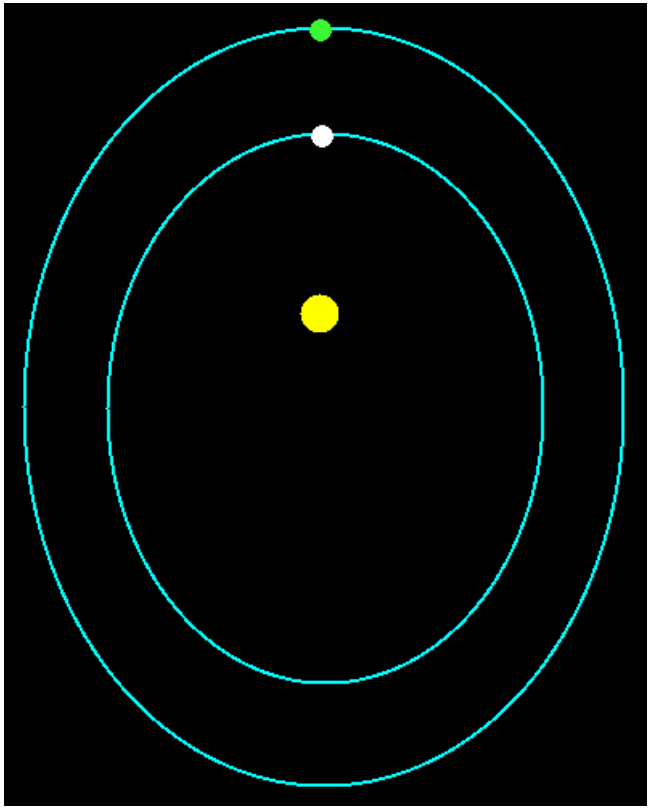


LAW 2: Planets sweep out equal areas of their elliptical orbit in equal times.

This law means that the speed of a planet as it revolves around the Sun is not constant. As the planet gets closer to the Sun, it speeds up; when it gets farther away, it slows down



LAW 3. The time a planet takes to revolve around the Sun is directly Related to how far away it is from the Sun.



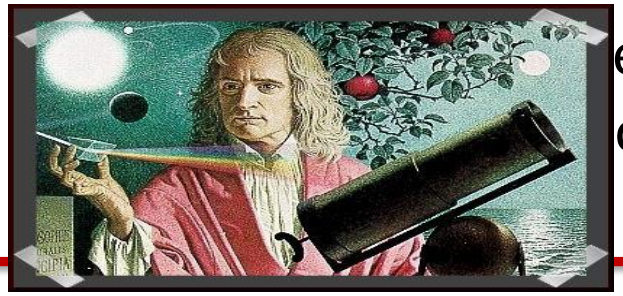
Planets move faster when the distance from the Sun is minimum, and slower when the distance is maximum.

6. Newton

Sir Isaac Newton (1643–1727), was considered to be the most influential scientist who ever lived.

Newton developed three laws to describe and predict motion, and explained how celestial bodies move through the universe.

Newton was the first to show mathematically that the force of gravity extend outside of the earth (think of the visual of Newton sitting under a tree and apple hits him on the head because of gravity).



eflecting telescope that was larger and observations. Newton's design for this Newtonian design.

STUDENT ACTIVITY

- Issac Newton – Life and Vast achievements in Science.

MOVIE

- Issac Newton – Life and Vast achievements in Science.

