SPACE PHYSICS

Lecture 11

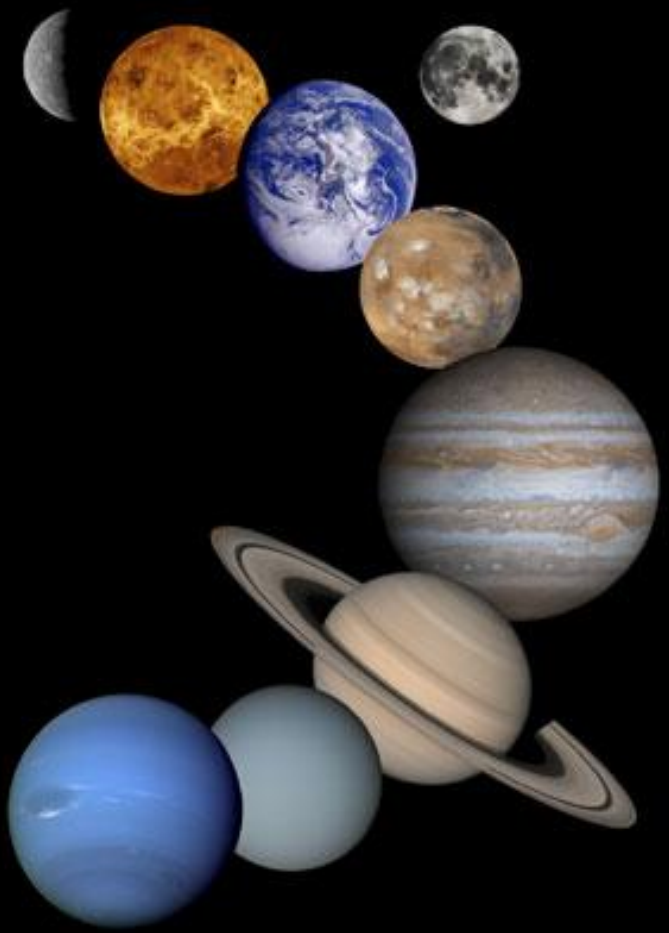
J. Sahraei

Physics Department,

Razi University

http://www.razi.ac.ir/sahraei

Our Solar System



Pluto is not shown. No spacecraft has visited Pluto and it is too small and distant for good photography.

OTHER BODIES

- Comets are giant dirty snowballs composed of frozen gases and icy lumps

- Asteroids are chunks of rock that range in size from dust particles to a few hundred miles across

- Meteoroids are tiny particles of dust and sand. Entering the Earth's atmosphere, they are called meteors. It if actually hits the surface, it is called a meteorite

Comets

Comets have been called "dirty snowballs." They are small celestial objects, made of ice, gas, dust, and a small amount of organic material, that orbit our Sun

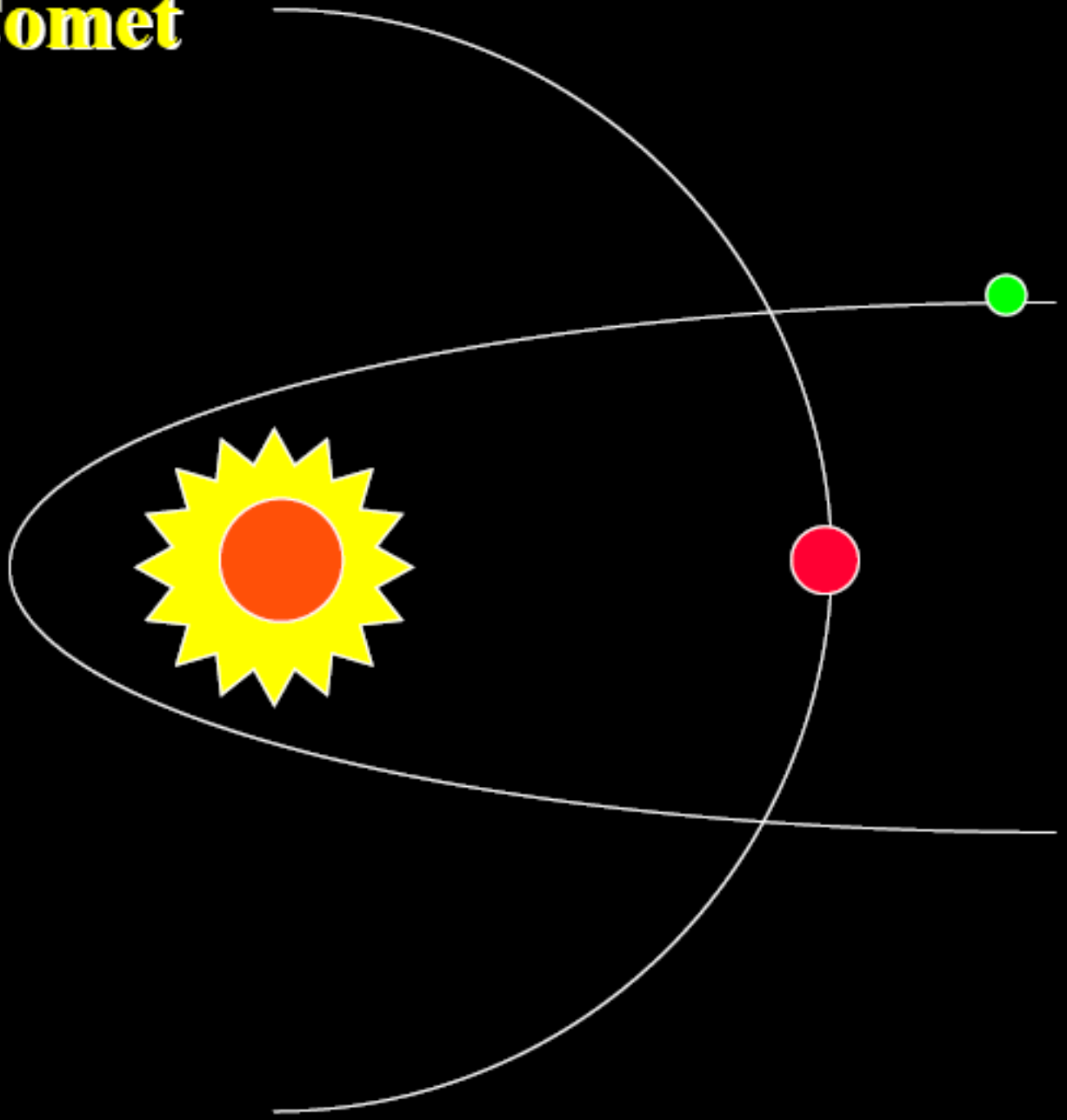
There are about 1000 known comets and more are discovered each year.

Comets

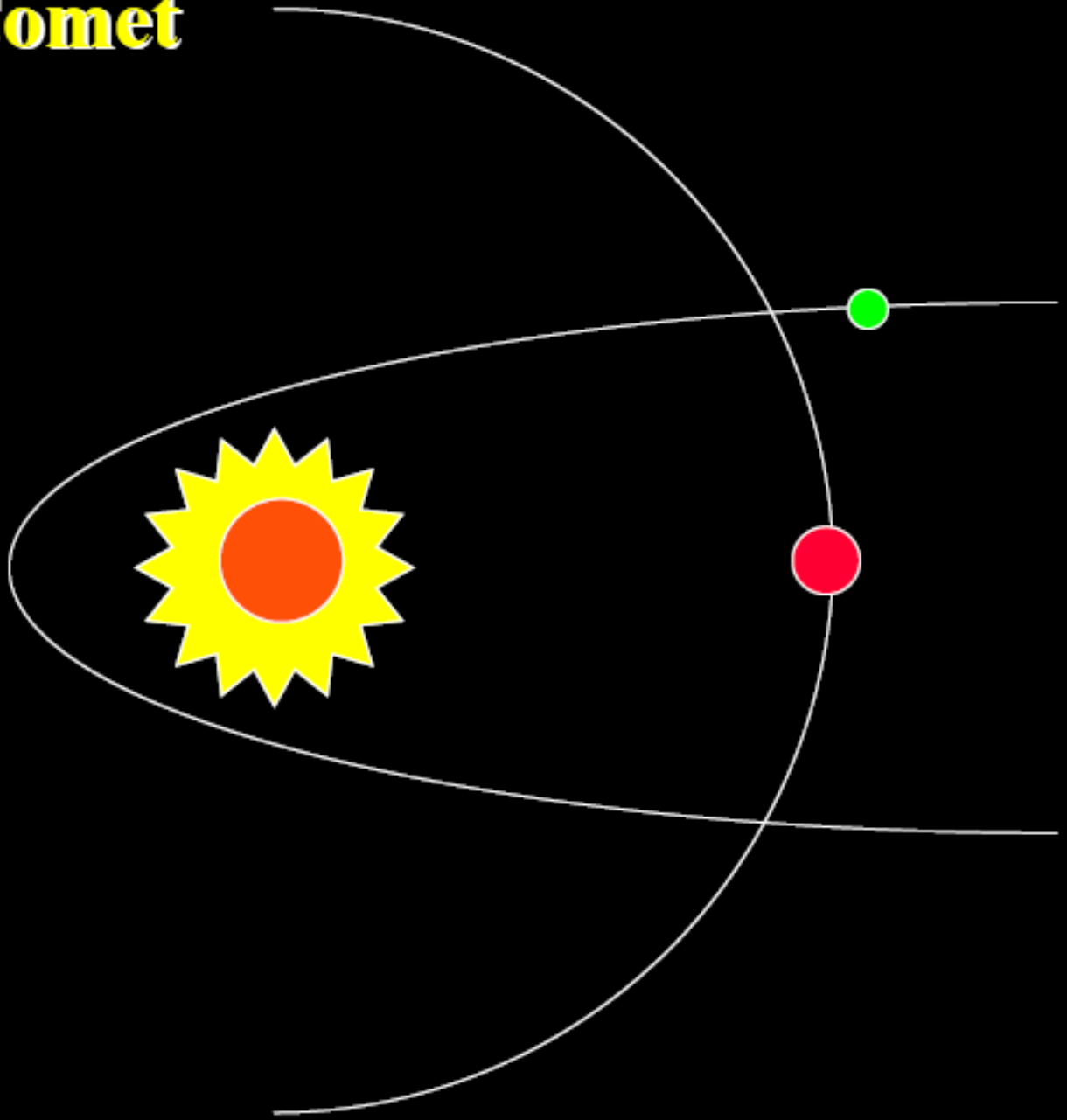
Comets' orbits are usually very long, narrow ellipses.

