

# Reminders

- Make your Personal Horizon Diagram assignment
  - Due today
  - No late assignments accepted
  - You *can* check for correctness before you submit
- Individual and Group Quiz 1
  - In class on Thursday
  - Make sure you are in a place with good Internet
  - No late submissions accepted
- Observing through a Telescope Assignment posted
  - Sign up for a 30-minute observing session in Canvas under People/Groups

first /  
25  
mins

T T

## PRACTICE AND REVIEW SESSIONS

With Dr. Michelle Wooten

- Wednesdays 11:30 a.m. - 12:30 p.m.
- Thursdays 10 - 11 a.m.

With Teaching Assistants

- Tuesdays 2 - 7 p.m.
- Wednesdays 2 - 7 p.m.
- Thursdays 2 - 7 p.m.

With a Learning Assistant

- Fridays 2 - 3 p.m.

Zoom Links available in the Syllabus

Second 25  
minutes

Assignments

Undated Assignment



# Concept Test

Today the Sun rose in which direction?

- A) Directly to the East
- B) North of East
- C) South of East
- D) It depends where you are on Earth

# Study Abroad

[https://www.youtube.com/watch?v=\\_-VxDR6E0WY&feature=youtu.be](https://www.youtube.com/watch?v=_-VxDR6E0WY&feature=youtu.be)







*Akira Fujii/David Malin Images*



Rolf Wahl Olsen - 03/02/2006 12:21 UTC  
Jewelbox Cluster MCG 4-7-55  
10" Newton / ToluCane Pro SC1  
48 x 21s



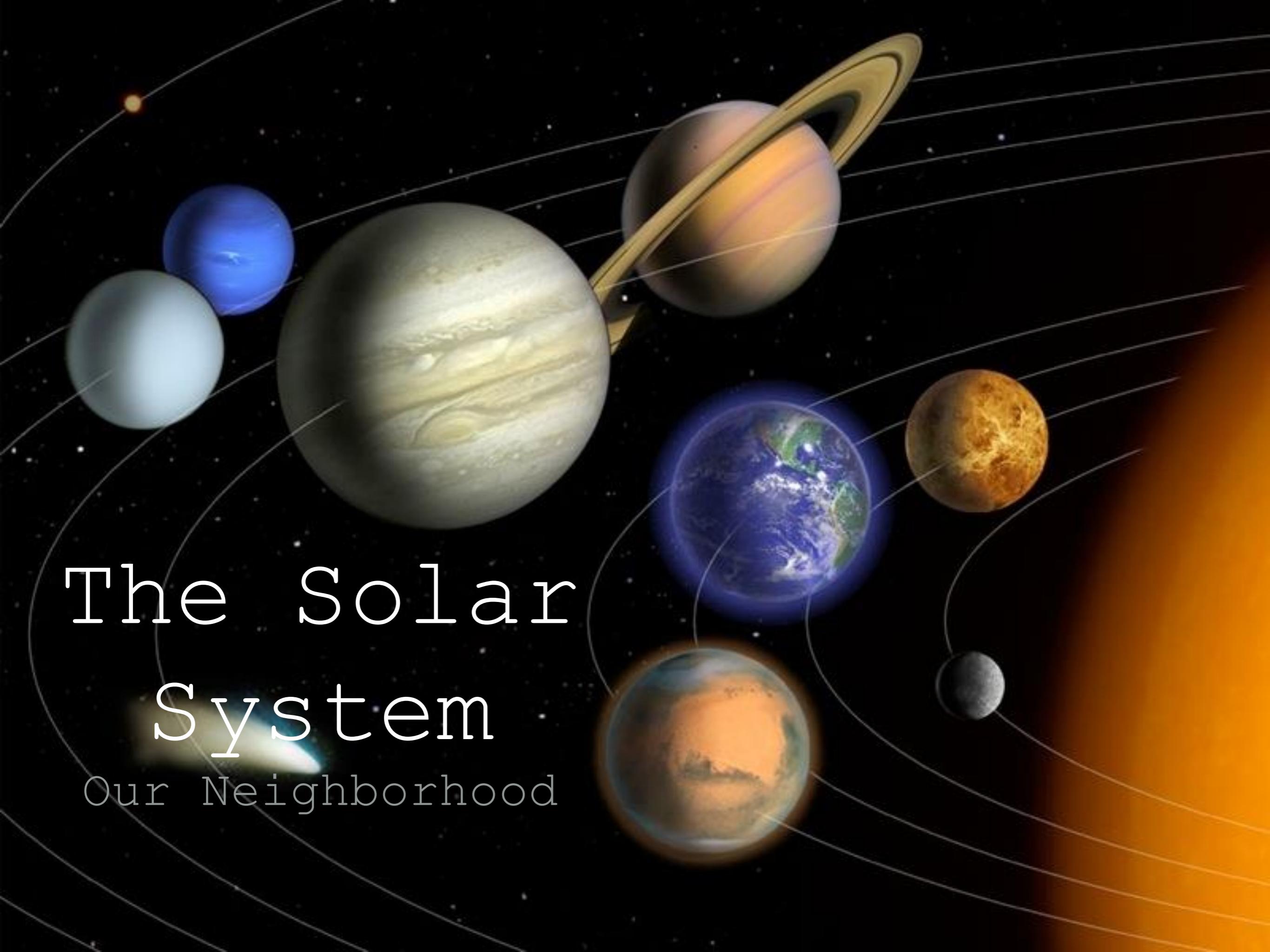


# Assignment:

## Observing Through a Telescope Activity

# The Solar System

Our Neighborhood



# Today

- Order and features of planets

# Your ideas: In your composition notebook...

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Take 5 minutes to respond to the following prompt:

Sketch a picture of your place in the Solar System from the perspective of far above Earth's north pole.

Indicate...

*I recommend making use of your colored pencils!*

- A) Your location in the Solar System,
- B) the approximate location and relative size of all the Solar System objects for which you have some knowledge
- C) The shape of the orbits of these Solar System objects
- D) Label the names of all the Solar System objects in your diagram.
- E) On the next page write about what you felt you were unable to accurately portray in your representation.

*→ Canvas → "Participation Sept 15"*

# Some Definitions

Definition:

An **Astronomical Unit (AU)** is defined as the distance between the Sun and Earth. It is about 93 million miles (or about 8 light-minutes).

Definition:

A **day** is defined as how long it takes for a planet or moon to complete one rotation about its axis of rotation.

Definition:

A **year** is defined as how long it takes for a planet to complete one orbit around the Sun.  
Revolution

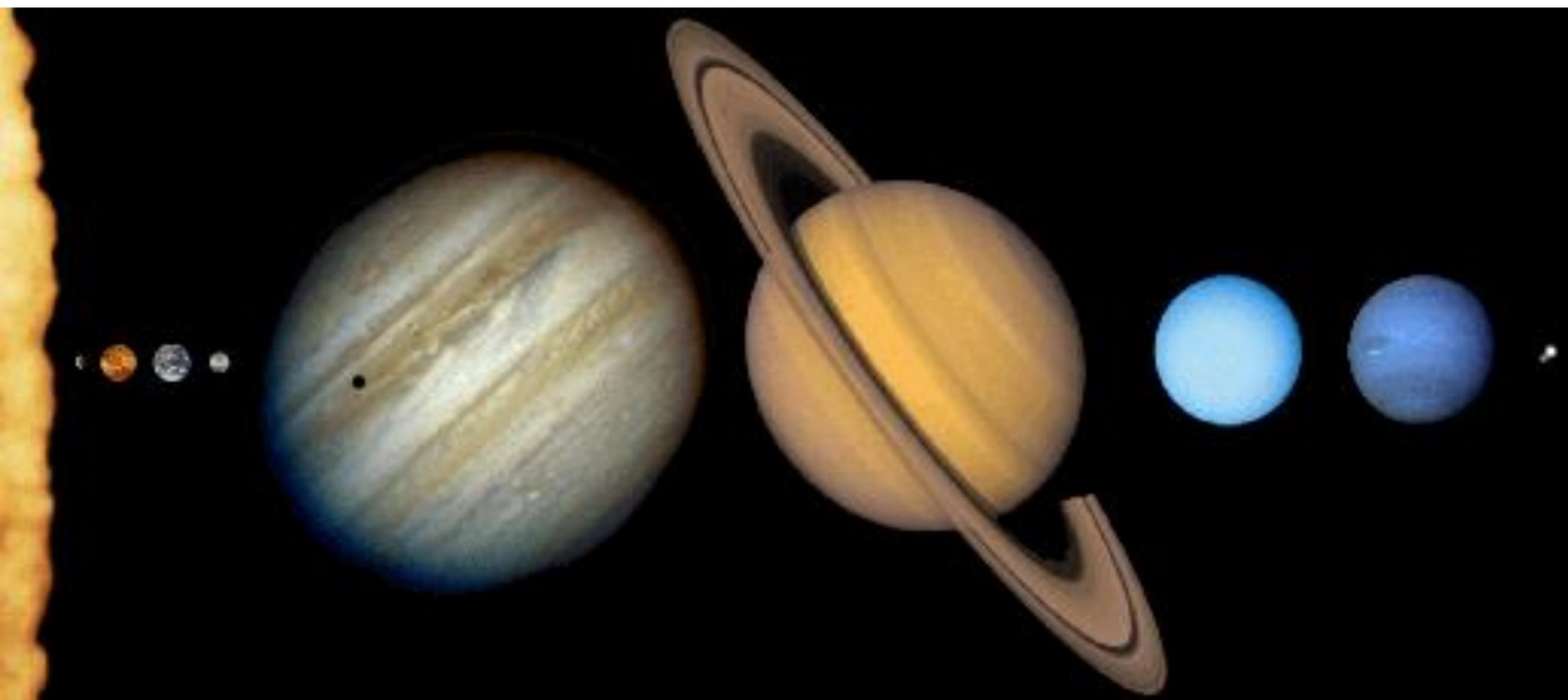
Definition:

A **planet** orbits around the Sun. A **moon** orbits around a planet.

# How should we divide the Solar System?

What can we measure about the planets in our own solar system?

