

Last Day of Unit 2

Instruction

Asteroids, Dwarf Planets,
Comets, and Meteors

Observing through a Telescope Assignment

Many new spots opened tonight due
to remote observing requirement

*Sign up and complete your
assignment early*

Asteroids

Asteroid discoveries since the 1980s

https://www.youtube.com/watch?v=S_d-gs0WoUw

The final color of an asteroids indicates how closely it comes to the inner solar system.

- Earth Crossers are Red
- Earth Approachers ($\sim 1.3\text{AU}$) are Yellow
- All Others are Green

That image of the Asteroid Belt you probably have in your head is wrong

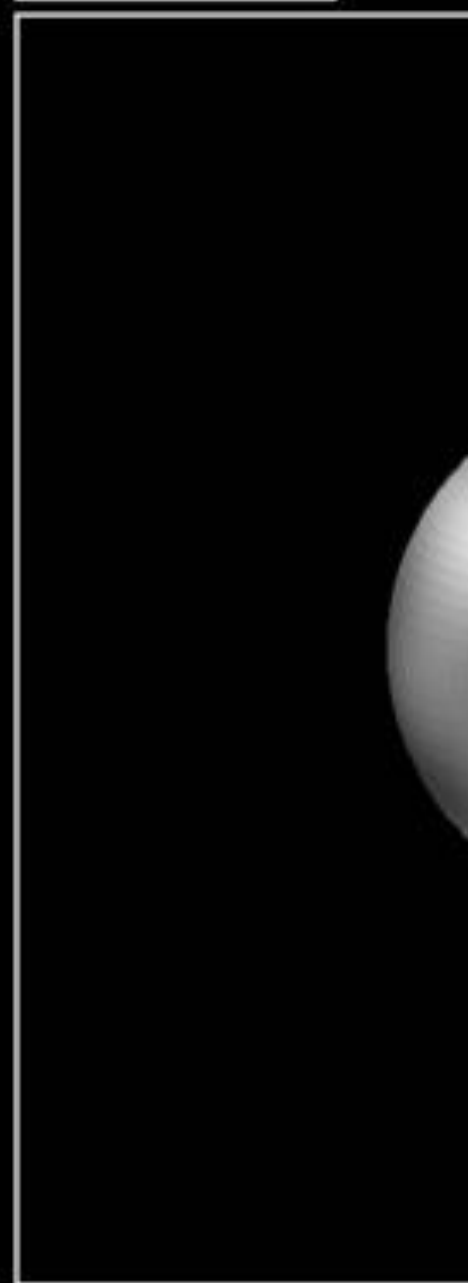
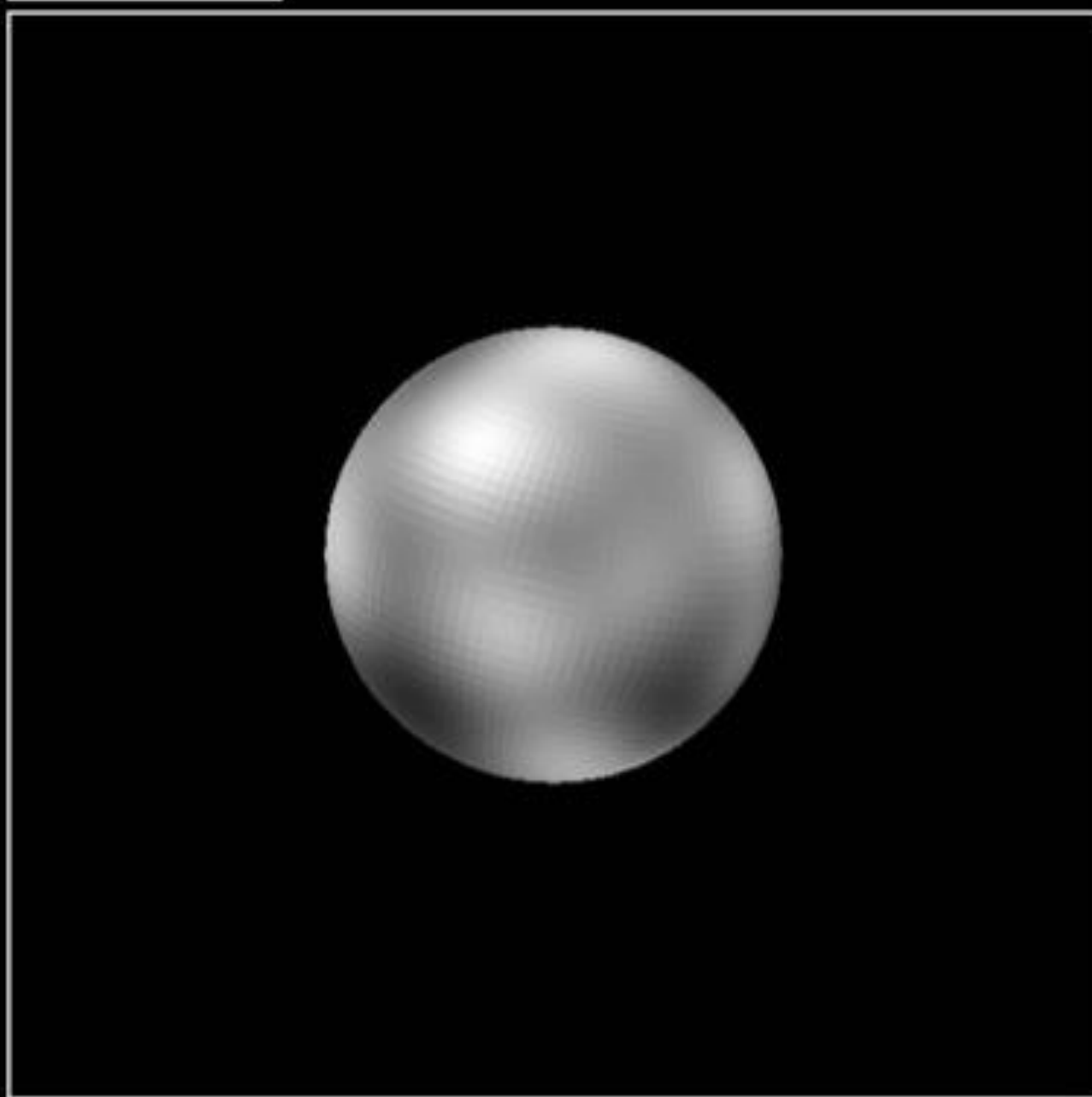
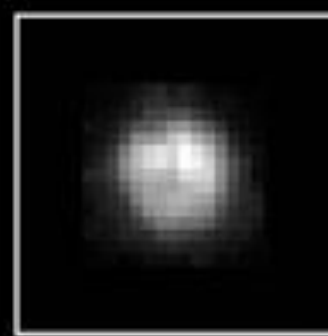
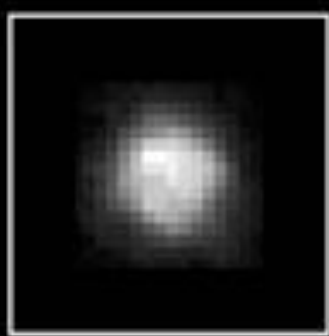