They produce tails of gas and dust when they approach the sun.

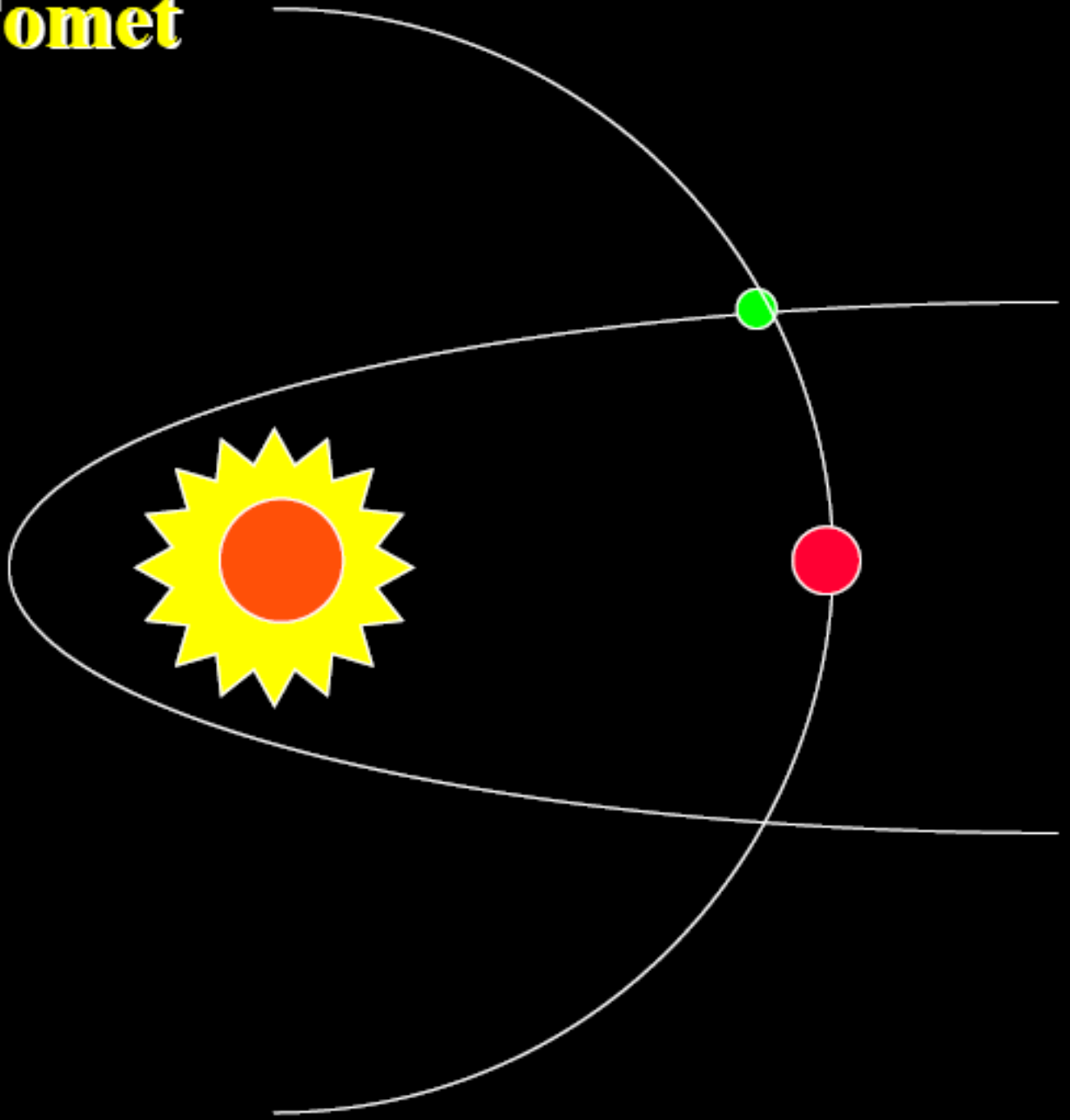
Path of Comet