STUDY CHECK

- Page 373 Questions #1, #3, #4
- Page 375 #2, #3, #5, #8

Study Check

- Page 373 #4, #9,
- Page 380 #1, #2, #3
- Page 385 #2, #3, #4, #5

MOVIE

- Astronomy 101: The sun is the centre

INTERMEDIATE SCIECNE 9

- **Unit 1: Space**

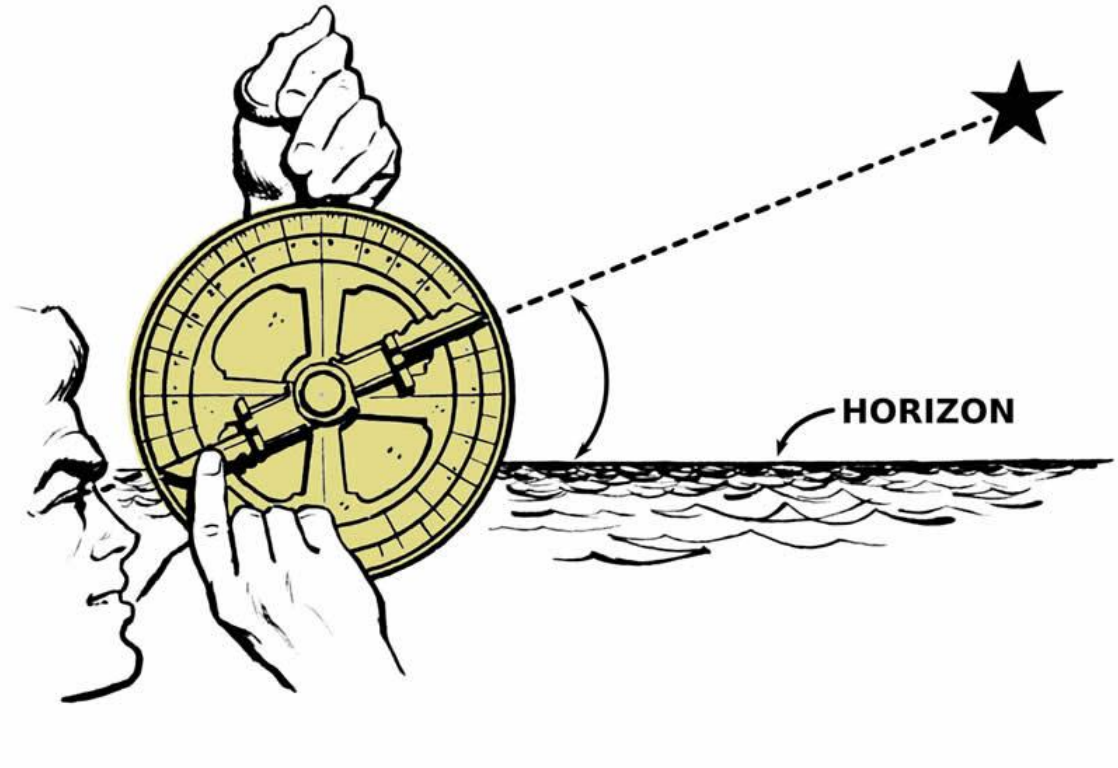
SECTION 5: EARLY TECHNOLOGY

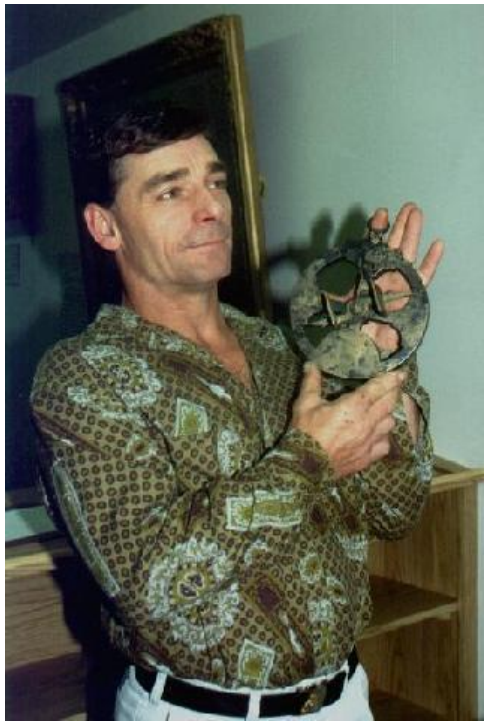
Technologies that advanced scientific observations

- 1. ***Stone circle*** is a monument of standing stones arranged in a circle. The ancient stone circles were used as astronomical viewing places.