VARIABLES



# Variables in Unit 2

direction of motion

distance from Sun

Size (diameter)

temperature

Composition

# The Solar System

## Definition:

### Comparative planetology

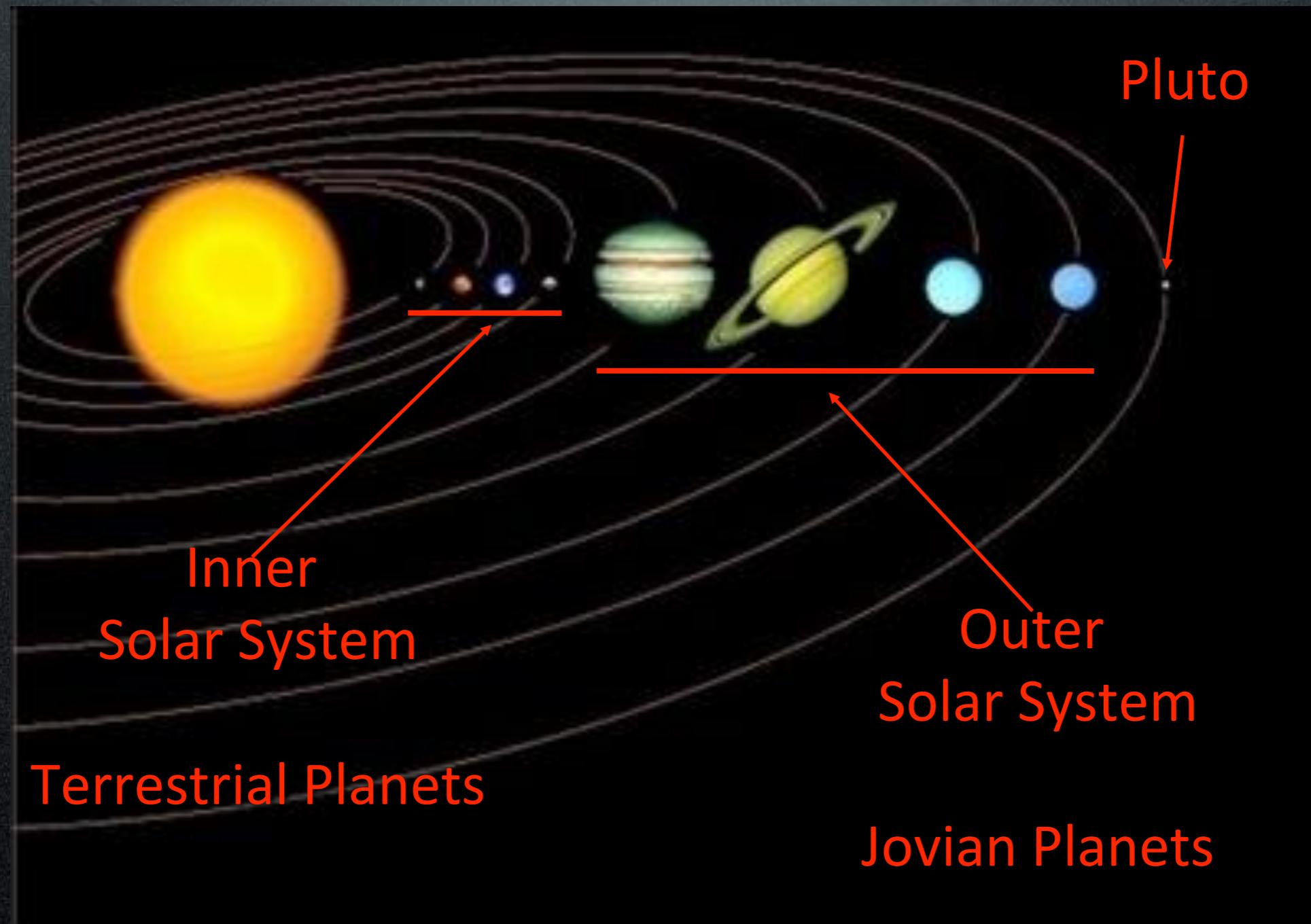
is the practice of studying and comparing the properties of planets, moons, asteroids and comets relative to each other.

- All planets (except Mercury) have nearly circular orbits.
- All except Venus and Uranus rotate counter-clockwise.

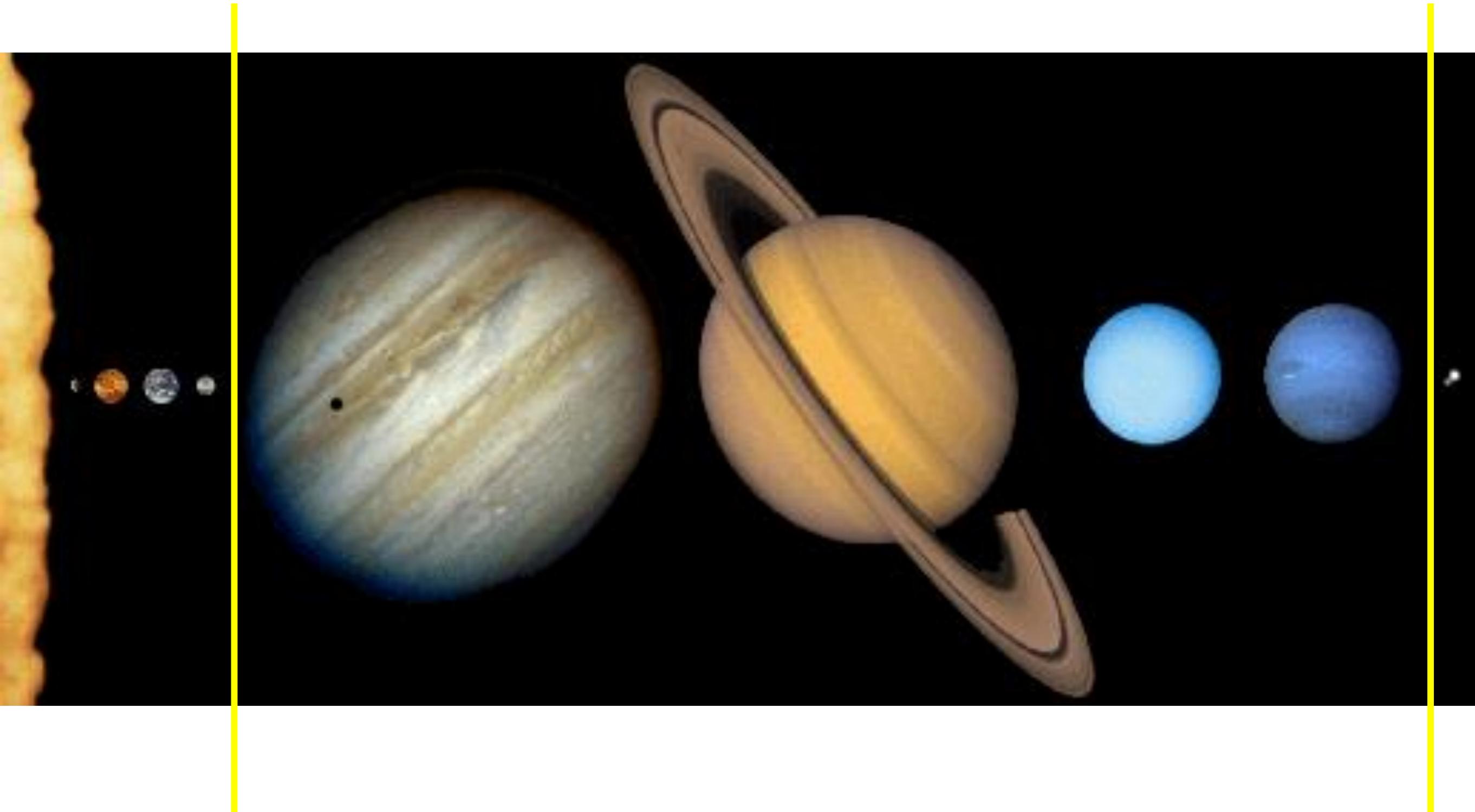
counter-clockwise (we're looking at the solar system from the Sun's perspective, or the North pole).

in the same direction.

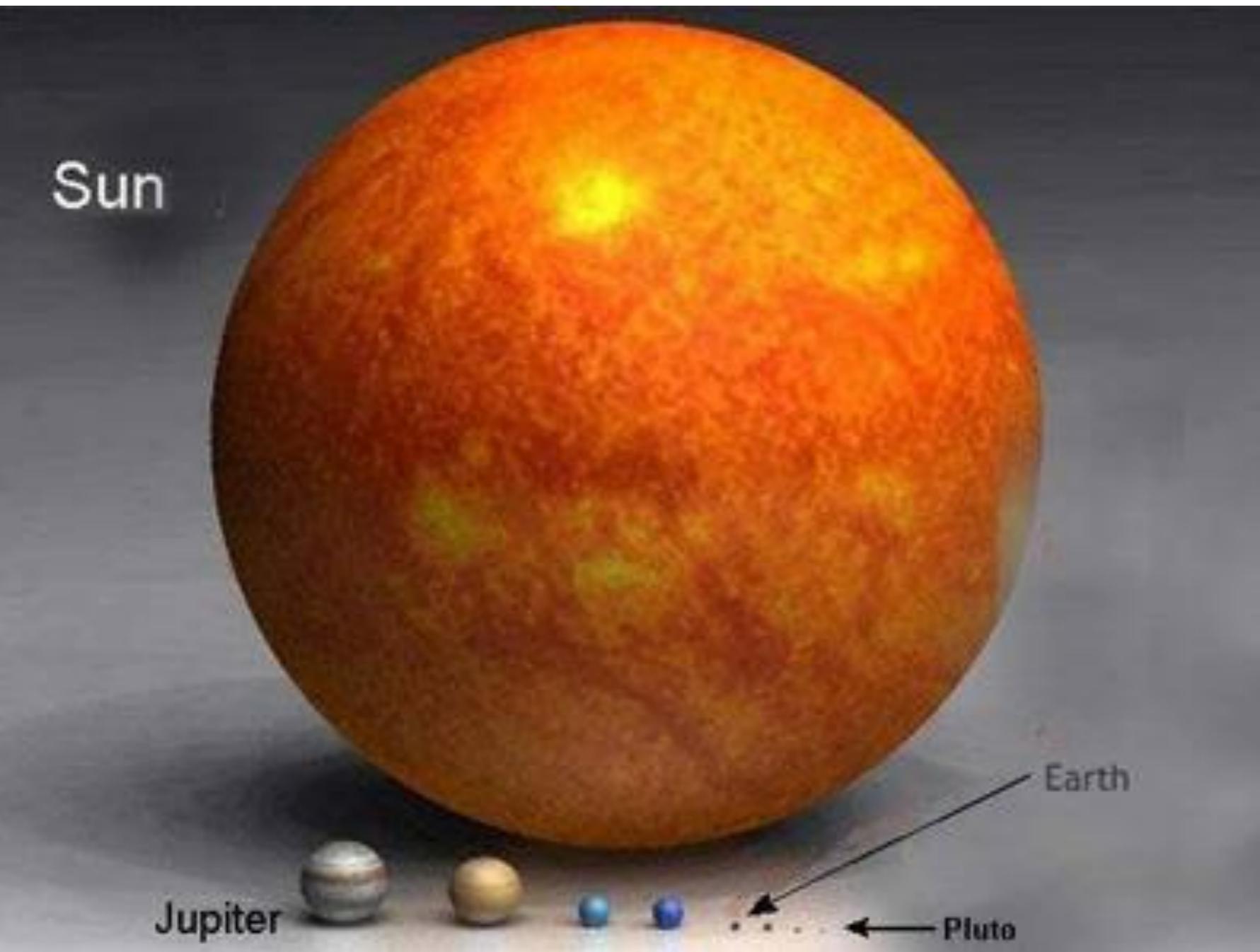
# Eight Planets



Terrestrial planets are vastly different than Jovian planets in terms of sizes and masses



# The Scale of the Solar System



How many  
Earths would fit  
across the Sun  
end-to end?