All asteroids are less than 1,000 km across
Typical asteroids are 1,000,000 km apart
The odds of successfully navigating an asteroid belt are... very good

Dwarf Planets

Pluto

- Pluto is tiny. It is only 0.22% the mass of the Earth and a tenth the diameter.
- Its orbit is also different. It is very elliptical and at an angle to the orbits of the other planets.
- Pluto is, on average, about 40 AU from the Sun. It takes 248 years to complete an orbit.
- Pluto has a relatively large moon, named Charon. Four additional, smaller moons have also been discovered!



Pluto



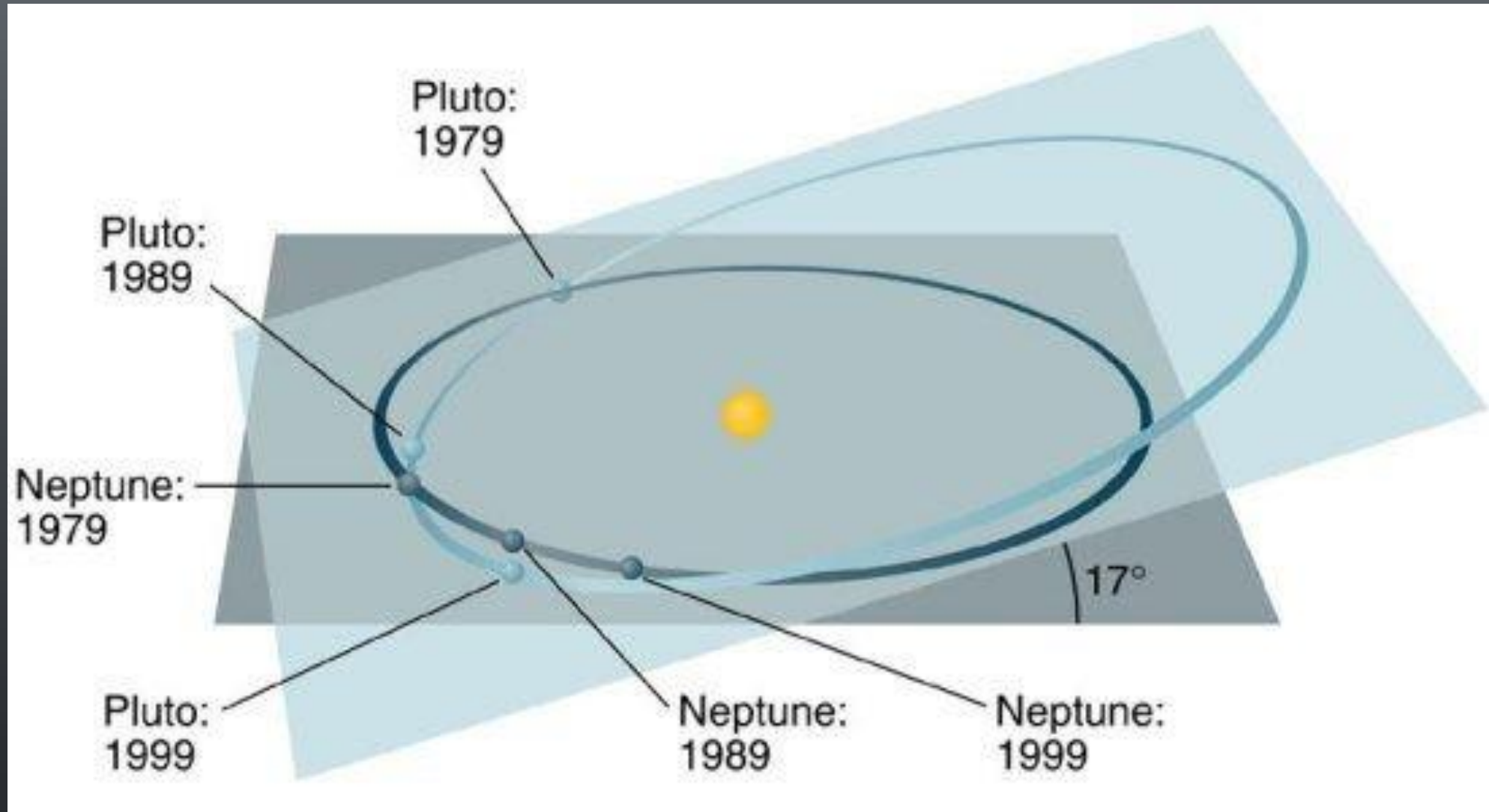
**2,275 km
(1,422 miles)**

Earth

**12,756 km
(7,920 miles)**

Pluto

Hubble Space Telescope • Faint Obj



- The next time Pluto will be closer to the Sun than Neptune (again) will be 2227.

OMG, You Killed Pluto!

Question: Why is Pluto no longer considered a planet?