- The ancient stone circle builders employed advanced geometry, and had intimate knowledge of astronomy, and were skilled engineers.

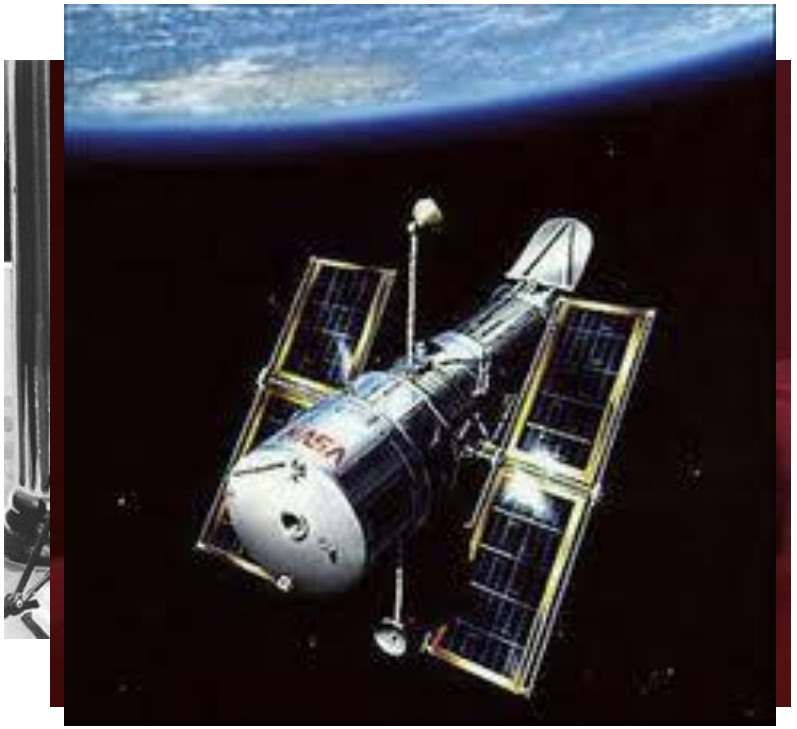
2. Astrolabe is a device that was used by early astronomers to pinpoint the locations of objects in space.





it was developed around the time of Ptolemy. Astronomers used them to help locate and predict the positions of the Sun, Moon and stars

1. Telescope : is an instrument that aids in the observation of remote objects by collecting electromagnetic radiation (such as visible light). It uses lenses to gather and focus light to provide a magnified view.



Some satellites orbiting through space are large telescopes.

CORE STSE

- **CLESTRIAL NAVIGATION**

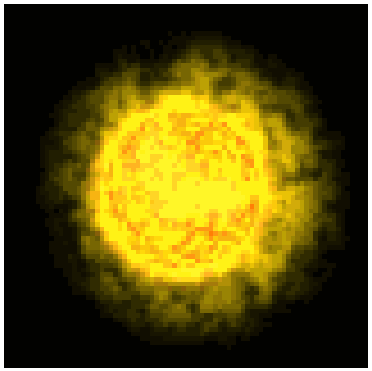
Chapter Review

- Page 386 #2, #4, #5, #6, #7, #8, #9
- Page 387 #10, #11

INTERMEDIATE SCIECNE 9

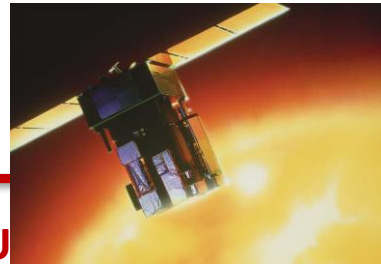
- **Unit 1: Space**

SECTION 6: THE SUN



FACTS ABOUT THE SUN

- The Sun is an average-sized star
- It contains more than 300 000 times more mass than Earth.
- 110 Earths lined up side-by-side to match the Sun’s diameter
- Scientists have calculated that the Sun has been giving off heat and light for 5 billion years and it has enough hydrogen to last another 5 billion years.