- A. ~55
- B. ~110
- C. ~510
- D. ~1020
- E. ~2040

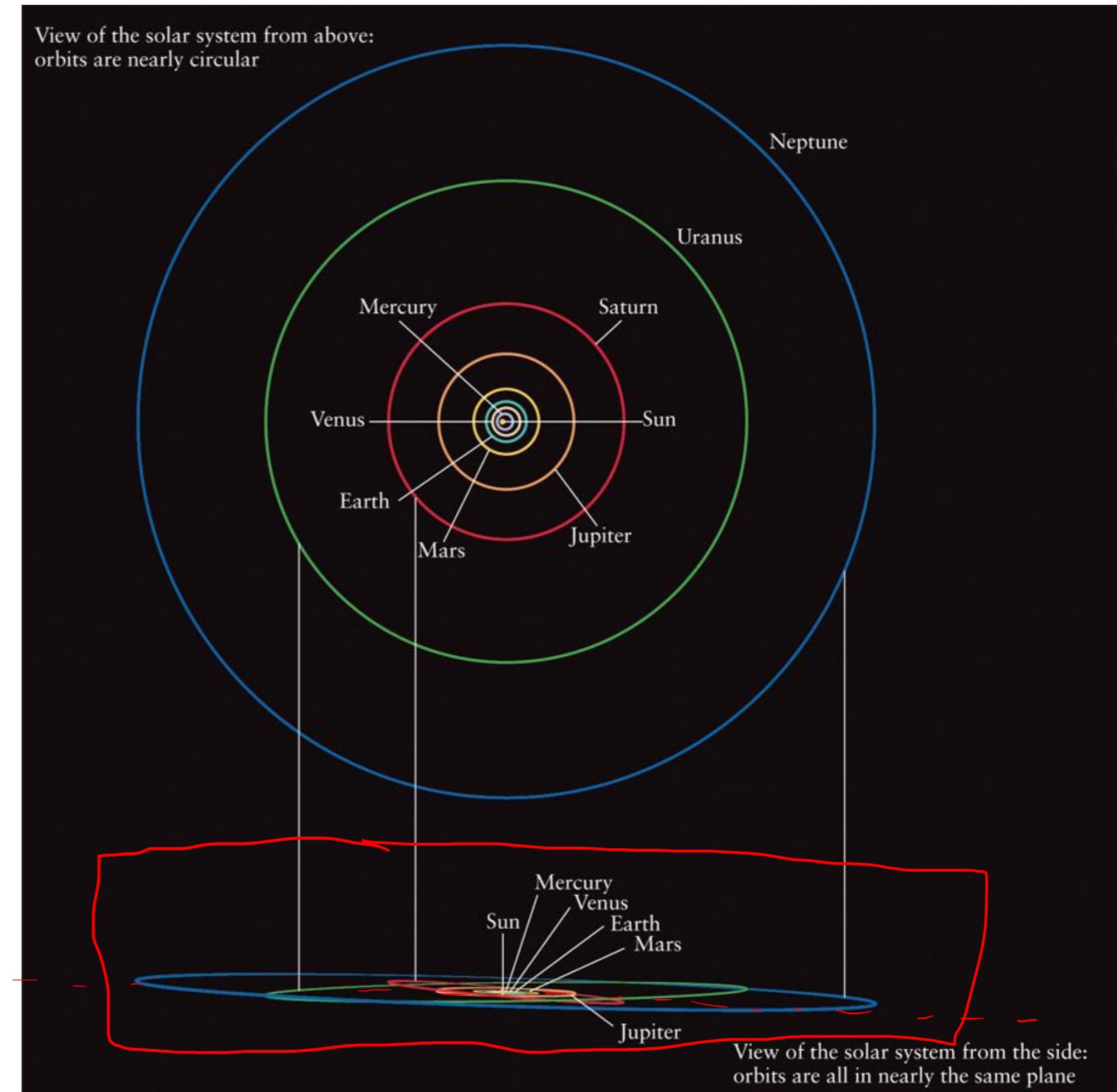
# Comparing the Planets: Orbits

## The Solar System to Scale

- The terrestrial planets are crowded in close to the Sun.
- The Jovian planets orbit the Sun at much greater distances.

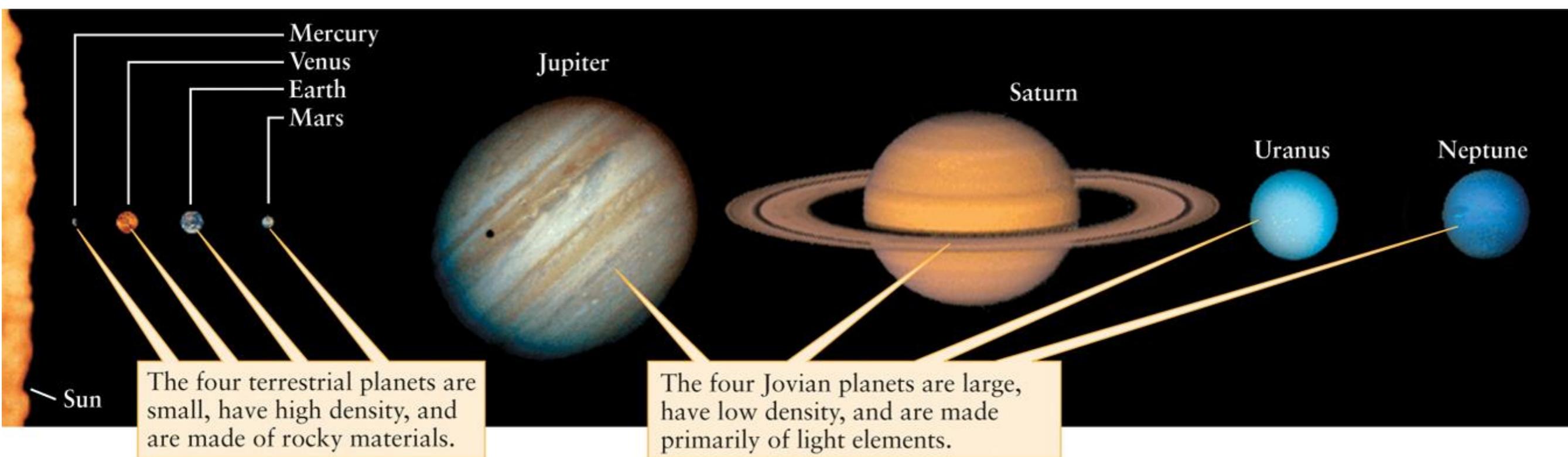
Notice how circular the orbits are.

*ecliptic*



# Comparing the Planets: Size and Composition

- Terrestrial planets: rocky materials with dense iron cores and high average densities
- Jovian planets: primarily light elements such as hydrogen and helium, low average densities