- In August 2006, the International Astronomical Union (IAU) voted to define what it means to be a planet. The resulting criteria reclassified Pluto as a "dwarf planet."
- These objects are known as Trans-Neptunian Objects. TNOs are 30-100 AU from the Sun.







start calling pluto
an asteroid....

and it starts acting
like one.

paid for by the friends of pluto



[order mo' urban](#)
[on amazon](#) and [b&n](#)
now shipping

plushy
Plusical
plusplus
plust
plustard
pluswhich
pluswon
Plut
pluta(o)
plutch
Plute
plutepoopsex
pluther
pluthera
pluto
pluto fo sho
pluto water
Pluto'd
plutocracy
plutocrat

plutoed

plutoed [demoted](#) [pluto](#)

1. plutoed

93 up, **33** down

to be demoted without due cause or reason

I was captain of the ship for one day, but then I was plutoed.

tags [demoted](#) [promoted](#) [plutod](#) [pluted](#) [denounced](#)

by [DkLdAp](#) US Dec 12, 2006 [email it](#)

2. plutoed

49 up, **9** down

"to demote or devalue someone or something WITH considerable cause."

- from the root word [pluto](#), a name of a former planet, which was demoted and designated as 134340,(dwarf planet) because it didn't meet its definition of a Planet.

An employeeed was [plutoed](#) from his company, for his wrongdoings.

tags [plutoed](#) [pluto'd](#) [pluto](#) [demoted](#) [planet](#) [devalue](#)

by [CyberJake](#) Pinoy Tambayan, Manila Jan 8, 2007 [email it](#)

3. plutoed

3 up, **6** down

to demote someone WITH considerable cause

A 2LT was PLUTOED from RL1 to RL3 because he couldn't start the engines.



White Print for Dark Color Shirts



Click on the image to change image

Click on the colors shown above to change color
When you have finished experimenting with your selections in the pull down menu combination.

[Pluto Never Forget T-shirt](#) \$15.00/ea

#1) Size:

#2) Size:

Planet vs. Dwarf Planet

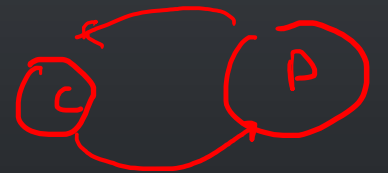
Question: What does it mean to be a planet?

The IAU agreed upon three criteria:

1. The object must orbit the Sun.

2. It must be big enough for its gravity to pull itself into a (nearly) spherical shape.

You are the center of gravity —



3. It has "cleared the area" in its neighborhood. Objects which have not will be called "dwarf planets".

All other objects that orbit the Sun will be called "Small Solar System Bodies."

Dwarf Planet Diameter:

*521 miles
or greater
838 km*

- From the textbook

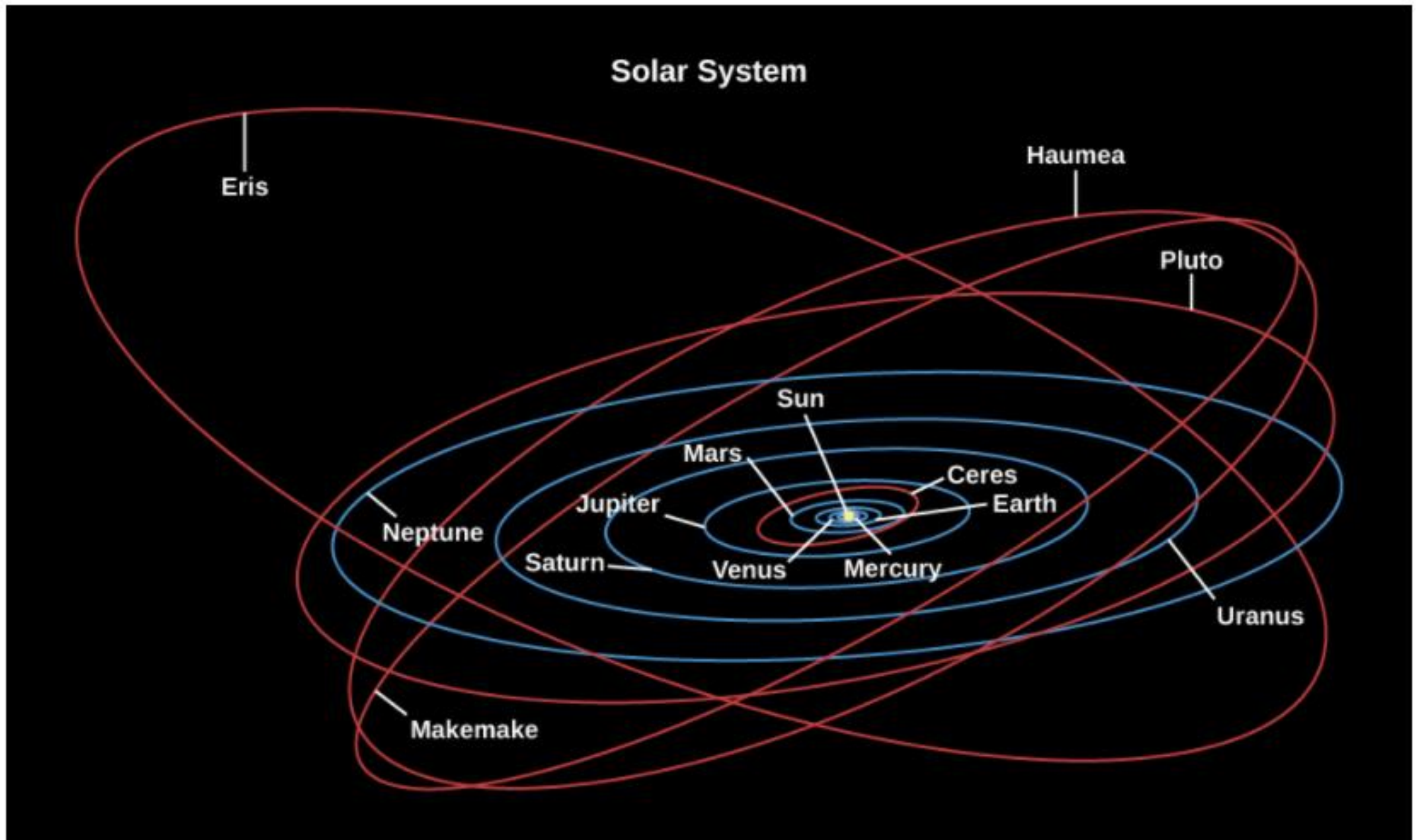
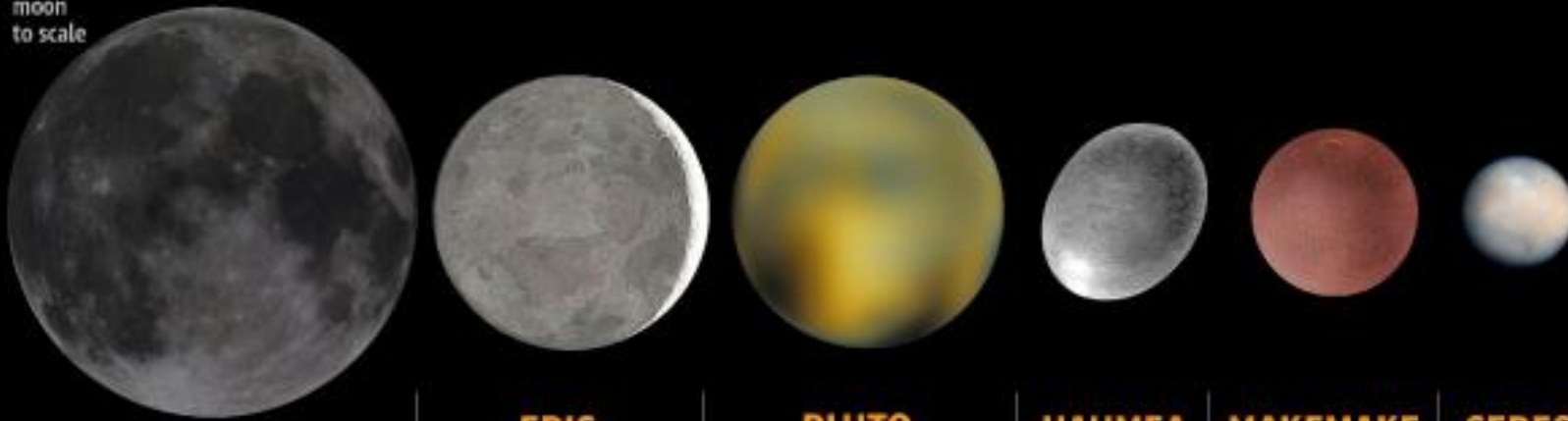