Composition and Characteristics of the Sun

Criteria	Characteristics
Mass	contains 300 000 times more mass that Earth
Motion	rotates
Composition	contains hydrogen and helium atoms
Function	chemical reactions in the sun give off electromagnetic radiation, including heat and light which support life in our solar system
Special Features	contains sun-spots, solar flares and solar prominences

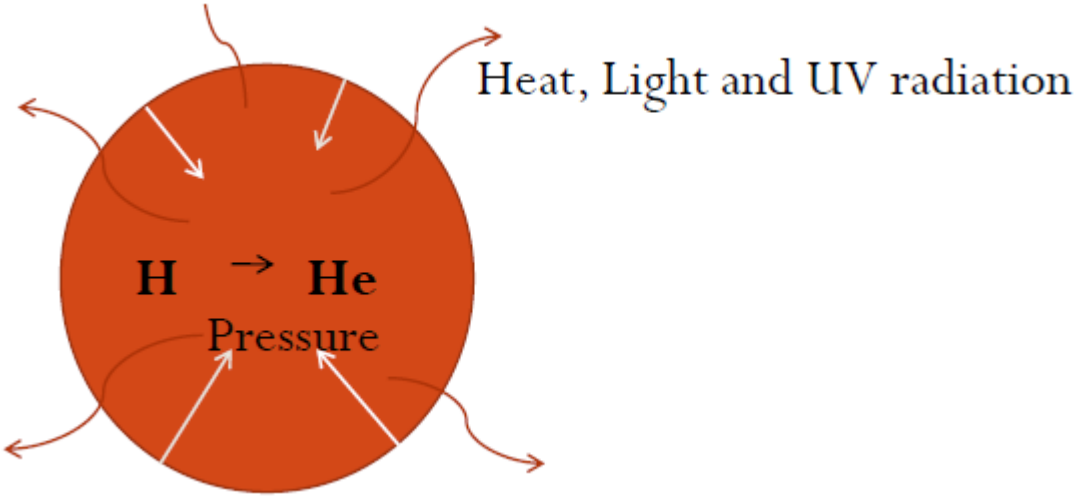
How The Sun Produces Energy

The Huge size of the sun causes pressure to build up at the center of the sun as gravity pulls the mass inward…

Thermonuclear Reactions turn:

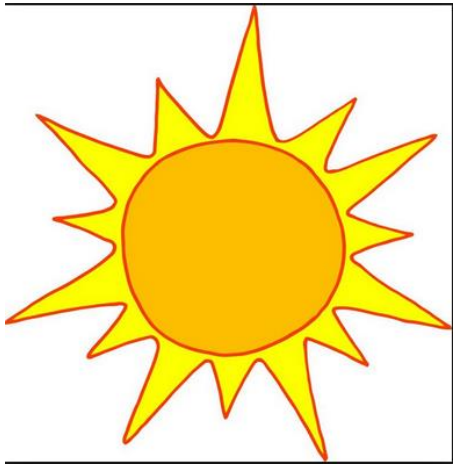
H (*hydrogen*) ⟶ **He** (*helium*)

giving off Heat, Light and UV radiation in the process



SOLAR RADIATION

Solar Radiation -E (energy) emitted from the sun in the form of *Electromagnetic Radiation*