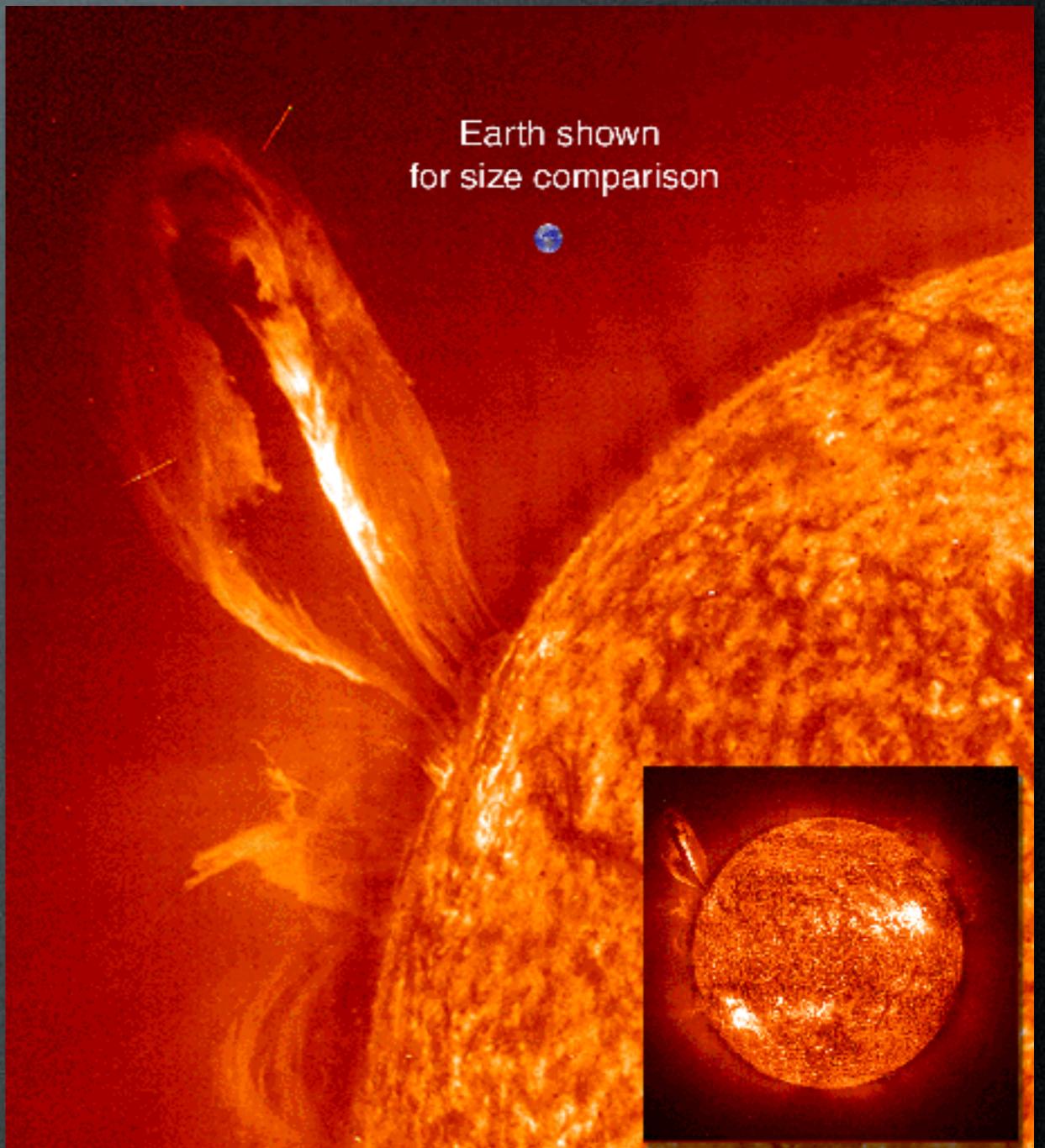


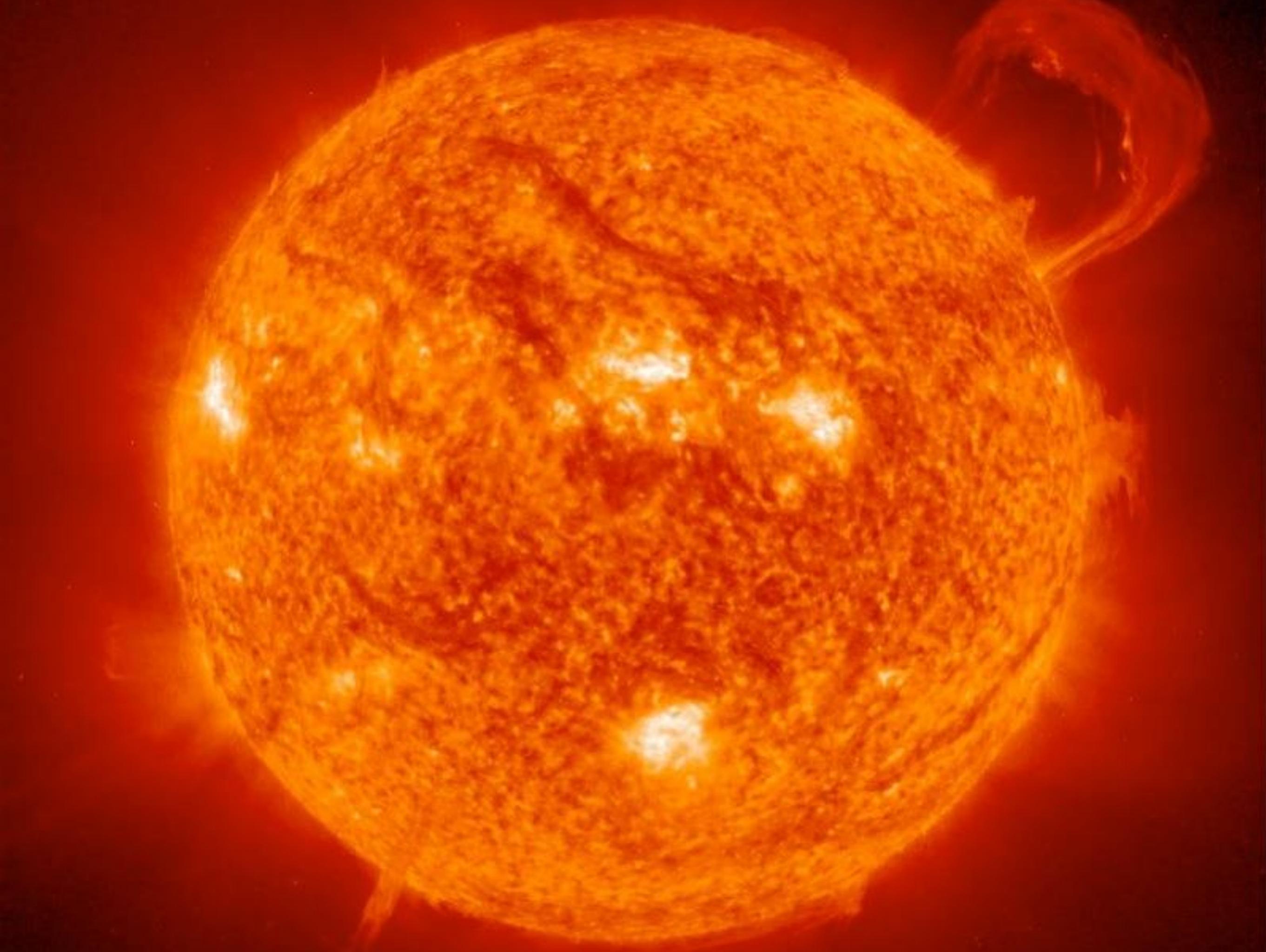
Which of the following statements is TRUE?

- A. All of the planets have orbits near the ~~ecliptic~~ plane.
- B. All of the planets orbit around the Sun in the same direction as Earth.
- C. None of the planets have highly elliptical orbits.
- D. All of the above statements are true.

# The Sun

- Diameter 109 times Earth.
- 333,000 times mass of Earth. It is 99.9% of the mass in the Solar System.
- Source of nearly all energy.
- 76% Hydrogen, 22% Helium, 2% the rest.
- 11,000°F on surface and 25 million °F in center.



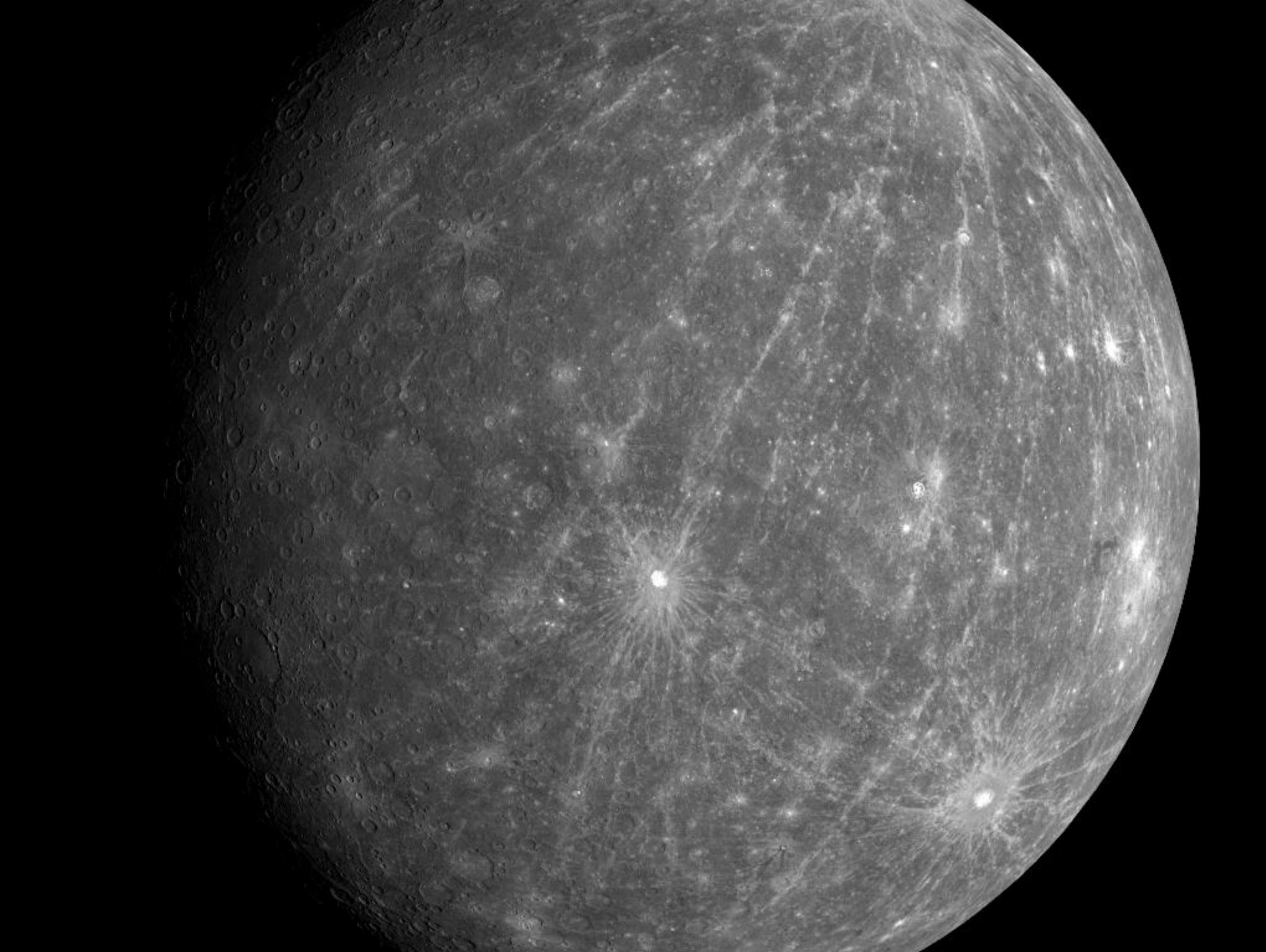


# Terrestrial Planets

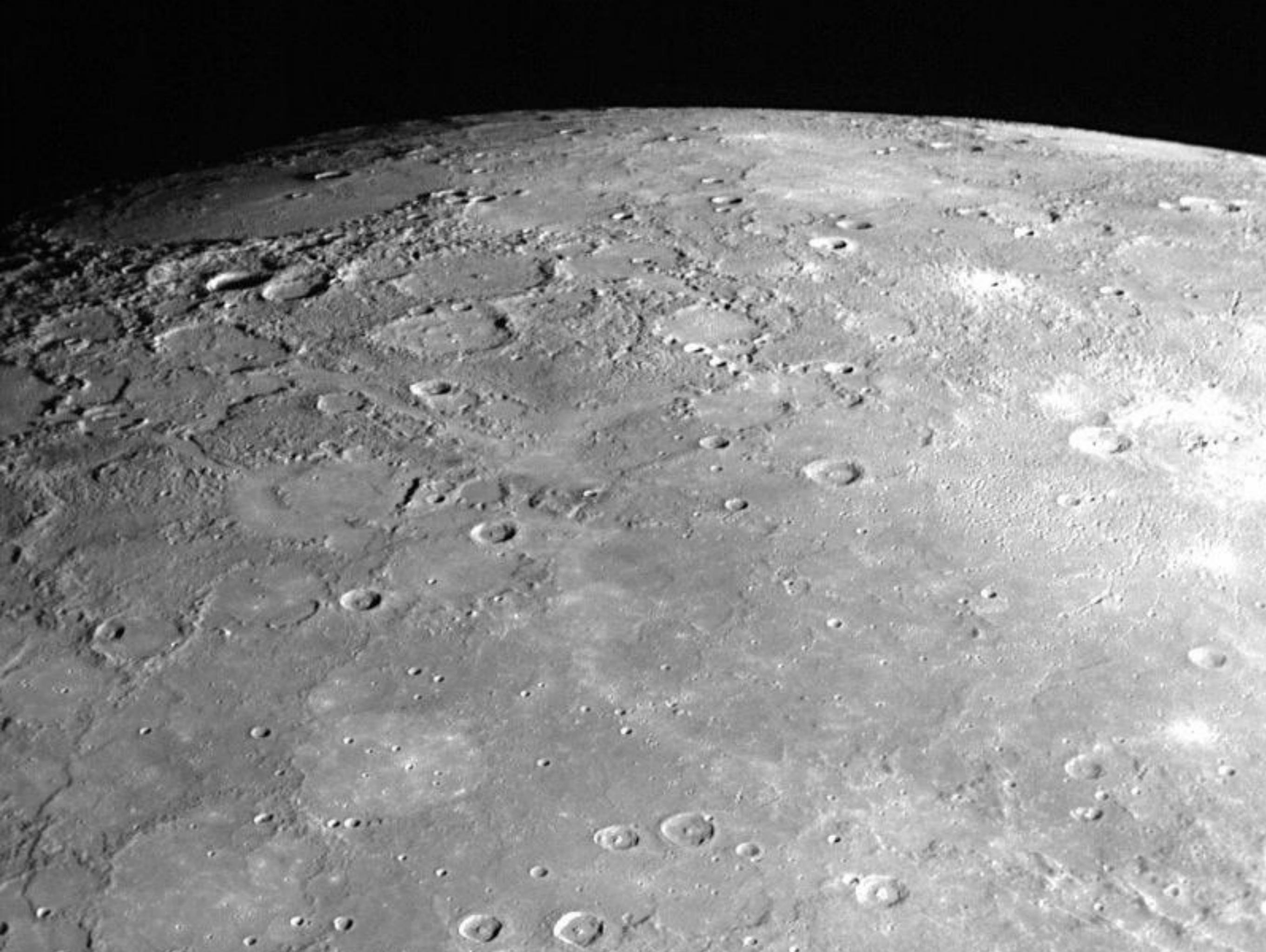
- Inner Solar System consists of four terrestrial planets.
- Dense, with rock and metal interiors.
- Few, if any, moons.
- Compared to Jovian planets, they are very small.