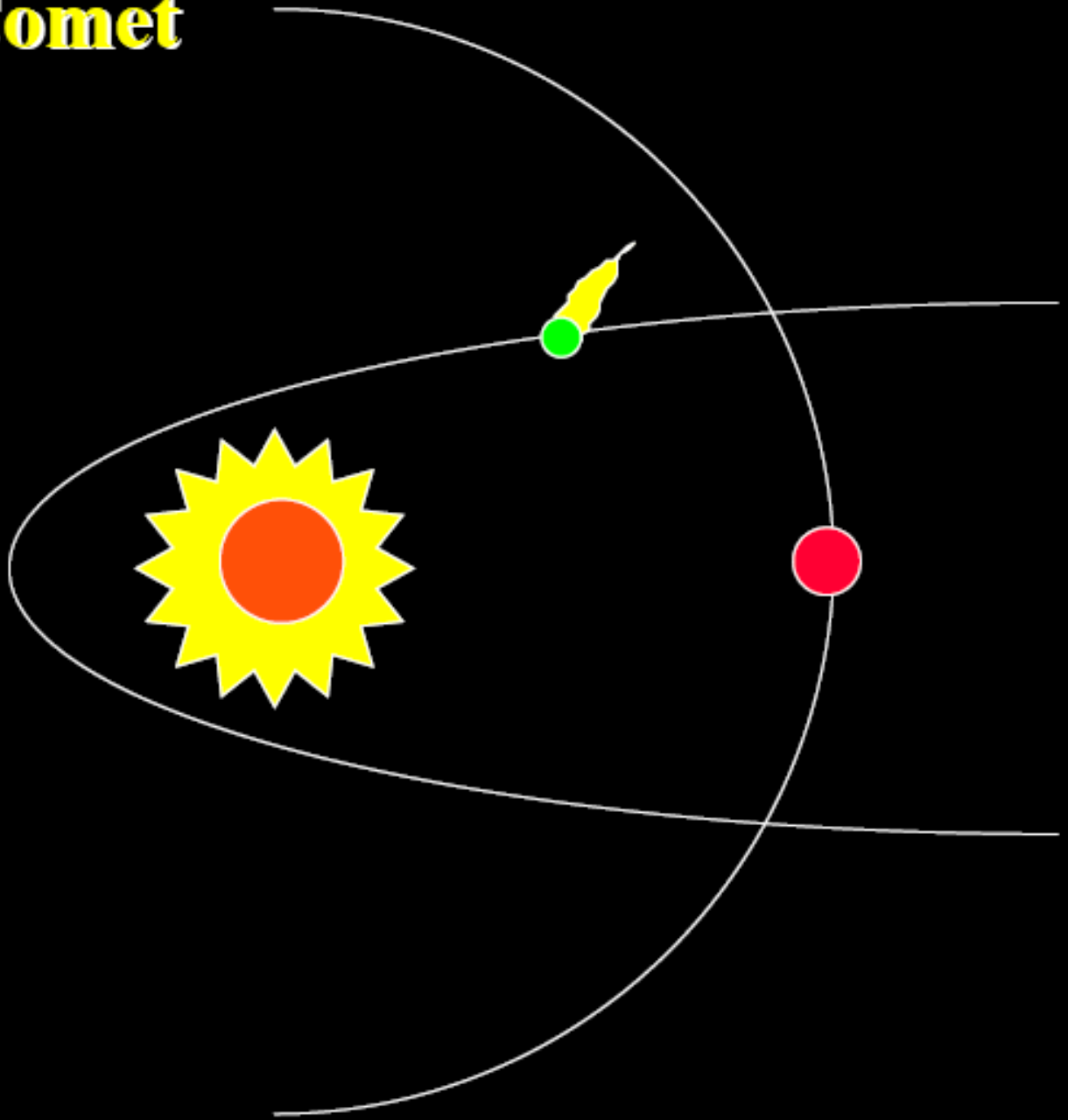
Path of Comet



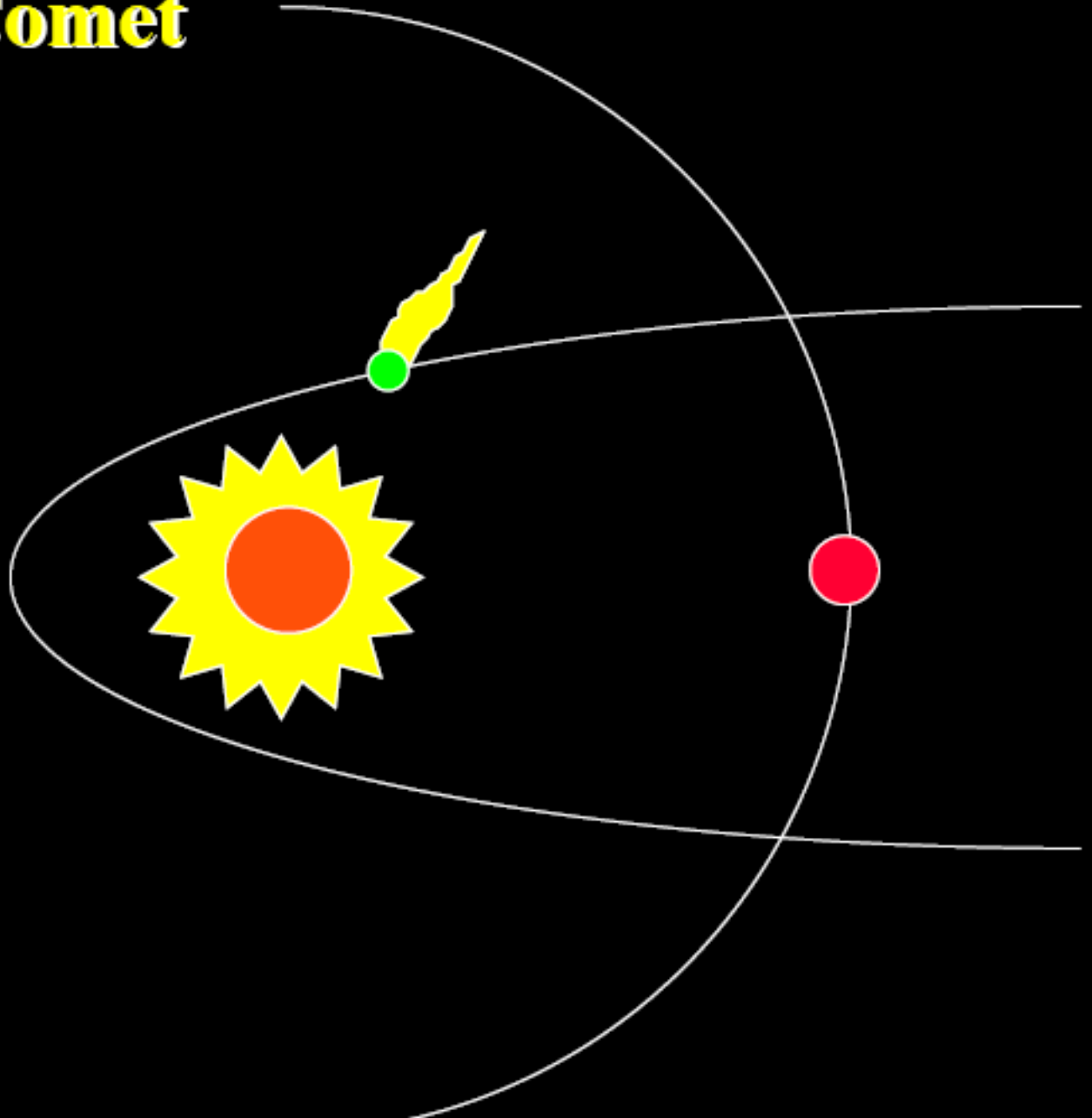
Path of Comet



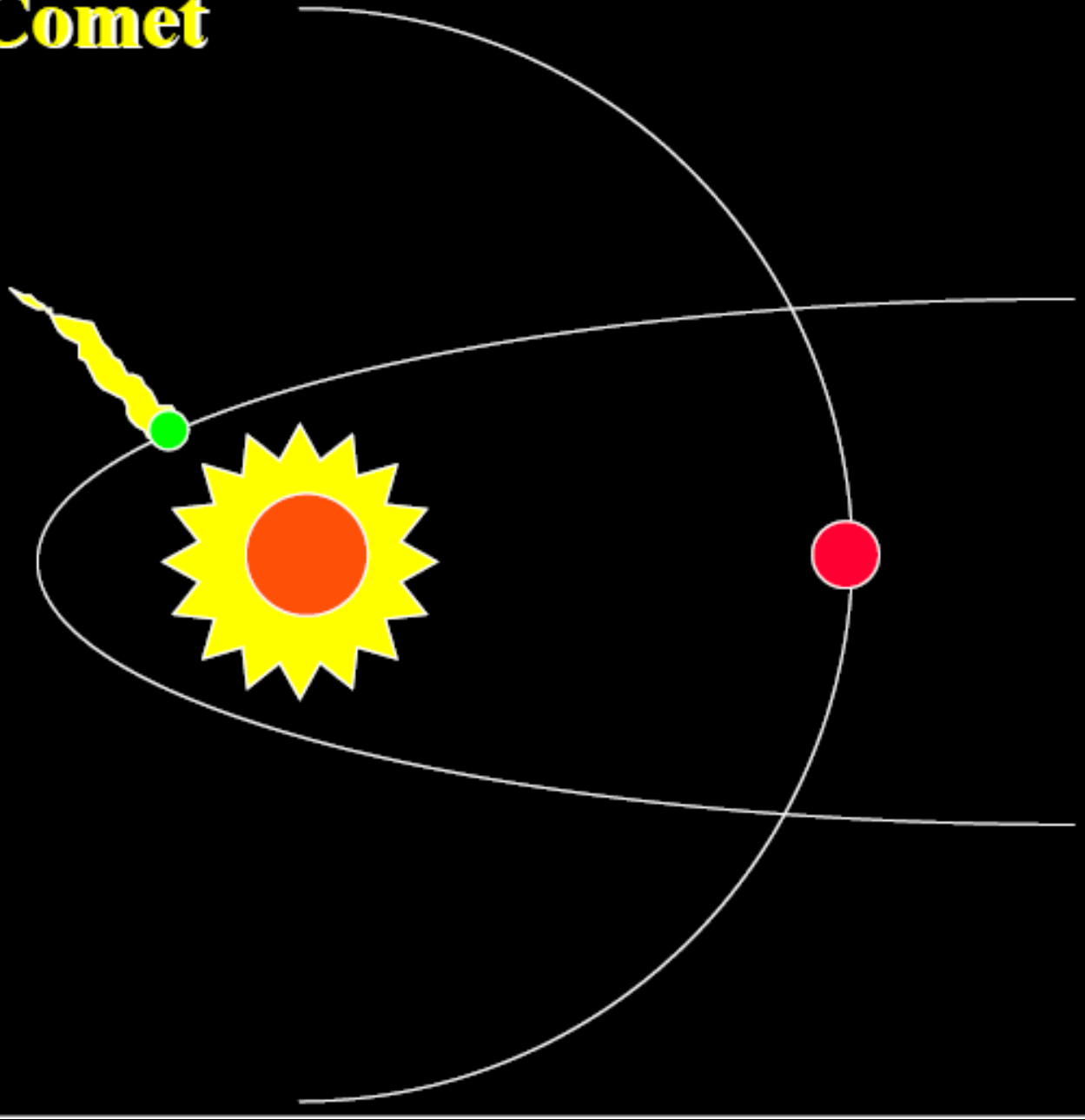