Figure 7.3 Orbits of the Planets. All eight major planets orbit the Sun in roughly the same plane. The five currently known dwarf planets are also shown: Eris, Haumea, Pluto, Ceres, and Makemake. Note that Pluto's orbit is not in the plane of the planets.

Dwarf Planets in the Solar System

In 2006, the organization responsible for classifying celestial bodies, the International Astronomical Union (IAU) decided that a new class of objects was needed. Pluto, considered a planet since its discovery in 1930, was reclassified into the new "dwarf planet" category. To date, five dwarf planets have been found, although some astronomers expect there may be as many as 50 in the solar system.

Earth's
moon
to scale



	ERIS	PLUTO	HAUMEA	MAKEMAKE	CERES
Year of discovery	2003	1930	2003	2005	1801
Diameter (mean)	1,445 miles 2,326 km	1,430 miles 2,302 km	892.3 miles 1,436 km	882 miles 1,420 km	591.8 miles 952.4 km
Orbital period (Earth years)	561.4	247.9	281.9	305.34	4.6
Distance from sun (times Earth's distance)	68	39.5	43.1	45.3	2.8
Orbital inclination (degrees)	46.9	17.14	28.2	29	10.59
Rotation period	25.9 hours	6.39 Earth days	3.9 hours	22.5 hours	9.1 hours
Moons	1	5	2	0	0

- Why isn't Ceres considered an asteroid?