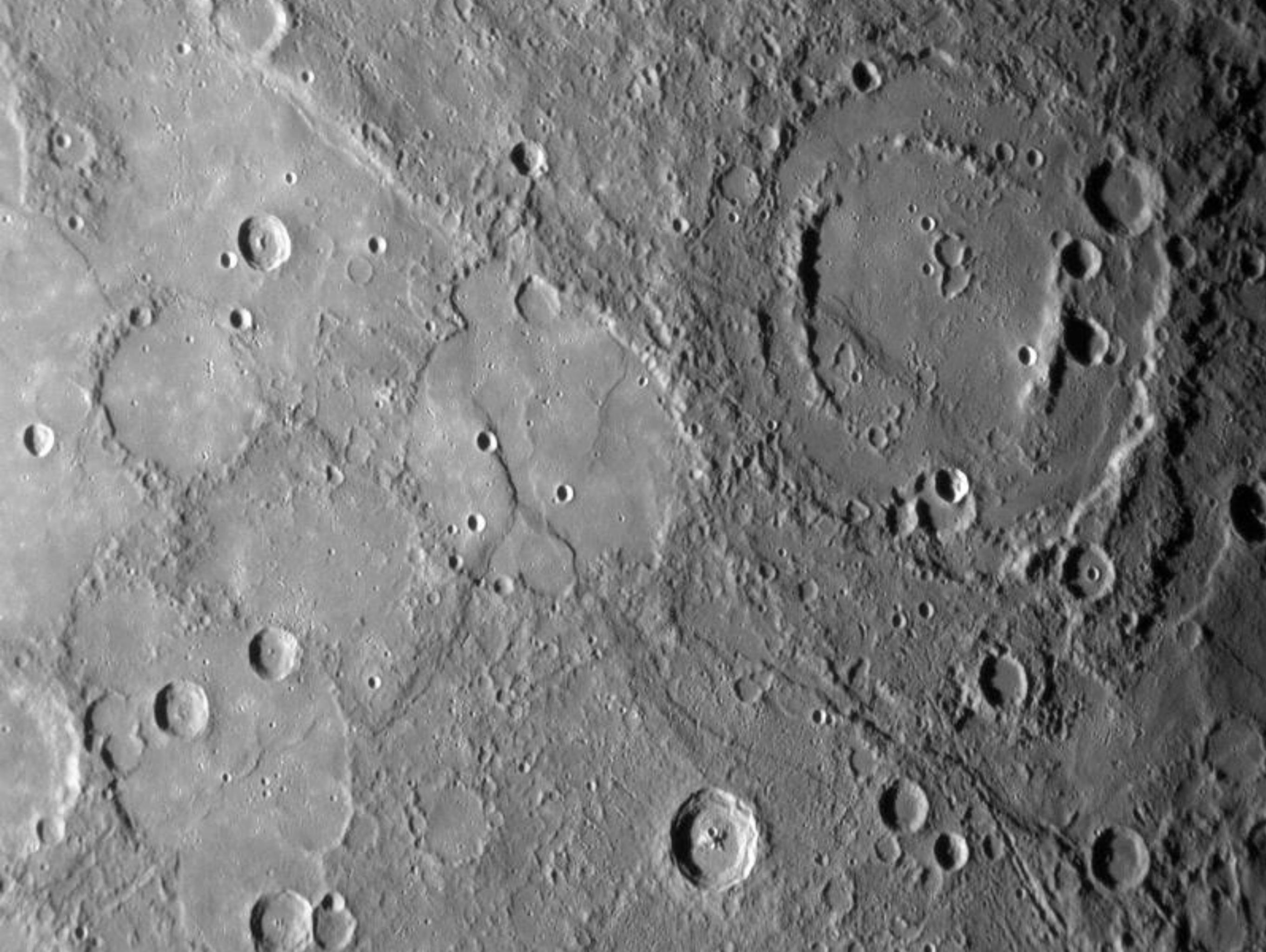
# Mercury



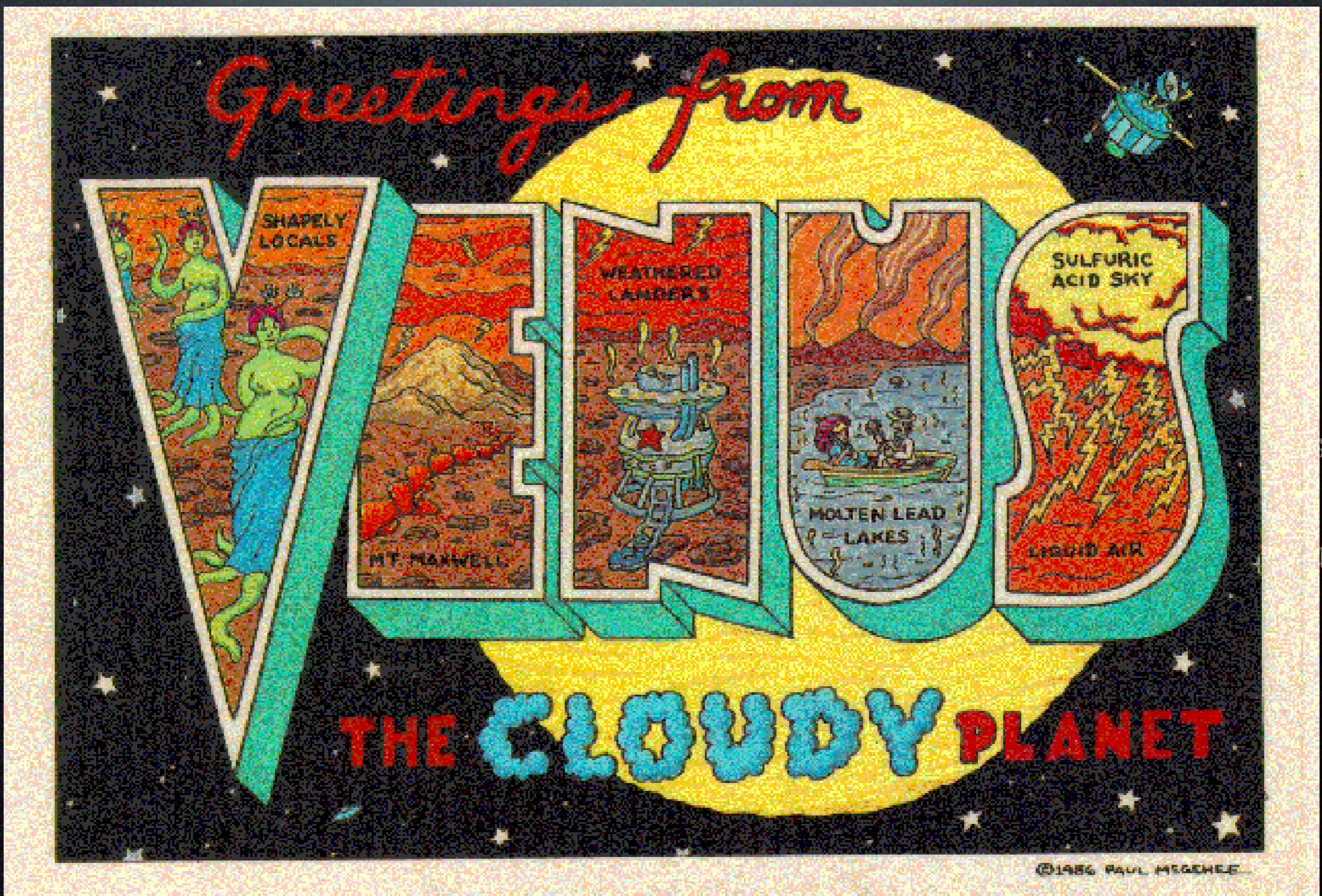


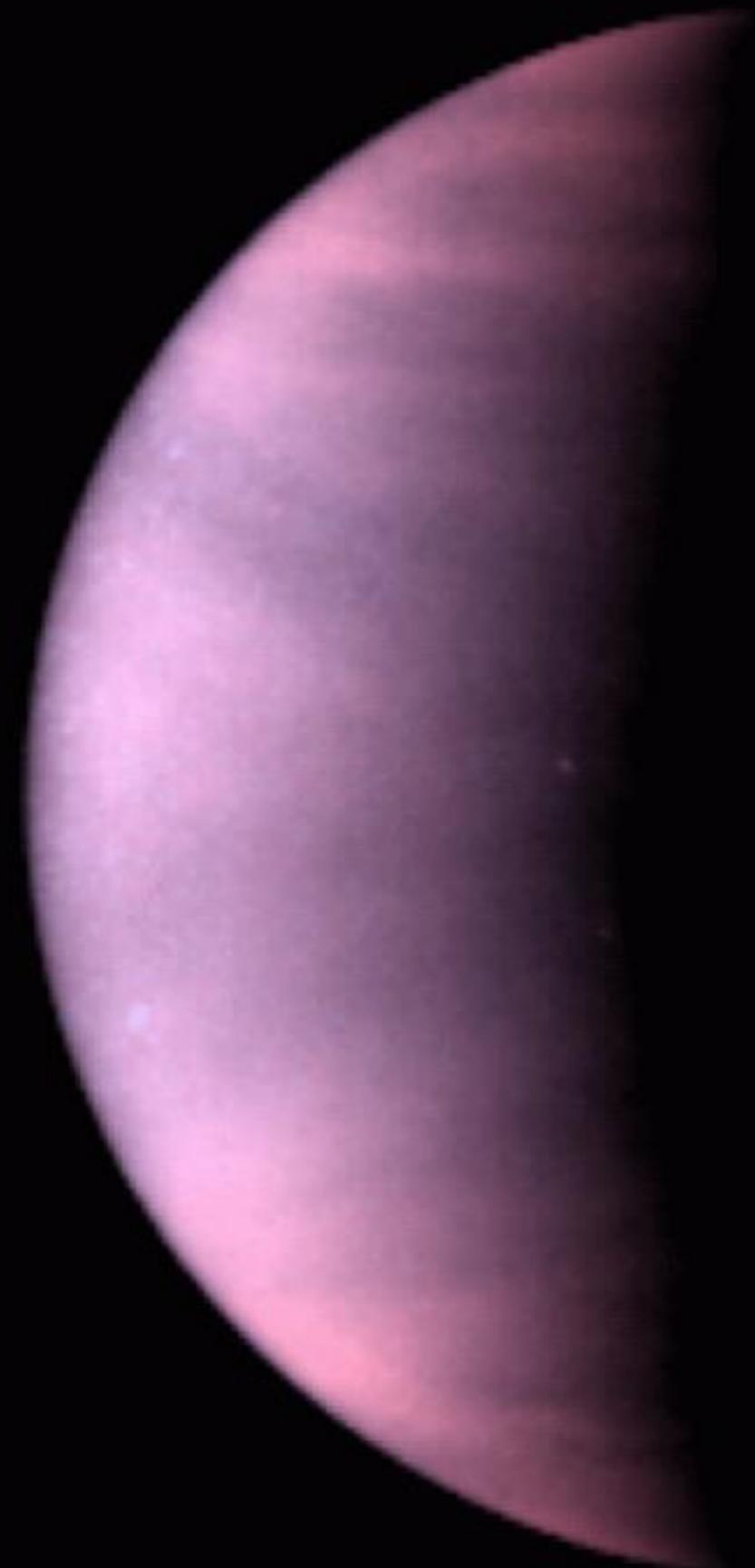
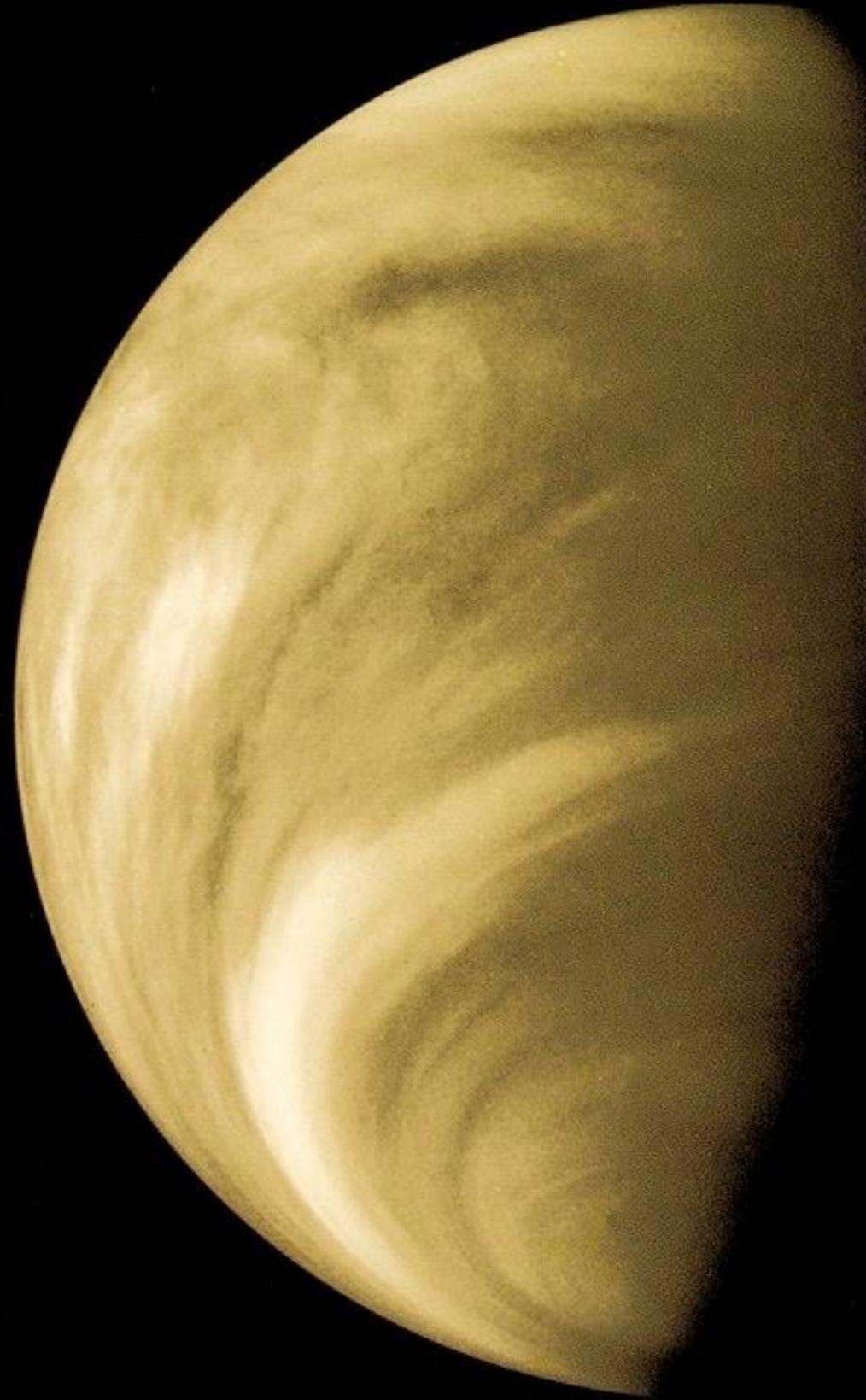






# Venus





**Venus in UV**

PR95-16 · ST Scl OPO · March 21, 1995  