Path of Comet



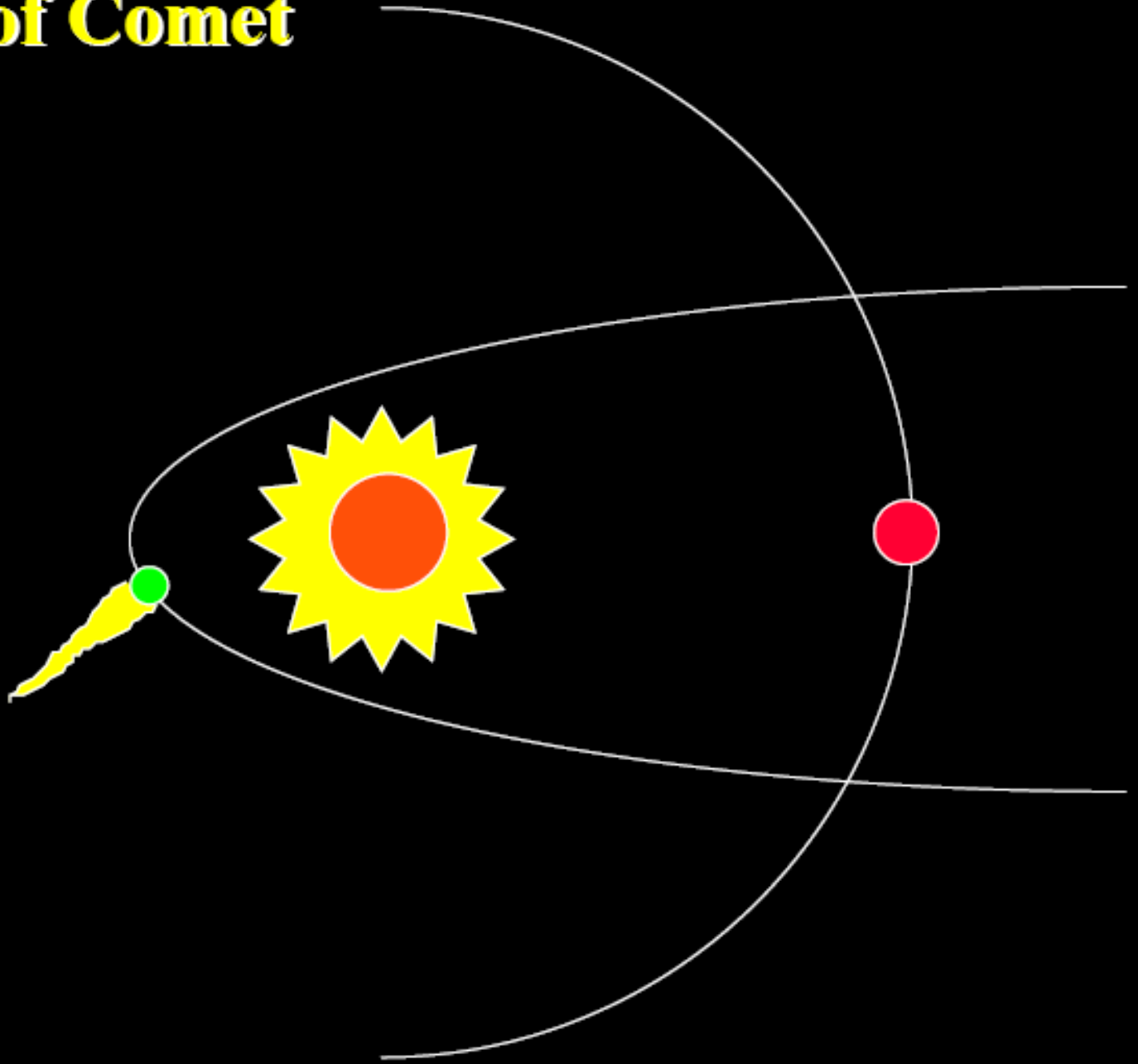
Path of Comet



Path of Comet



Path of Comet



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