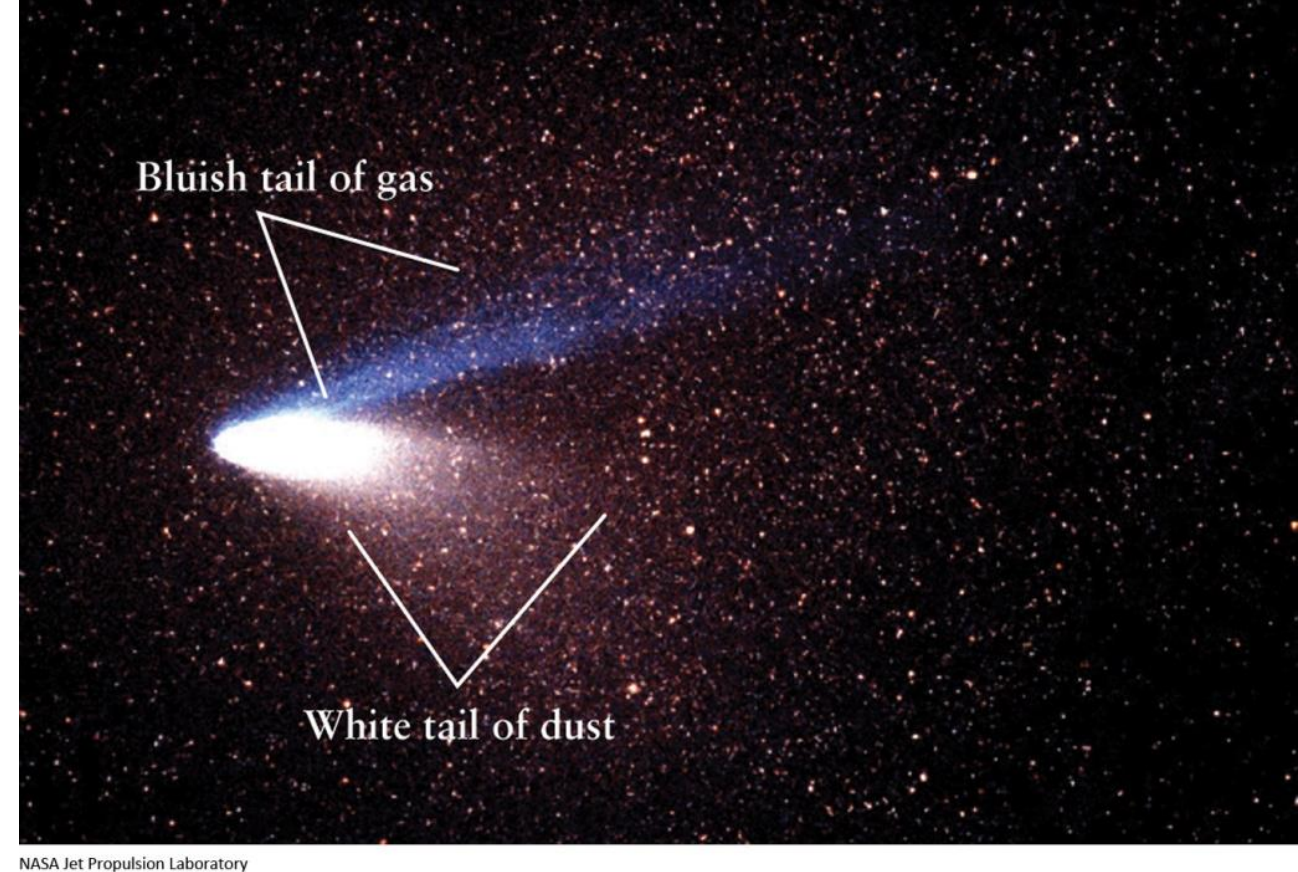
> 521 miles



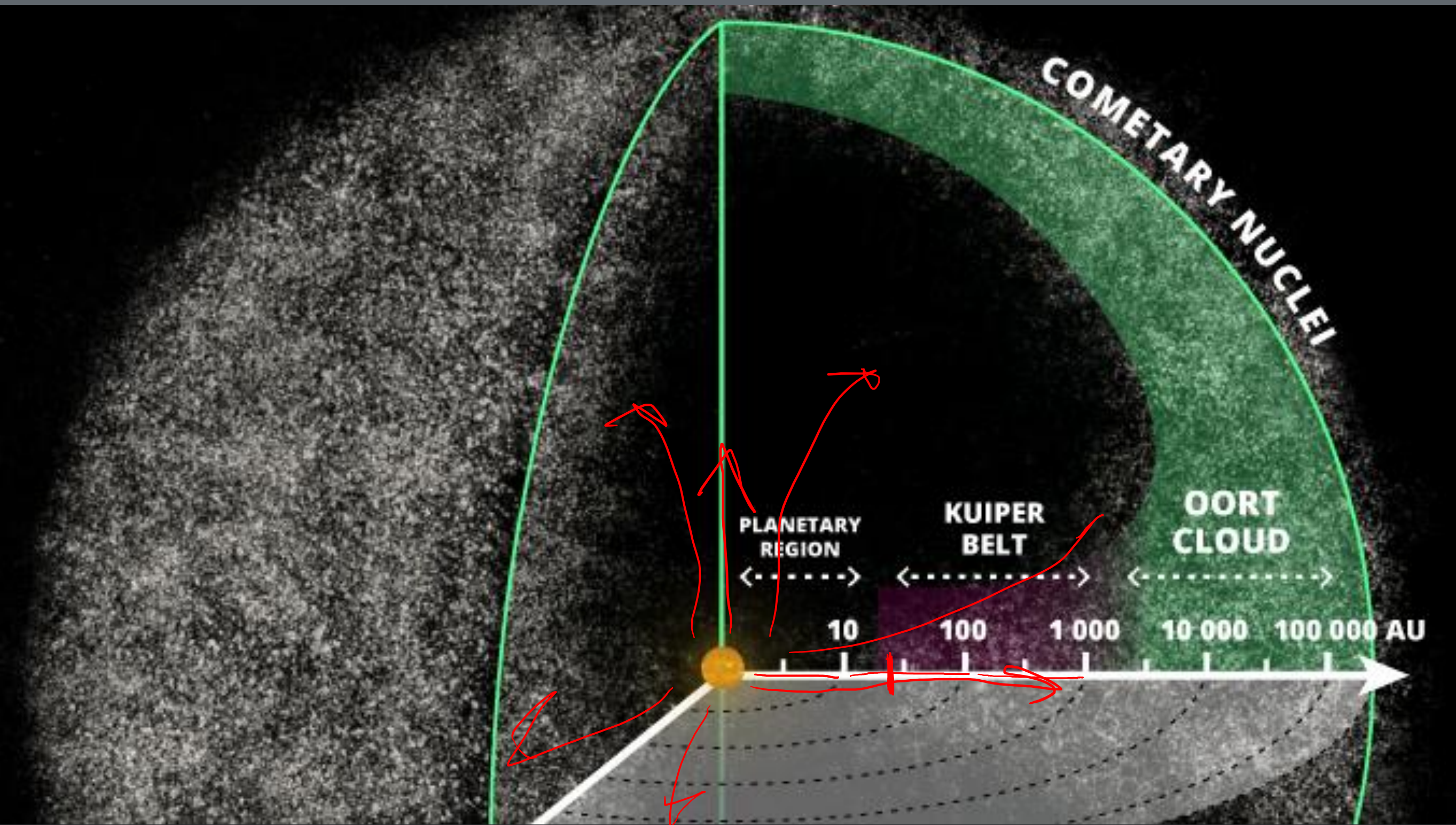
Absolute
Magnitude = 1

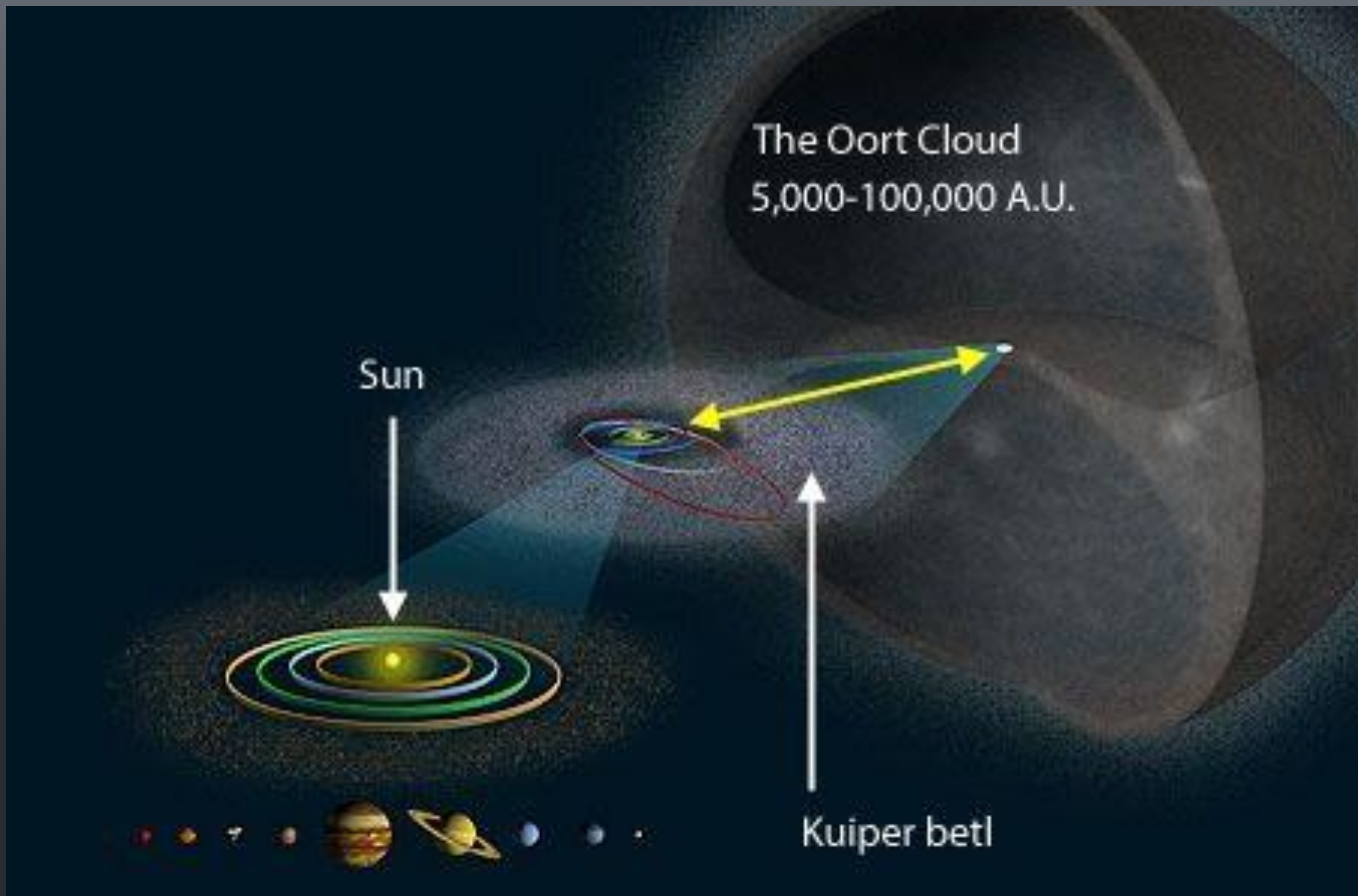
Comets

Comets



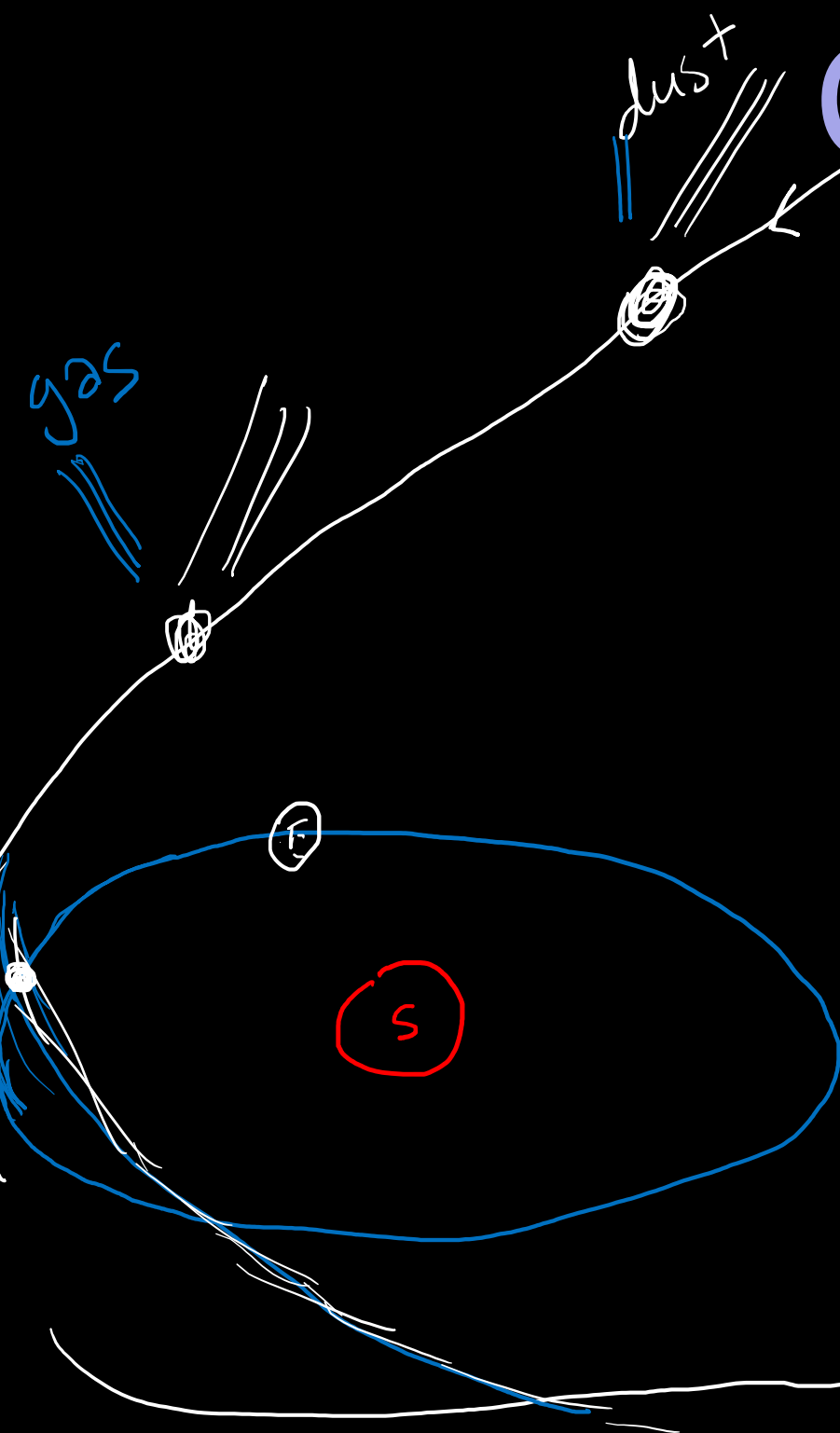
- Leftover objects that formed beyond the frost line, so they mostly consist of ice and rocky dust. Often called “dirty snowballs” *trans-Neptunian objects*
- Come from the Kupier belt or Oort cloud. Most likely made from by a collision or gravitational perturbation.
 - A fragment of a collision can be diverted into a new and elongated orbit that brings it close to the Sun.
- Small objects; nuclei no larger than 20 km across.