L. Esposito (U.CO), NASA

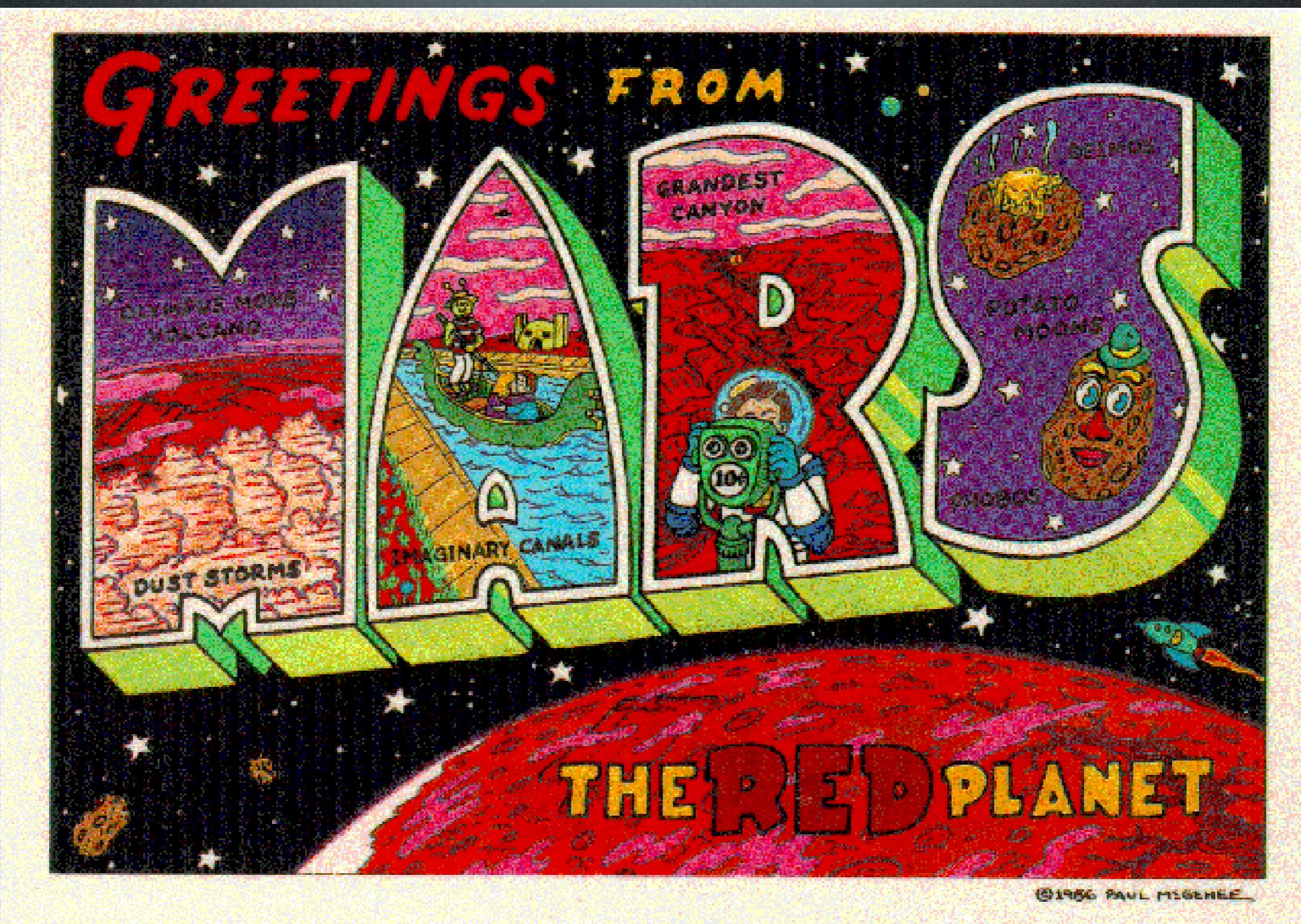
**HST · WFPC2**

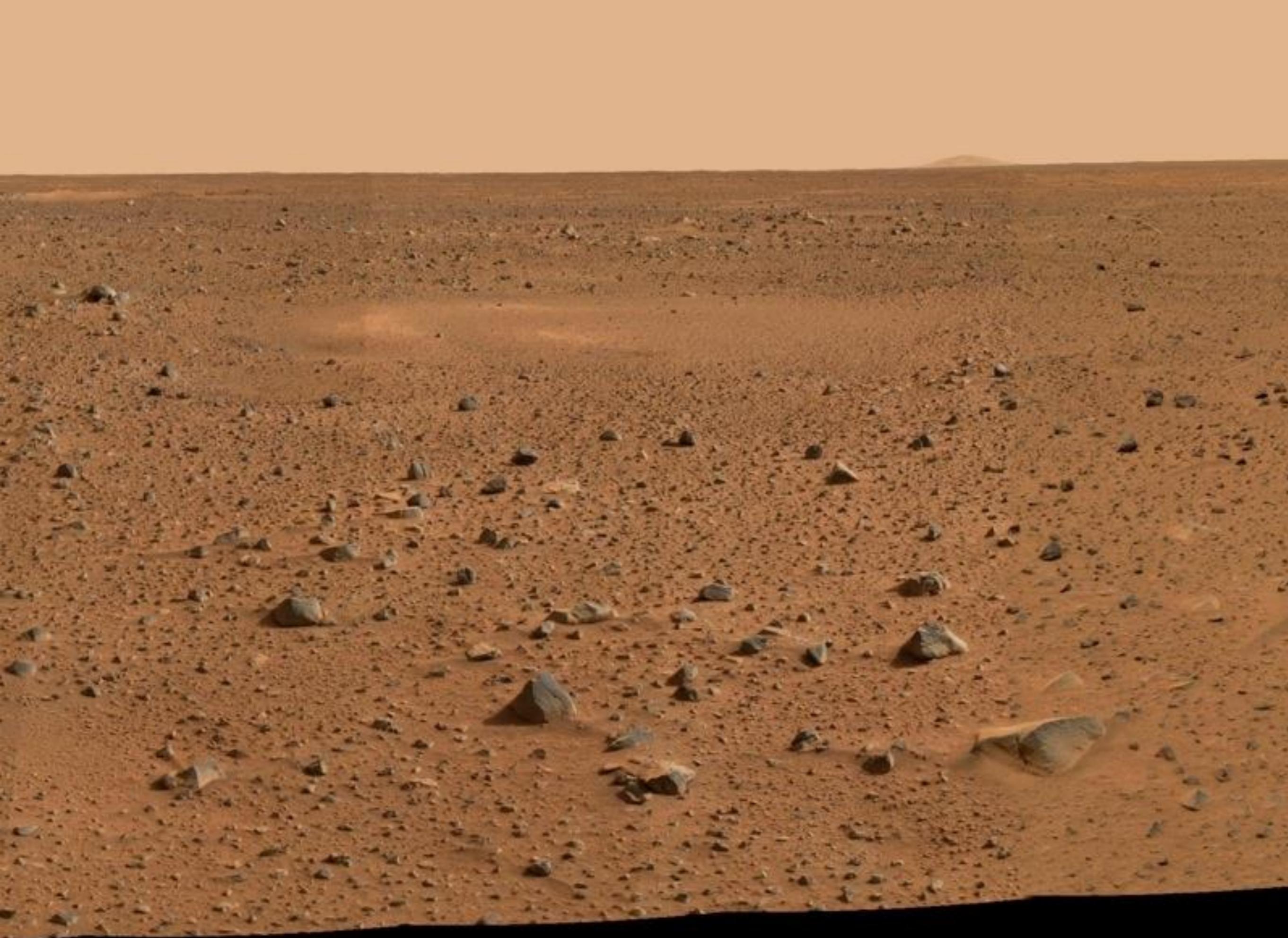
# Earth





# Mars





# Concept Test

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Which planet is about the same size as Earth?