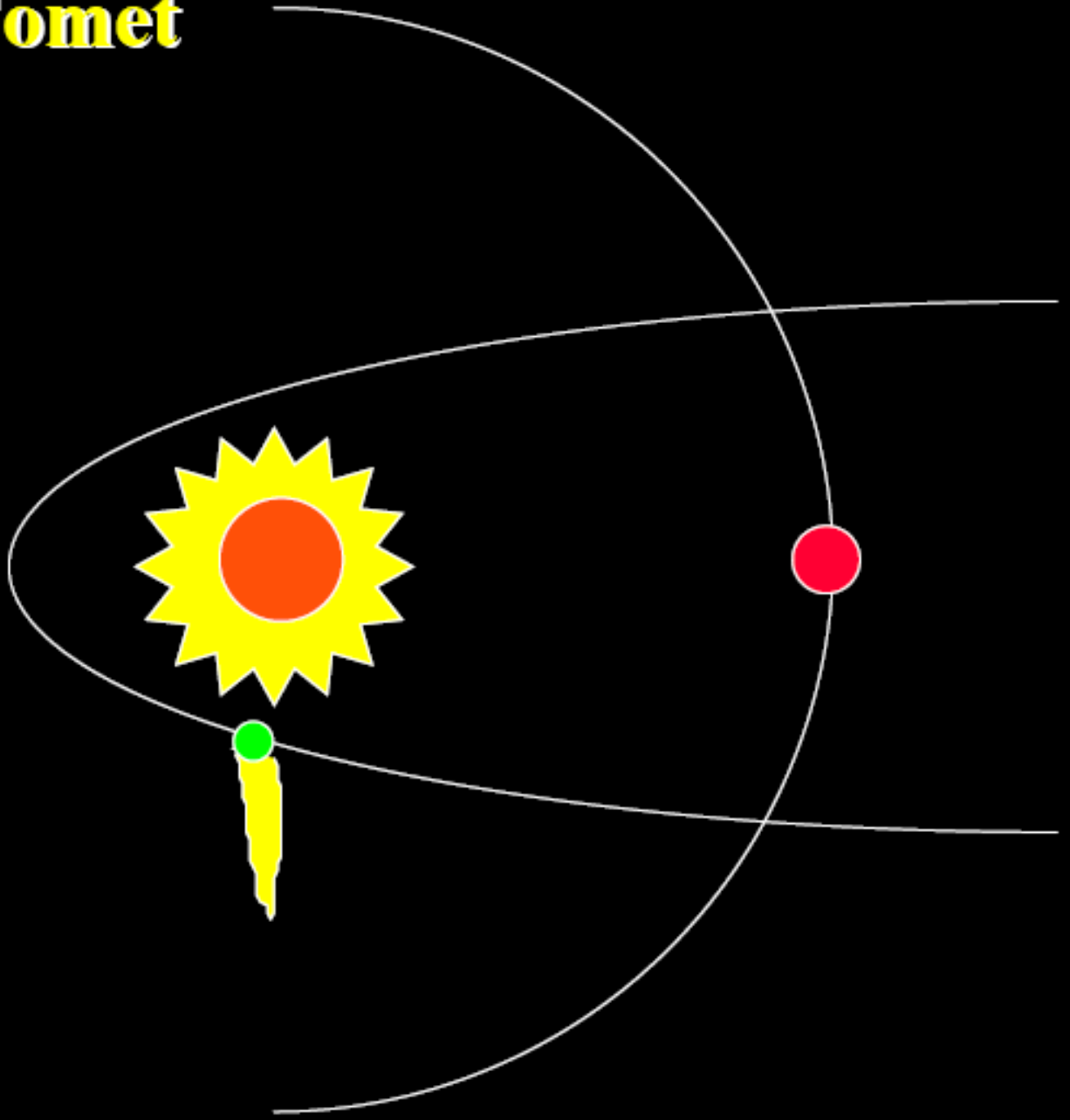
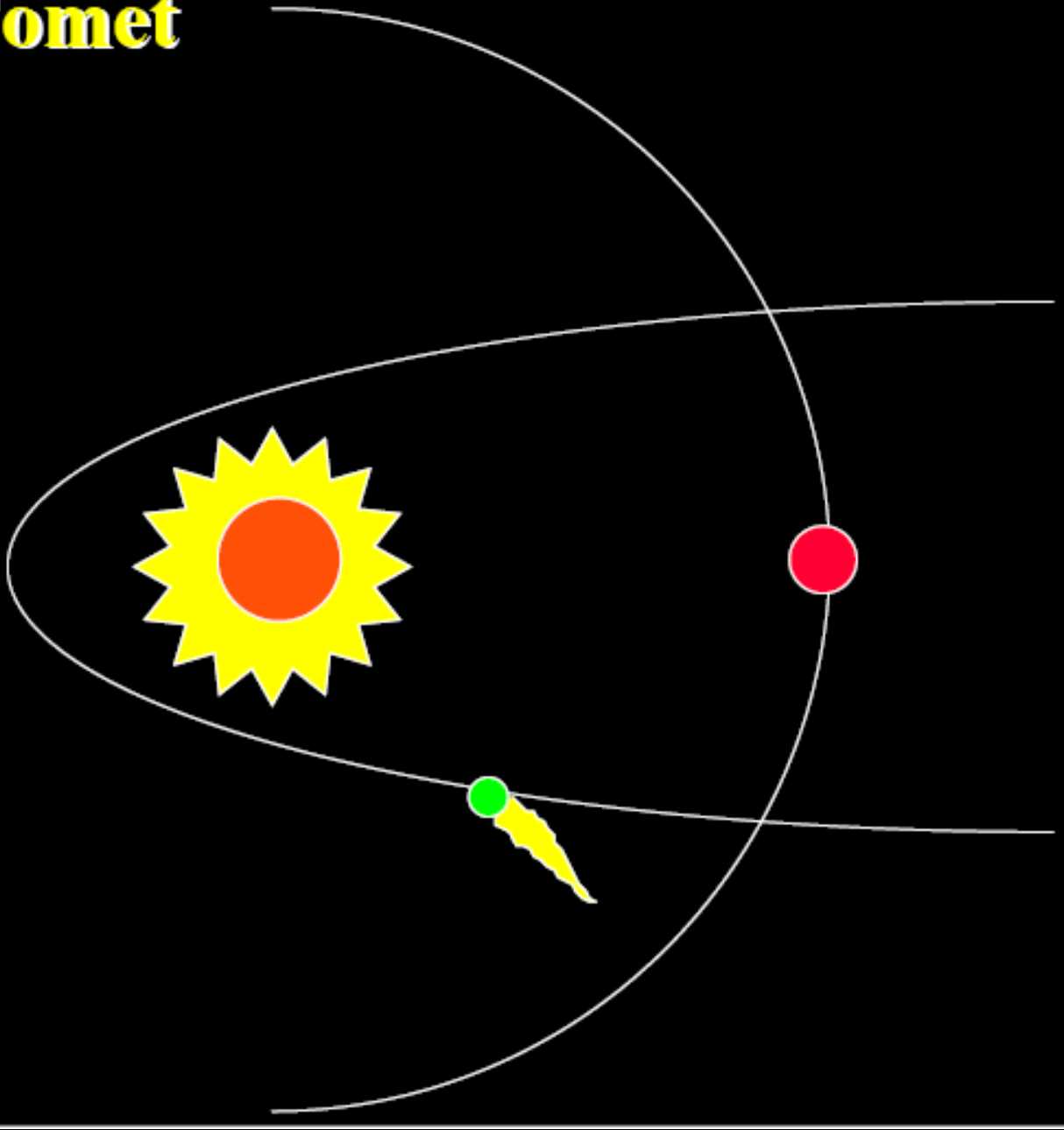
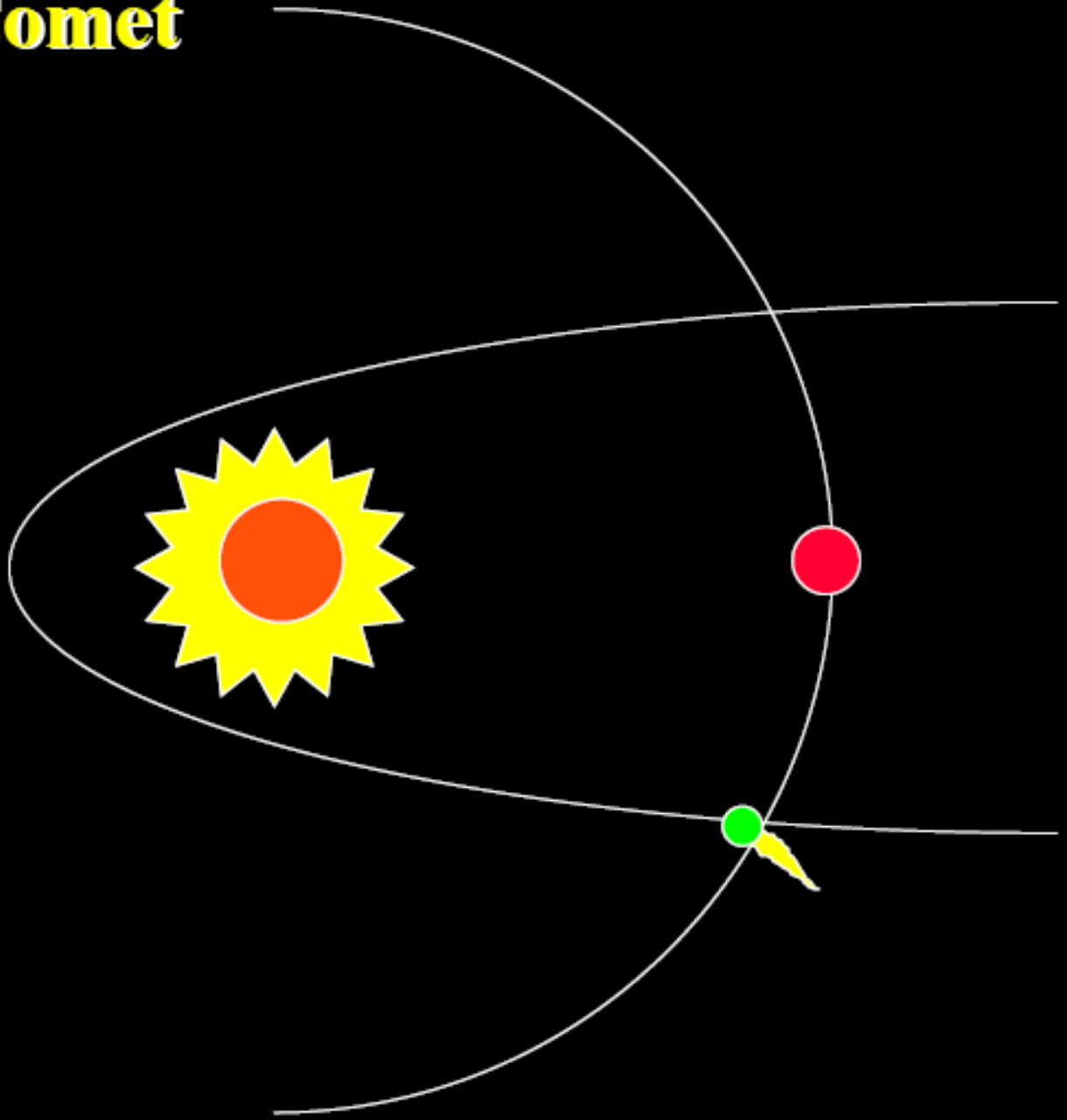