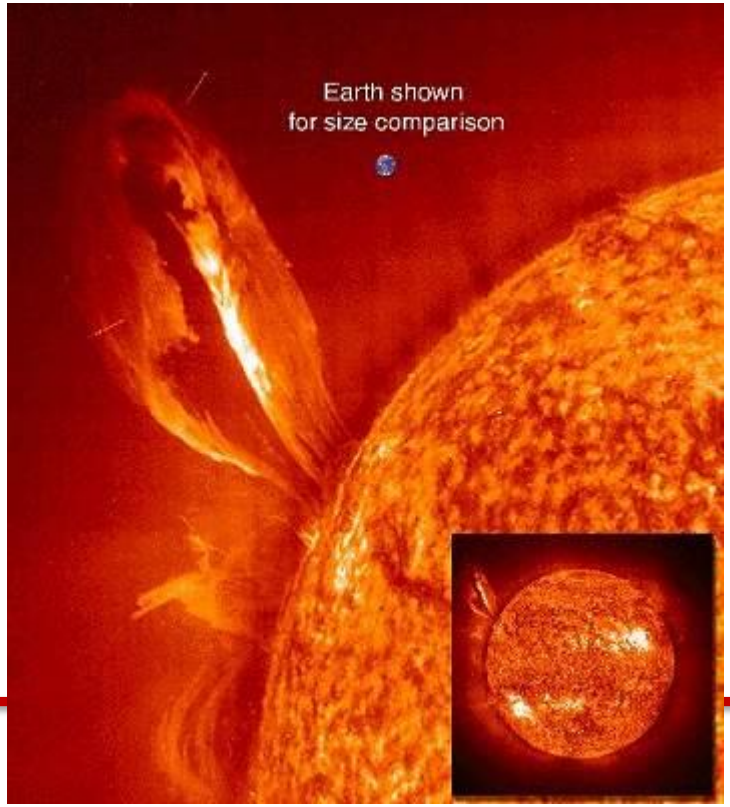


energy that is carried or radiated in the form of waves that range in length, ex. Microwaves, radio waves, UV waves

Solar radiation is actually a very beneficial thing - it's sunlight! Every living thing on Earth depends on sunlight for survival

SOLAR PROMINENCE

Solar Prominence (also known as a filament) is an arc of gas that erupts from the surface of the Sun. Prominences can loop hundreds of thousands of miles into space. It can last for many months..



SUN-SPOTS

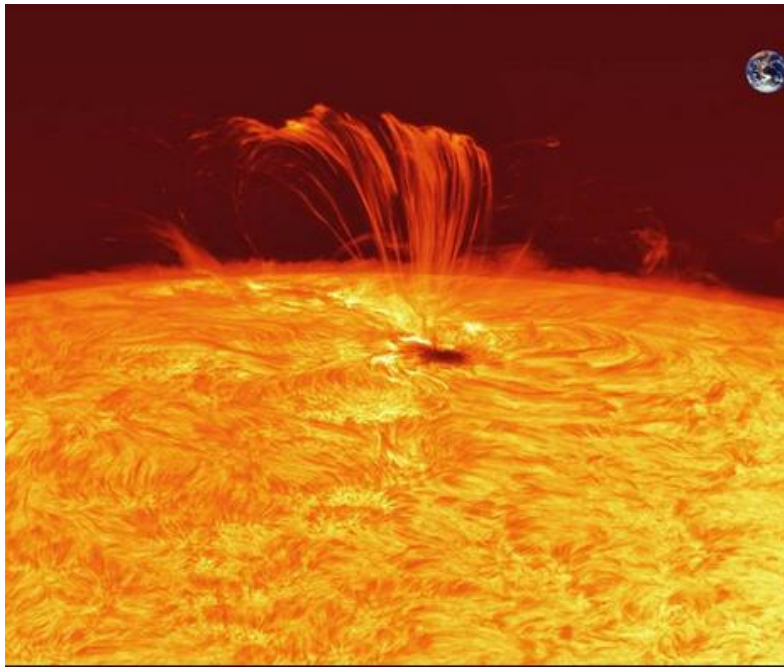
Sunspots –dark patches of slightly cooler (3500°C) surface areas on the sun, they increase and decrease in number on an 11-yr cycle. They may be related to changes in the Earth's climate .