- A) Mercury
- B) Venus
- C) Mars
- D) None

# Concept Test

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Which planet is about the same temperature as Earth?

- A) Mercury
- B) Venus
- C) Mars
- D) None

# What determines if a planet will keep an atmosphere?

**Planet mass:** a planet with higher mass exerts more gravity and can hold onto an atmosphere more easily

**Gas mass:** gases that are lighter (like H and He) escape the planet's gravity more easily

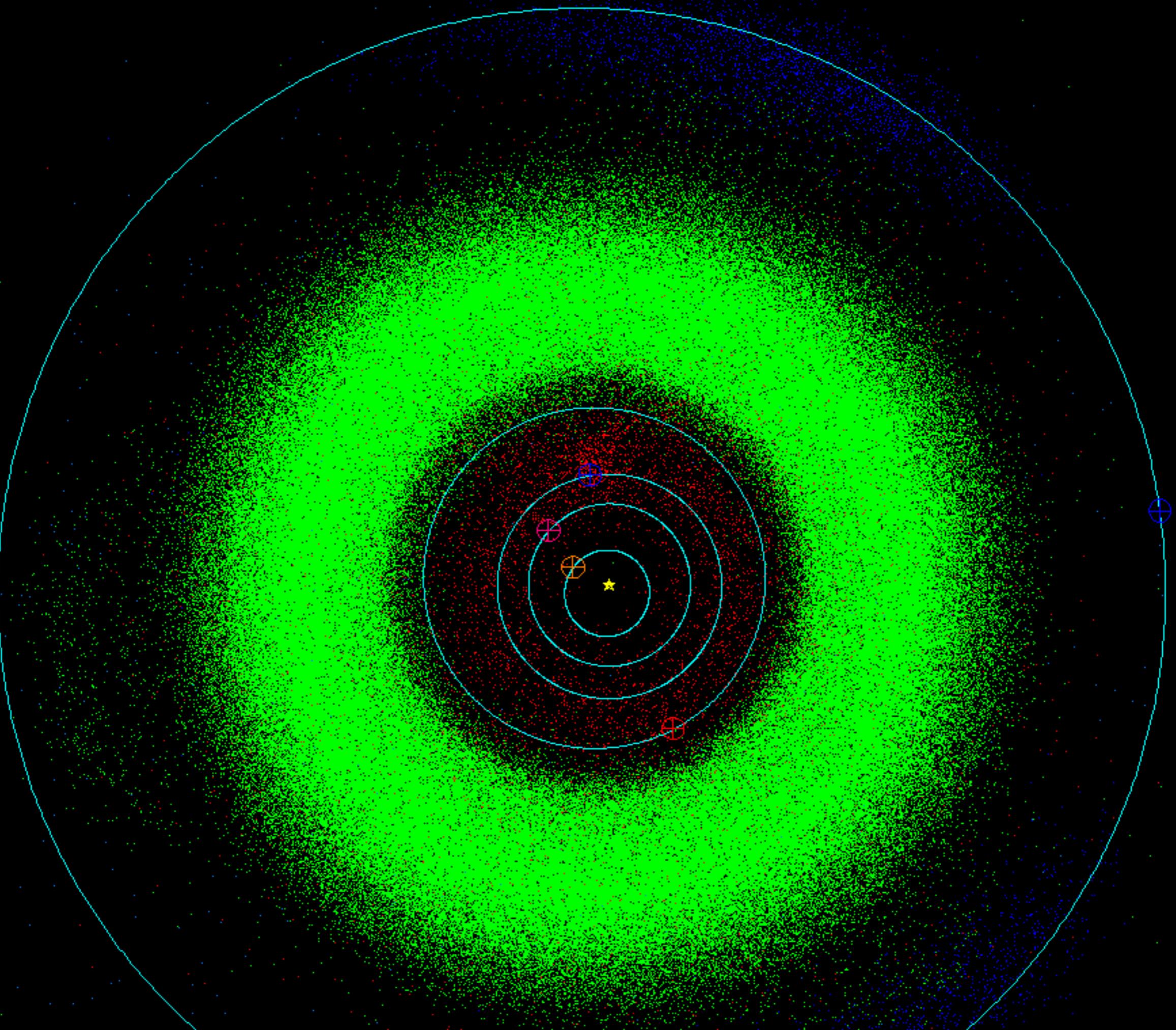
**Gas temperature:** if the temperature is higher, the gas particles are moving faster, and can escape the planet's gravity

Atom	# protons	# neutrons	Total weight
H	1	0	1
He	2	2	4
C	6	6	12
N	7	7	14
O	8	8	16

***It's easier for a heavy body to hold onto heavy/cold gases.***

Earth, Venus, and Mars do not have hydrogen and helium in their atmospheres because

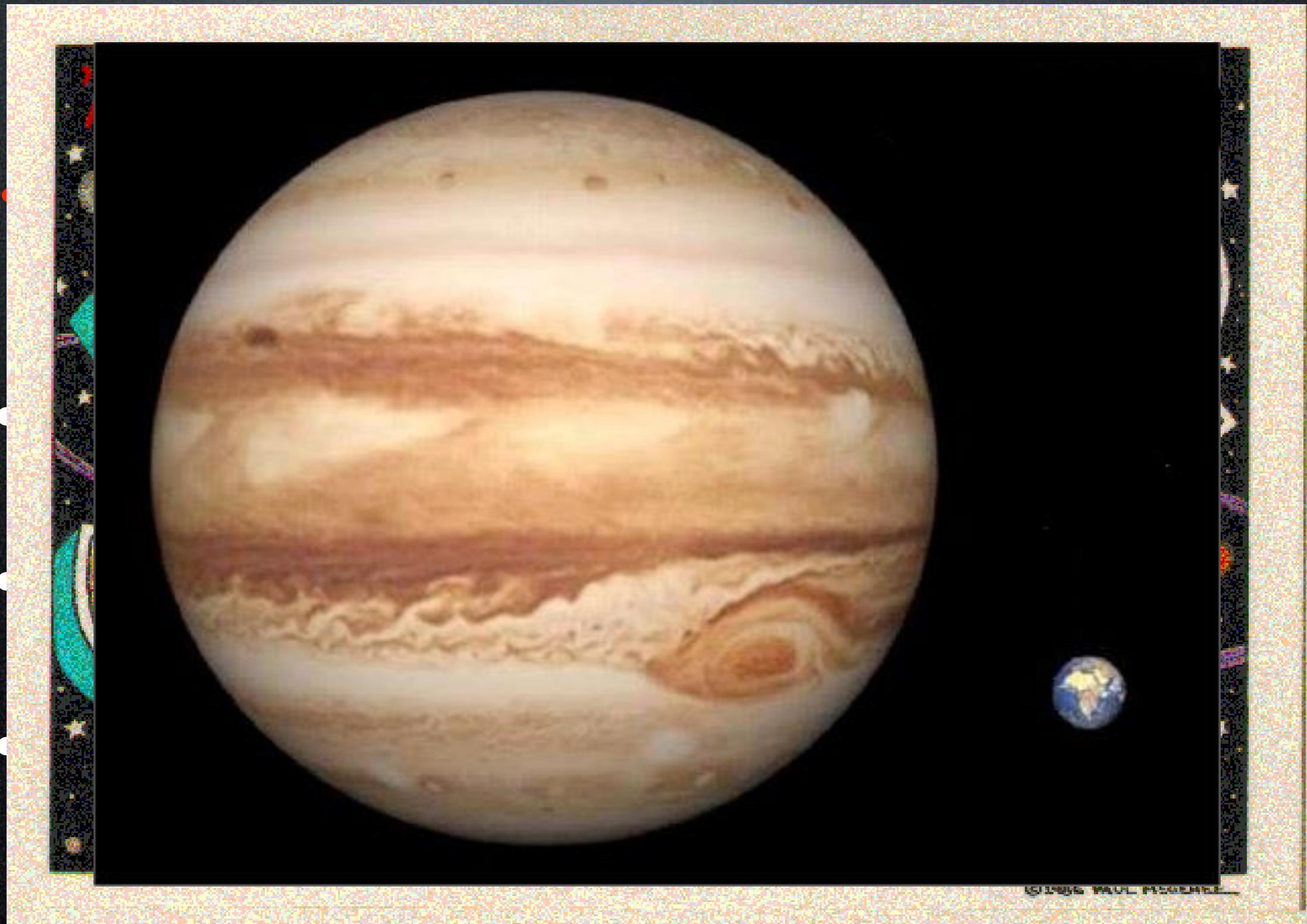
- A. they are not massive enough.
- B. they are not cold enough.
- C. hydrogen and helium are low-mass elements.
- D. All of the above.



# The Jovian Planets

- The gas giants are Jupiter, Saturn, Uranus and Neptune.
- Much larger and more massive.
- Do not have a solid surface. We see the upper cloud layers.
- About 75% Hydrogen and 25% Helium.
- Many moons. And all have rings.