Path of Comet

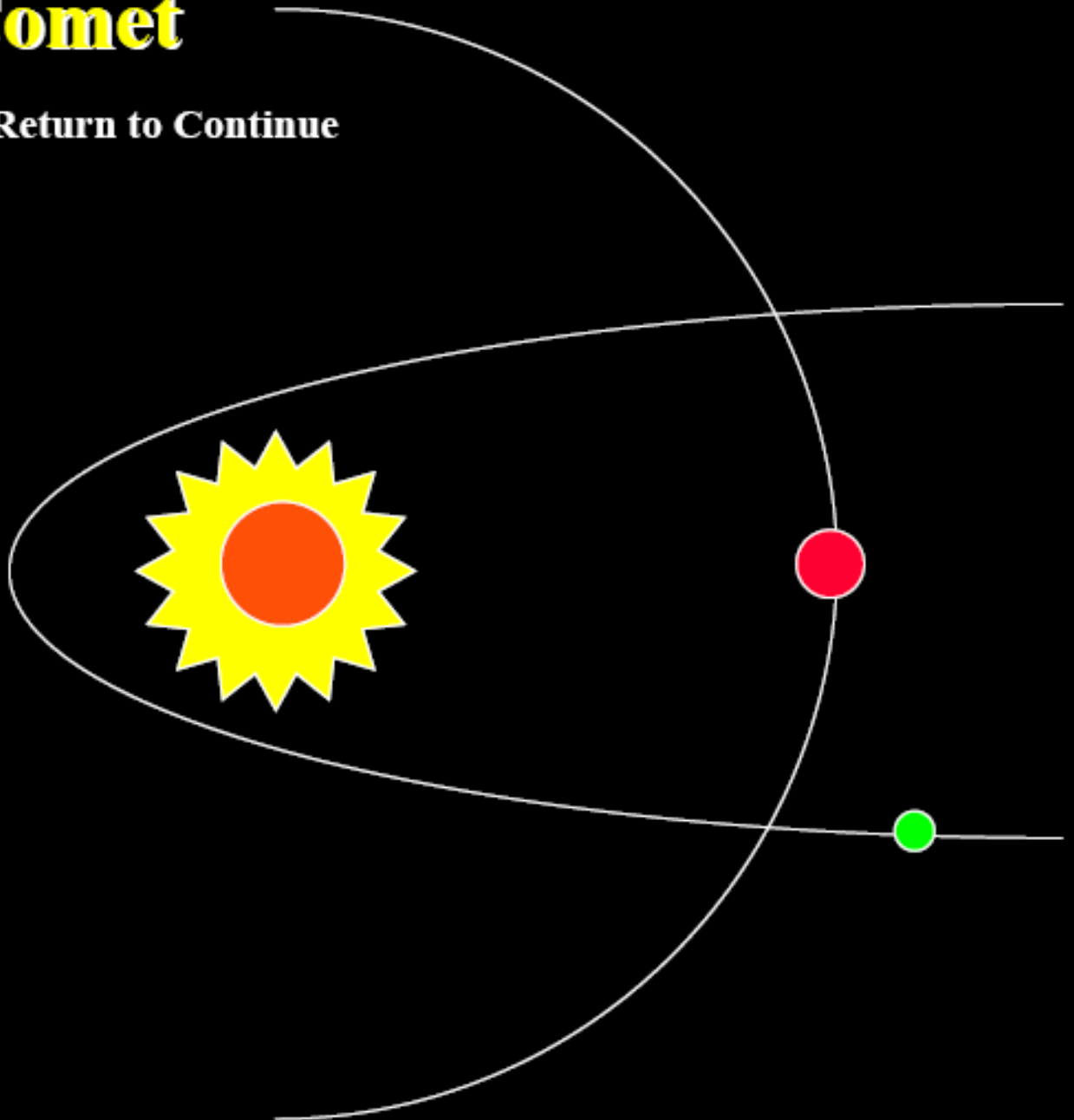


Path of Comet



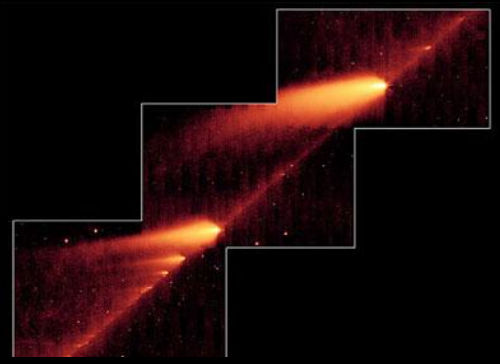
Path of Comet

Hit the Mouse or Return to Continue

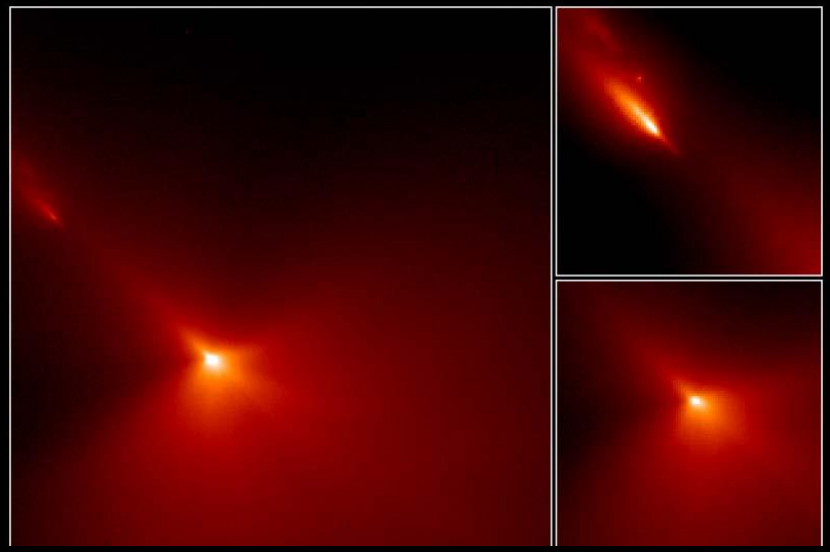


Comets:

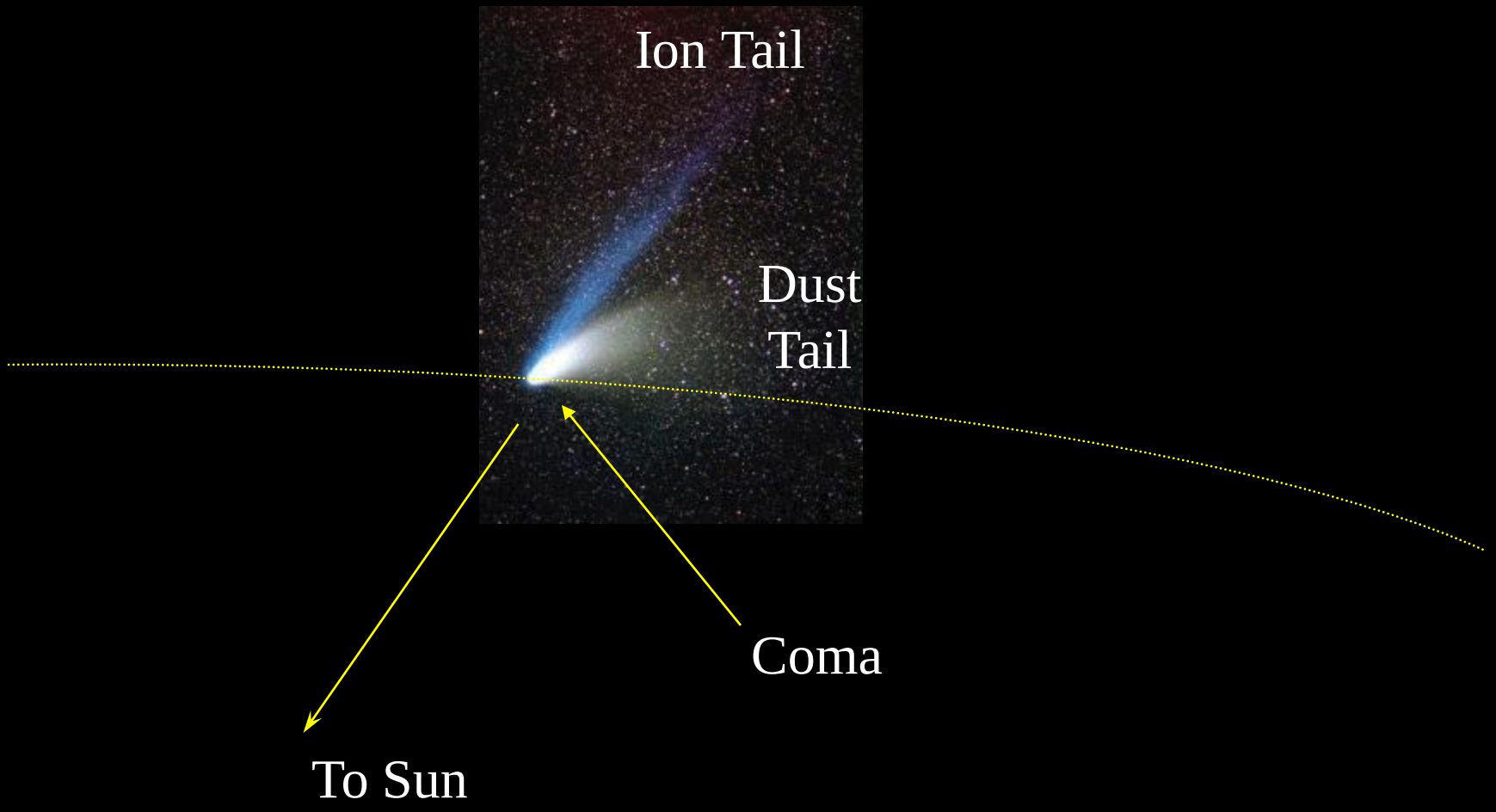
- Have very eccentric, longer orbit periods.
- Can be more difficult to detect.