It's not the freckle on your nose. But, it is like a freckle on the sun

SOLAR FLARES

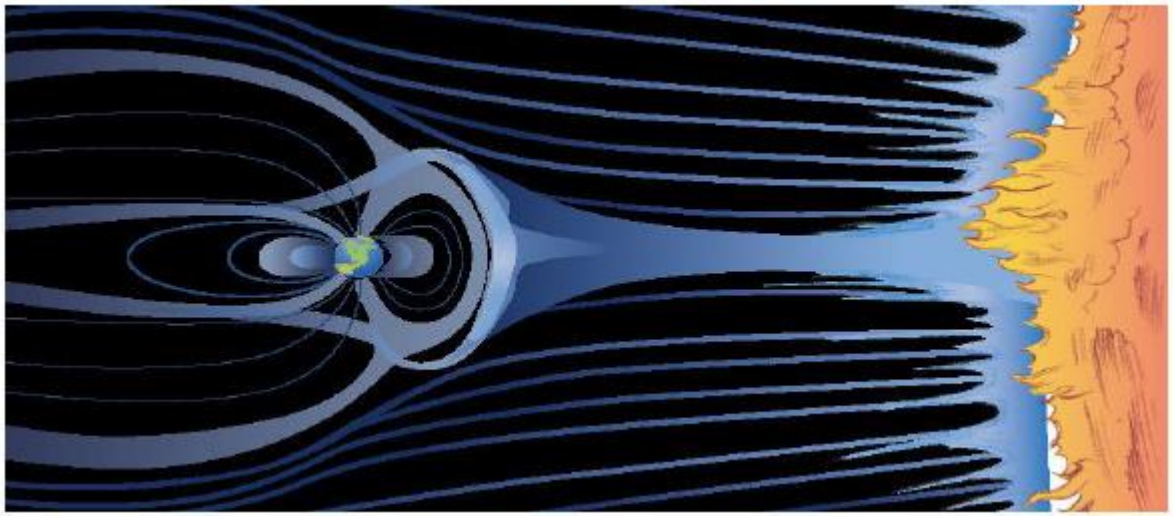
Solar Flares –eruptions of gas on the suns surface –can last a few hours, temperatures increase up to 11,000,000°C Creates *Solar Winds*