Comet Orbits

dormant = no reaction
no effect from SUN
does not have a tail



A month
B year
C 10 years

SALL

Meteors

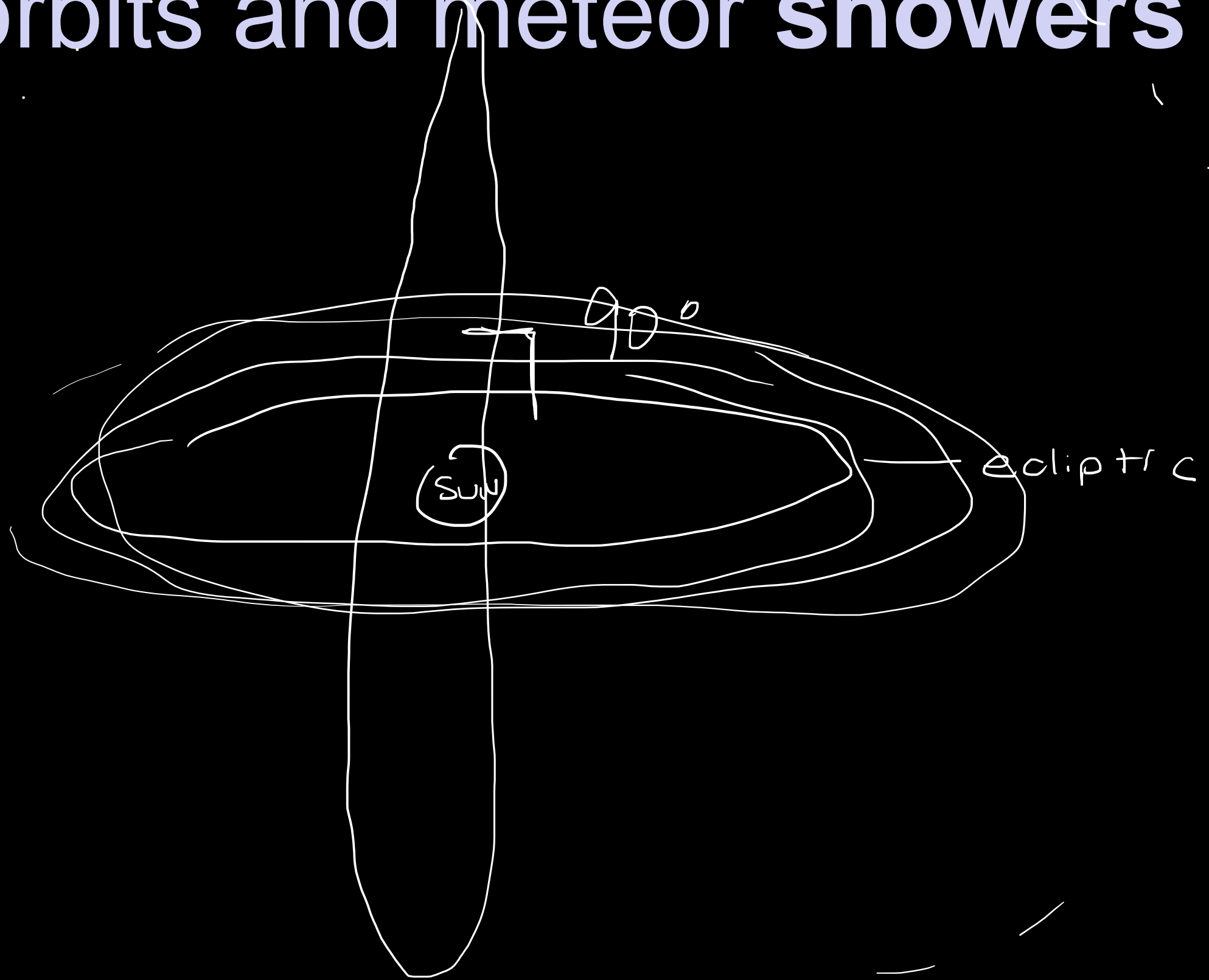
Meteoroids

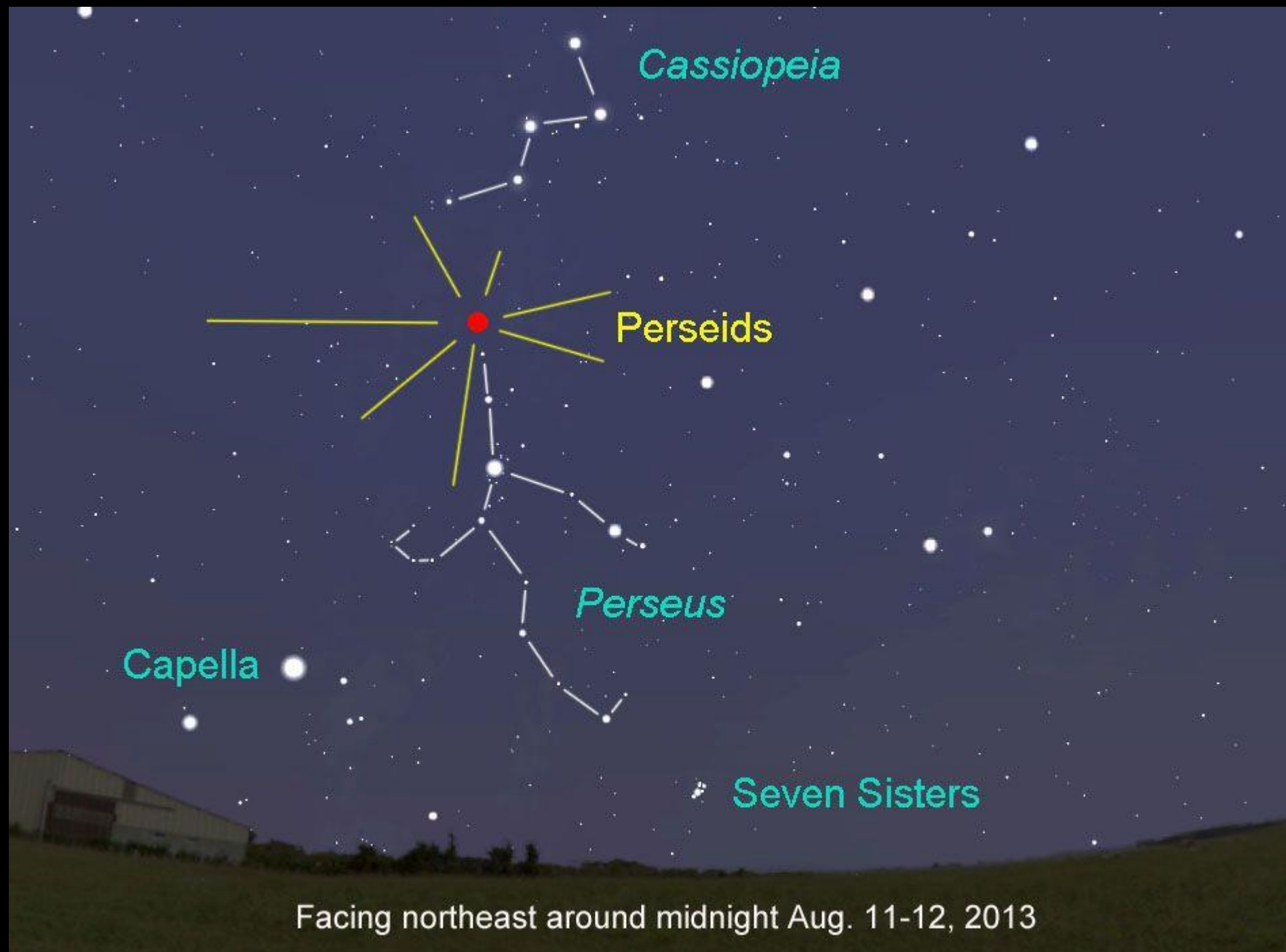
Meteorites

Other Objects in the Solar System

- **Meteoroids** – debris in the Solar System ranging in size from a grain of sand sized ones to boulder sized.
- When one enters Earth's atmosphere it is called a ***meteor*** (or shooting star) ;
- if it falls on the surface of Earth, it is called a ***meteorite***.

Relationship between comet orbits and meteor showers





Facing northeast around midnight Aug. 11-12, 2013



Meteor Shower Dates

<https://www.almanac.com/content/meteor-shower-calendar>

Principal Meteor Showers					
SHOWER	BEST VIEWING	POINT OF ORIGIN	DATE OF MAXIMUM*	NO. PER HOUR**	ASSOCIATED COMET
Quadrantid	Predawn	N	Jan. 4	25	—
Lyrid	Predawn	S	Apr. 22	10	Thatcher
Eta Aquarid	Predawn	SE	May 4	10	Halley
Delta Aquarid	Predawn	S	July 30	10	—
Perseid	Predawn	NE	Aug. 11–13	50	Swift-Tuttle
Draconid	Late evening	NW	Oct. 9	6	Giacobini-Zinner
Orionid	Predawn	S	Oct. 21–22	15	Halley
Taurid	Late evening	S	Nov. 9	3	Encke
Leonid	Predawn	S	Nov. 17–18	10	Tempel-Tuttle
Andromedid	Late evening	S	Nov. 25–27	5	Biela
Geminid	All night	NE	Dec. 13–14	75	—
Ursid	Predawn	N	Dec. 22	5	Tuttle
*May vary by one or two days **Moonless, rural sky Bold = most prominent					

Astronomers discover a new object in our solar system, orbiting perpendicular to the ecliptic plane. This object is most likely a(n)

- A. asteroid.
- B. comet.
- C. planet.
- D. trans-Neptunian object

Astronomers discover a new object in our solar system, orbiting perpendicular to the ecliptic plane. This object is most likely a(n)

- A. asteroid.
- B. comet.
- C. planet.
- D. trans-Neptunian object

Asteroids, trans-Neptunian objects (same as Kuiper belt objects), and planets all lie on or near the ecliptic. While comets can come from the Kuiper belt, some can also come from the Oort cloud. Since the Oort cloud is spherical and not a plane, comets that come from this region can have orbits that are perpendicular to the ecliptic plane.