OTHER BODIES

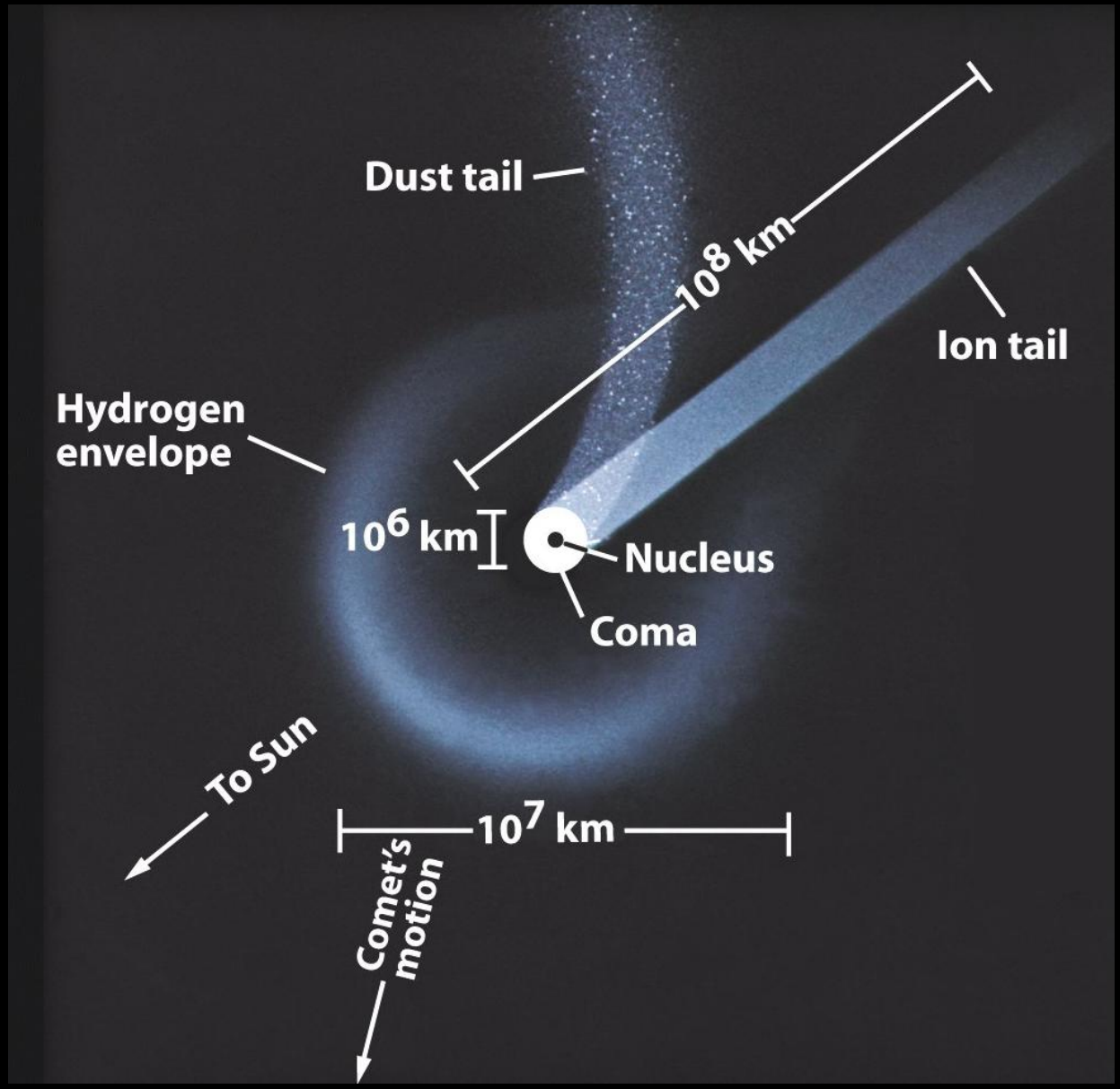


Structure of a Comet

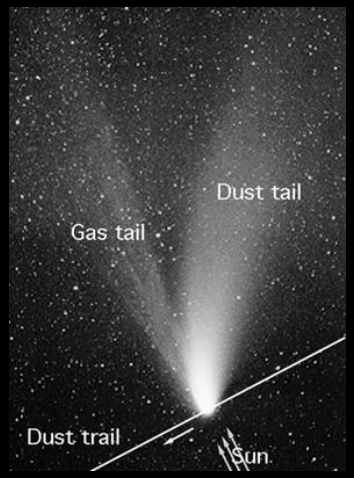


Comet: structure

- Nucleus
- Coma
- Hydrogen envelope
- Dust tail
- Ion Tail



Comet Structure



- **Nucleus**
  - 10 km "Dirty Snowball"
- **Coma**
  - Cloud of evaporated ices and ions
  - may be 100,000 km in diameter
- **Tail**
  - Always points away from Sun
    - Solar Wind and Radiation Pressure

nucleus

Every comet has a **nucleus** , a stable, porous central mass of ice, gas, and dust that if often between 1 and 10 kilometers (0.6 to 6 miles) in size.

The ice is made of varying amounts of water, carbon dioxide, ammonia, and methane.

The dust may contain hydrogen, oxygen, carbon, nitrogen, silica, and some metals. The nucleus may have traces of hydrocarbons.

coma

As comets approach our Sun [within about 450 million kilometers (280 million miles)], they heat up and the ice begins to sublimate (change from a solid directly to a gas).

The gas (water vapor, carbon monoxide, carbon dioxide, and traces of other substances) and dust forms an "atmosphere" around the nucleus called a **"coma."** Material from the coma gets swept into the tail.

tail

- As comets move close to the Sun, they develop **tails** of dust and ionized gas. Comets have two main tails, a **dust tail** and a **plasma tail.**
- The dust tail appears whitish-yellow because it is made up of tiny particles — about the size of particles of smoke — that reflect sunlight.

Dust tails are typically between 1 and 10 million kilometers long.

The plasma tail is often blue because it contains carbon monoxide ions.

Solar ultraviolet light breaks down the gas molecules, causing them to glow.

Plasma tails can stretch tens of millions of kilometers into space.

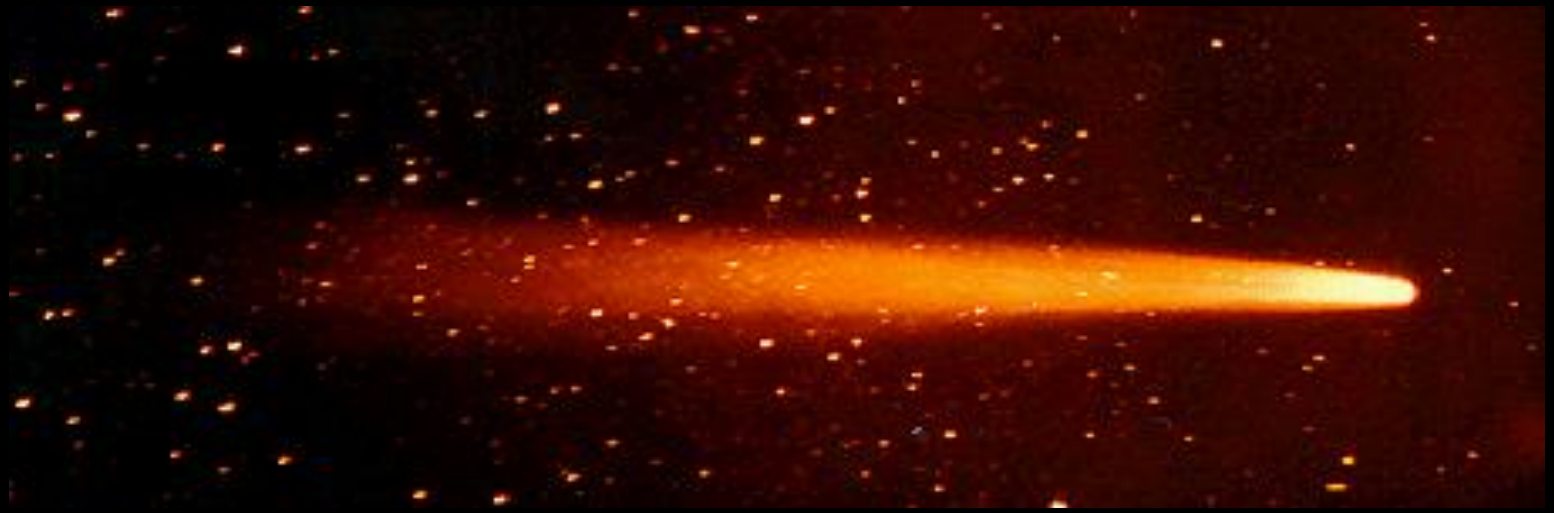
Rarely, they are as long as 150 million kilometers.

A third tail of sodium has been observed on Comet Hale-Bopp.