It creates energies equivalent to tens of millions of hydrogen bombs



Solar Wind

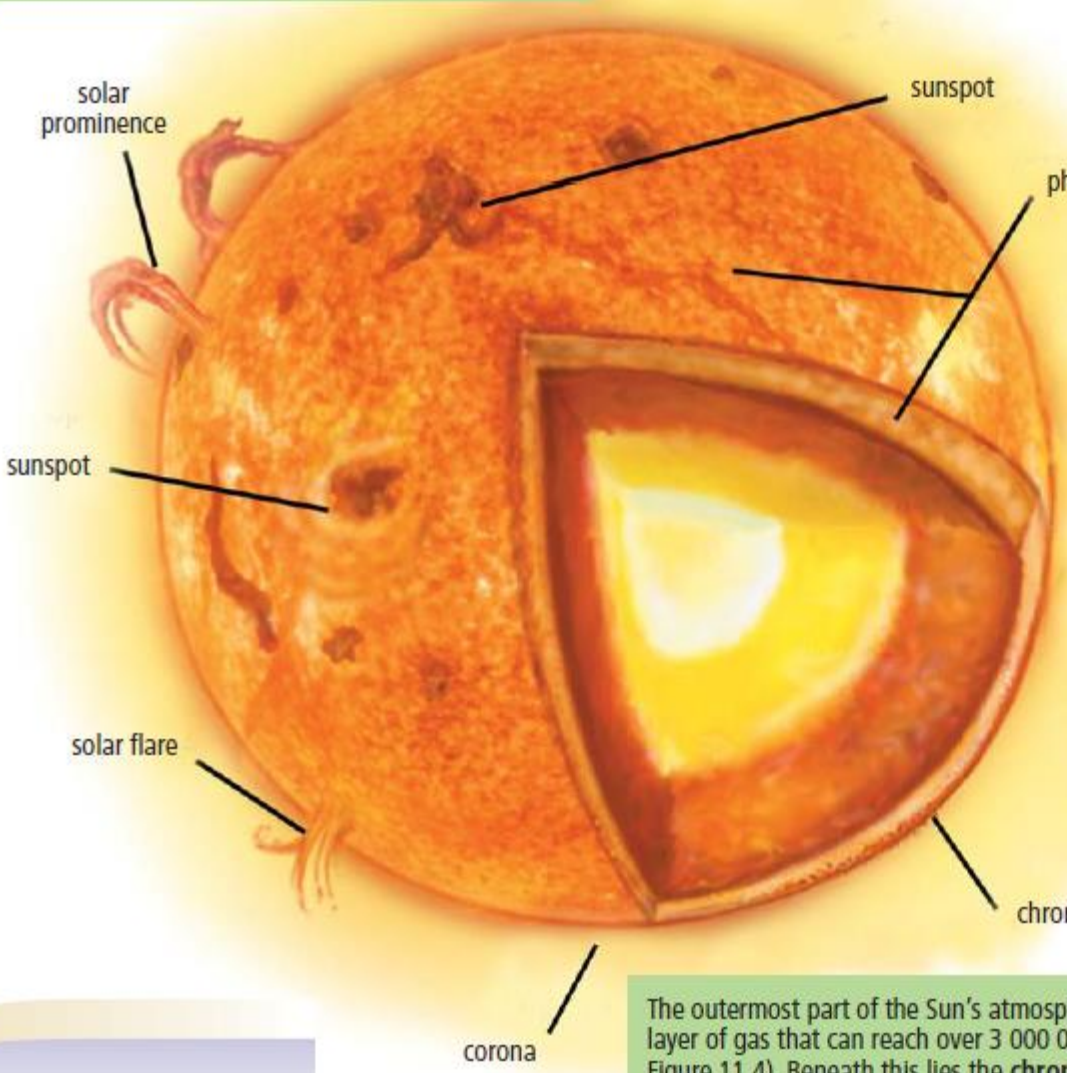
Solar Wind refers to the he continuous flow of charged particles from the sun that rush pass the earth



Solar wind streams off of the Sun in all directions at speeds of about 400 km/s

Solar prominences are large loops of super-hot gas that extend out from the Sun's surface. Prominences tend to be associated with sunspot activity and can stretch out great distances. Occasionally, extremely violent eruptions of gas called solar flares also occur. These eruptions can last for a few hours and heat gases to 11 000 000°C.

The dark patches are called **sunspots.** Some of them can be larher than the width of Earth. They indicate parts of the surface that are slightly cooler, about 3500°C, compared with the surrounding areas. The number of sunspots increases and decreases on an 11-year cycle.



The part of the Sun most familiar to us is the thin layer called the **photosphere.** In this turbulent area, hot gas rises to the surface, cools, and then sinks back into deeper layers. This cycling creates convection cells that give the photosphere a blotchy look. The photosphere reaches about 5800°C.

The outermost part of the Sun's atmosphere, the **corona**, is a layer of gas that can reach over 3 000 000°C (also shown in Figure 11.4). Beneath this lies the **chromosphere**, a 3000 km thick layer of hot (6000–20 000°C), low-density gas.

d You Know?