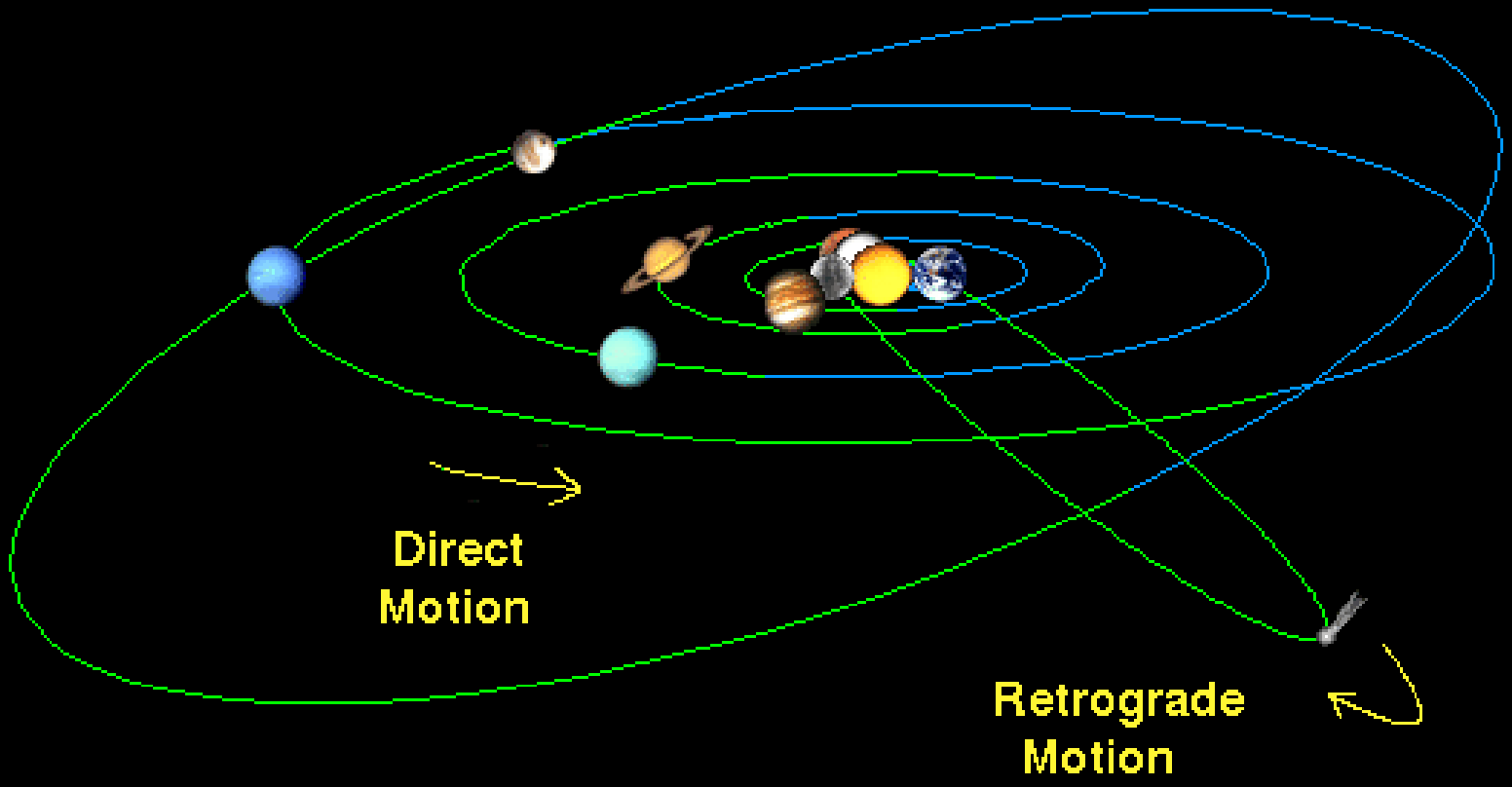
Comet Hale Bopp

Comets are enveloped in a broad, thin (sparse) **hydrogen cloud** that can extend for millions of kilometers. This envelope cannot be seen from Earth because its light is absorbed by our atmosphere, but it has been detected by spacecraft

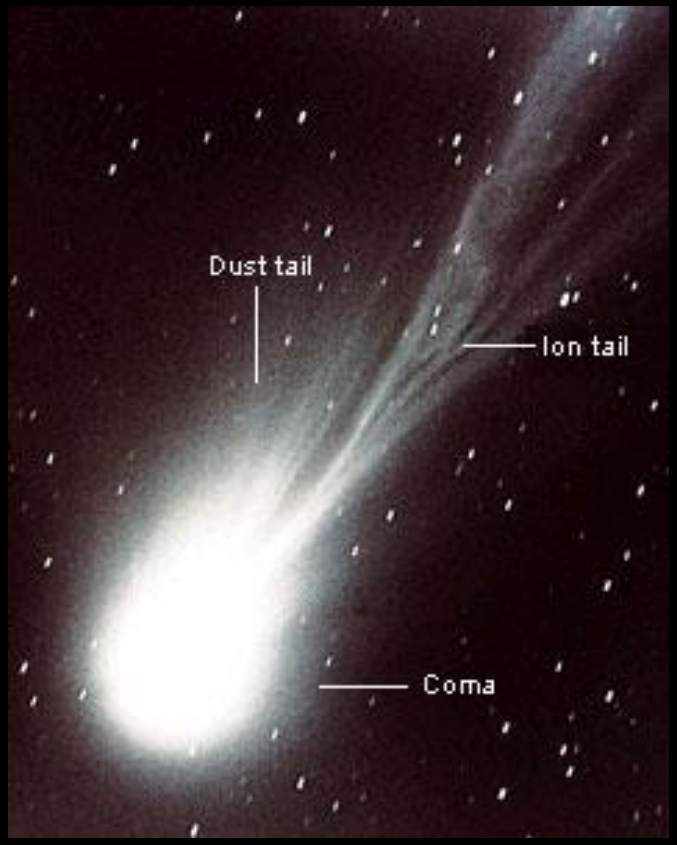
Comet Halley

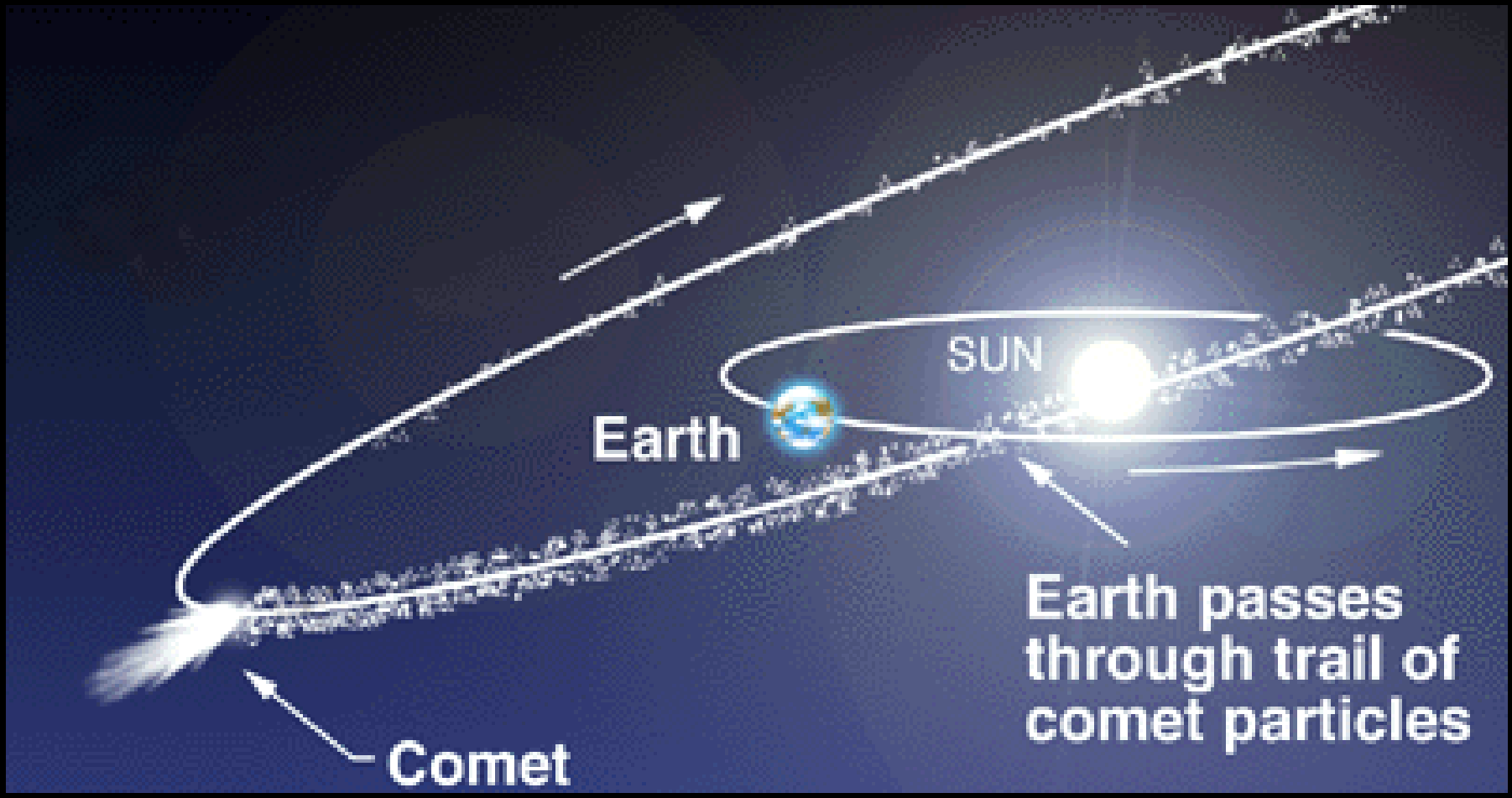


Halley's Comet Orbit...
next seen in 2062



Halley's Comet....
Orbits every 76 years




SUN
Earth
Earth passes through trail of comet particles
Comet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Comet – Planet Interactions

ARE THERE ANY
QUESTIONS?