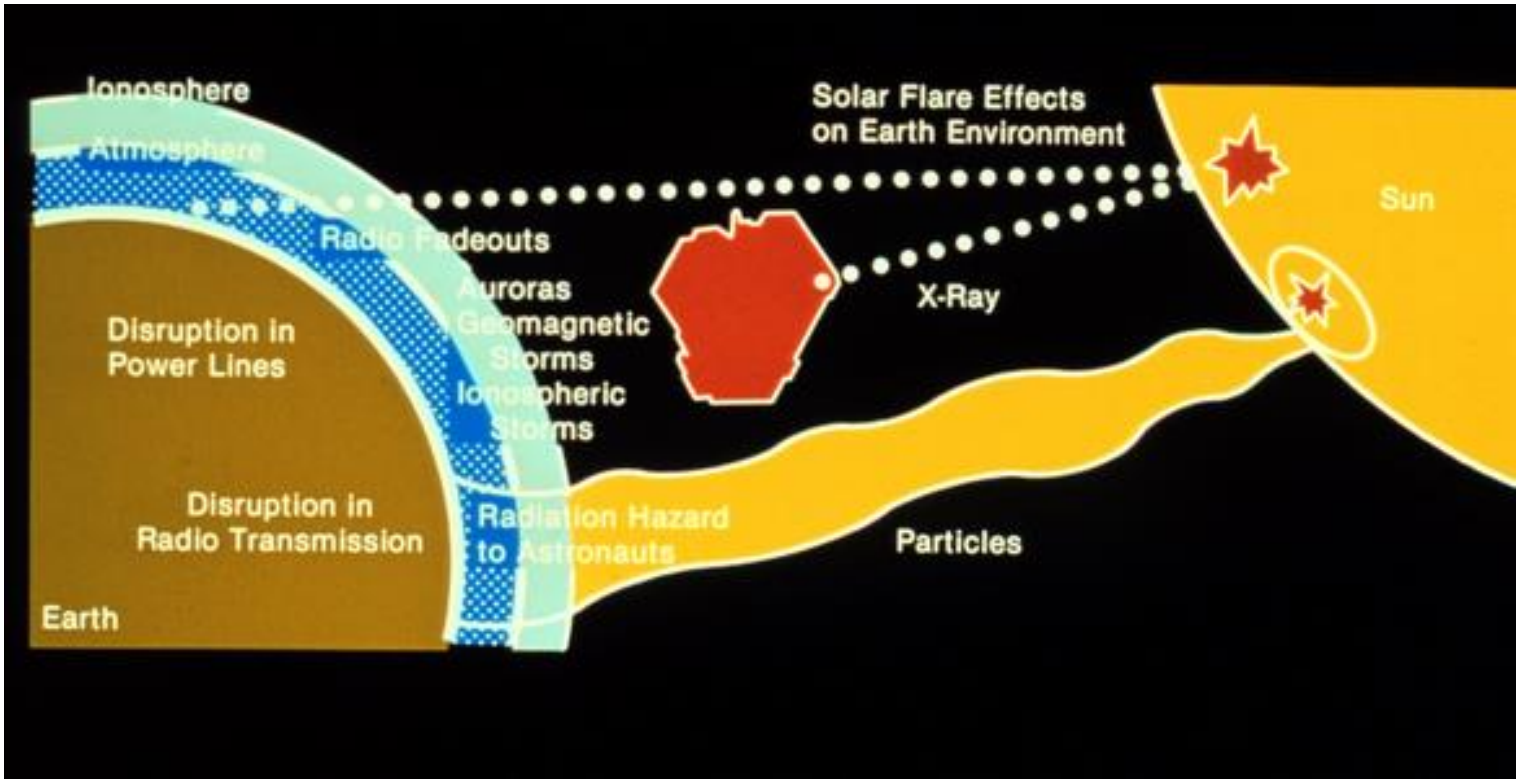
CE

EFFECTS OF SOLAR FLARES

1) Energetic particles emitted by solar flares are a primary contributor to the aurora borealis (Northern Lights)

Earth is protected from this solar wind by its magnetic field. Some of the particles enter the Earth's atmosphere at the poles where they collide with the gas in the atmosphere to create Auroras

2) Some solar winds can disturb Earth's magnetic field and disable satellites, knock out power lines, and expose astronauts to high levels of radiation



SUNSPOT ACTIVITY

See page 395 in textbook

MOVIE

- SUN by Bill Nye