# Jupiter

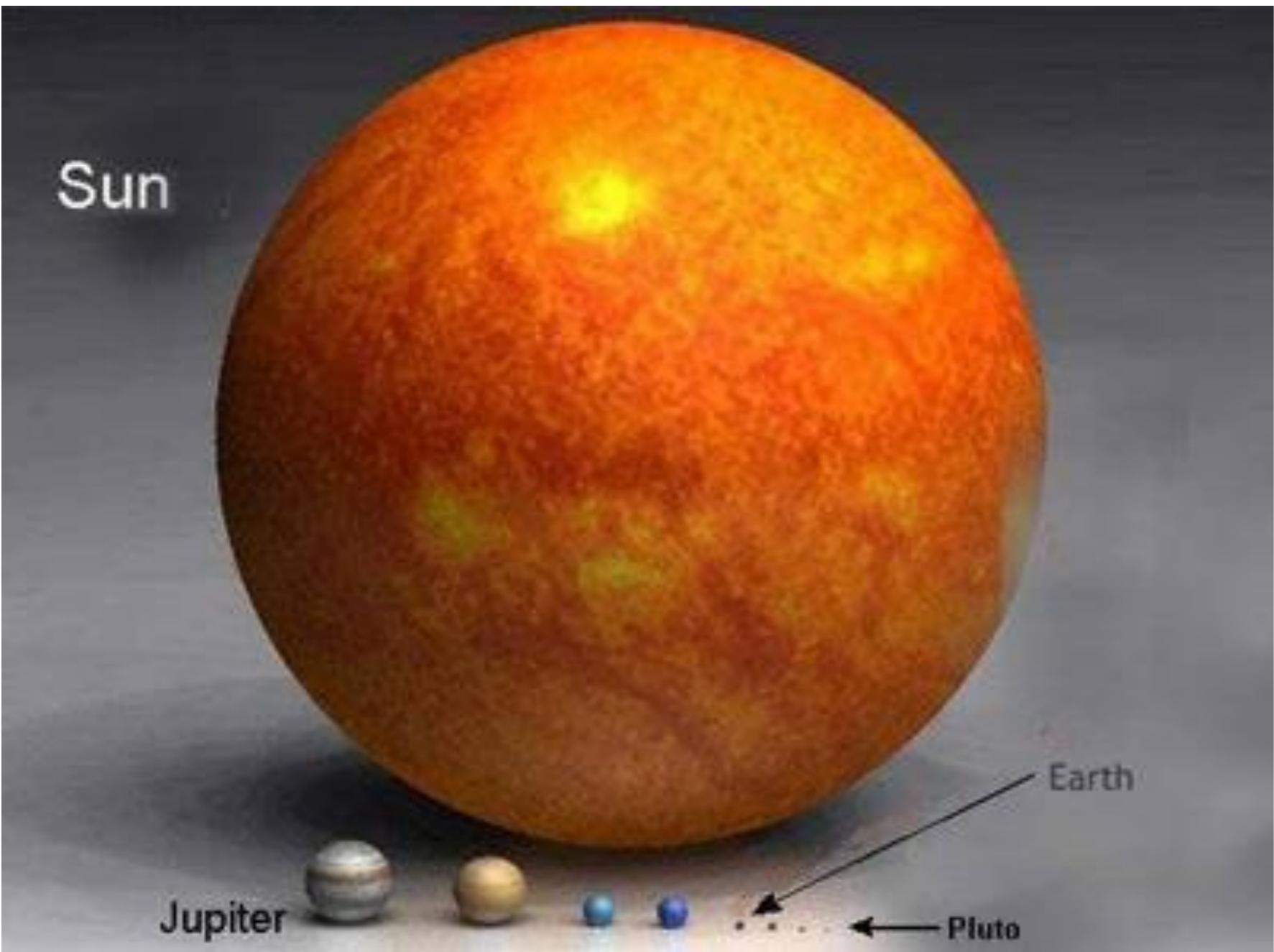


©1996 PAUL FINEART

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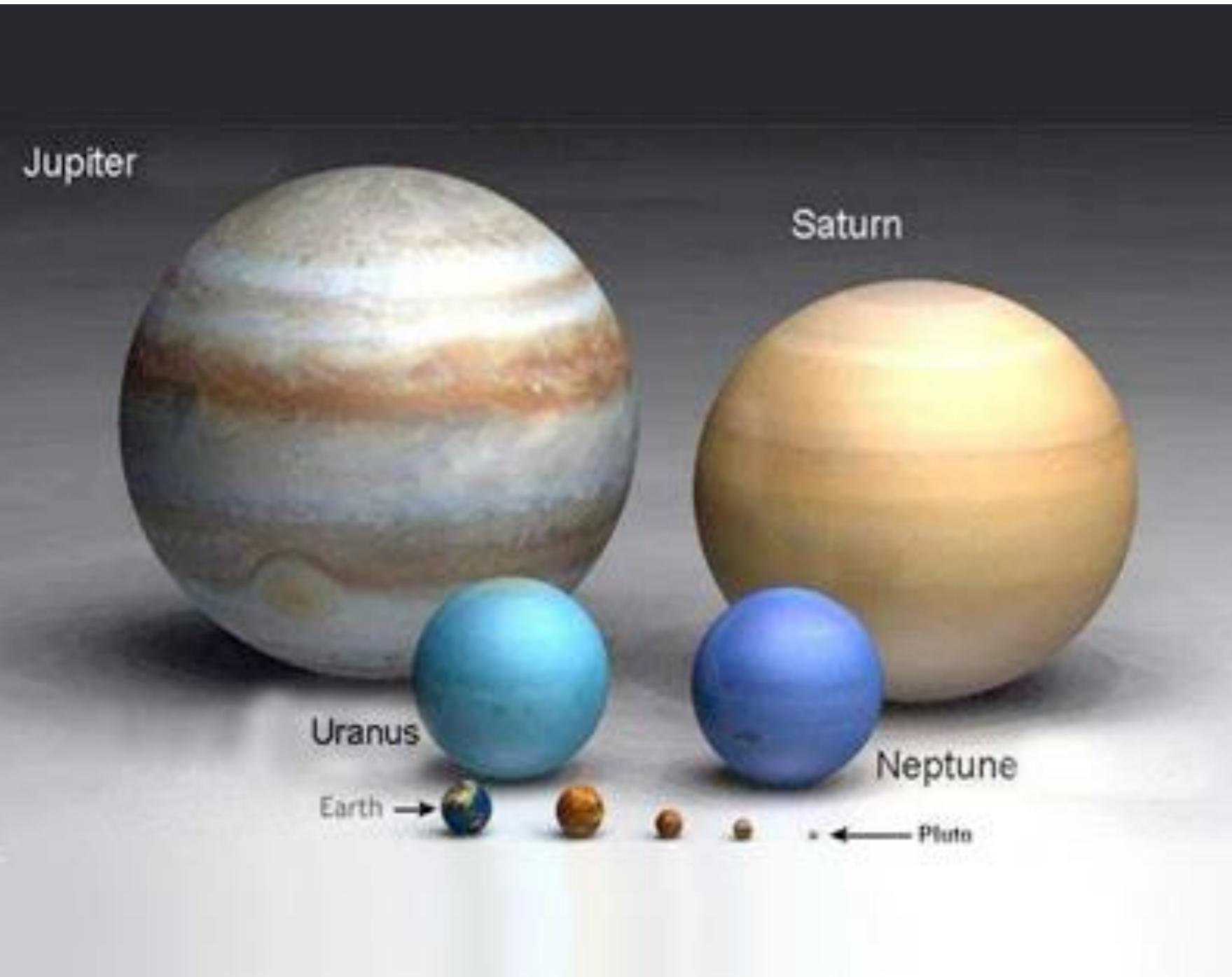
# The Scale of the Solar System



How many Jupiters would fit across the Sun end-to end?

- A. 5
- B. 10
- C. 20
- D. 30

# The Scale of the Solar System

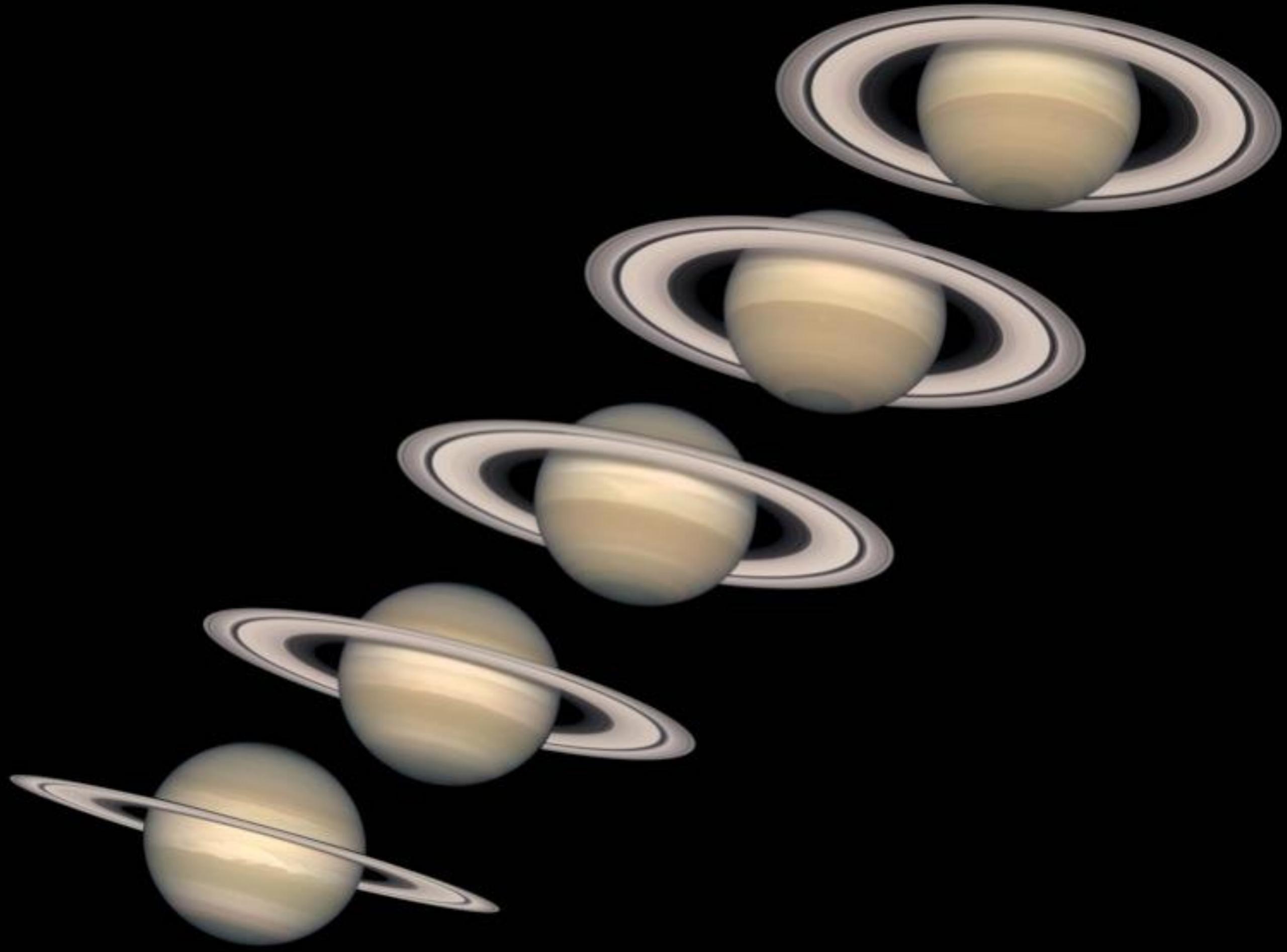


How many  
Earths would fit  
across Jupiter?

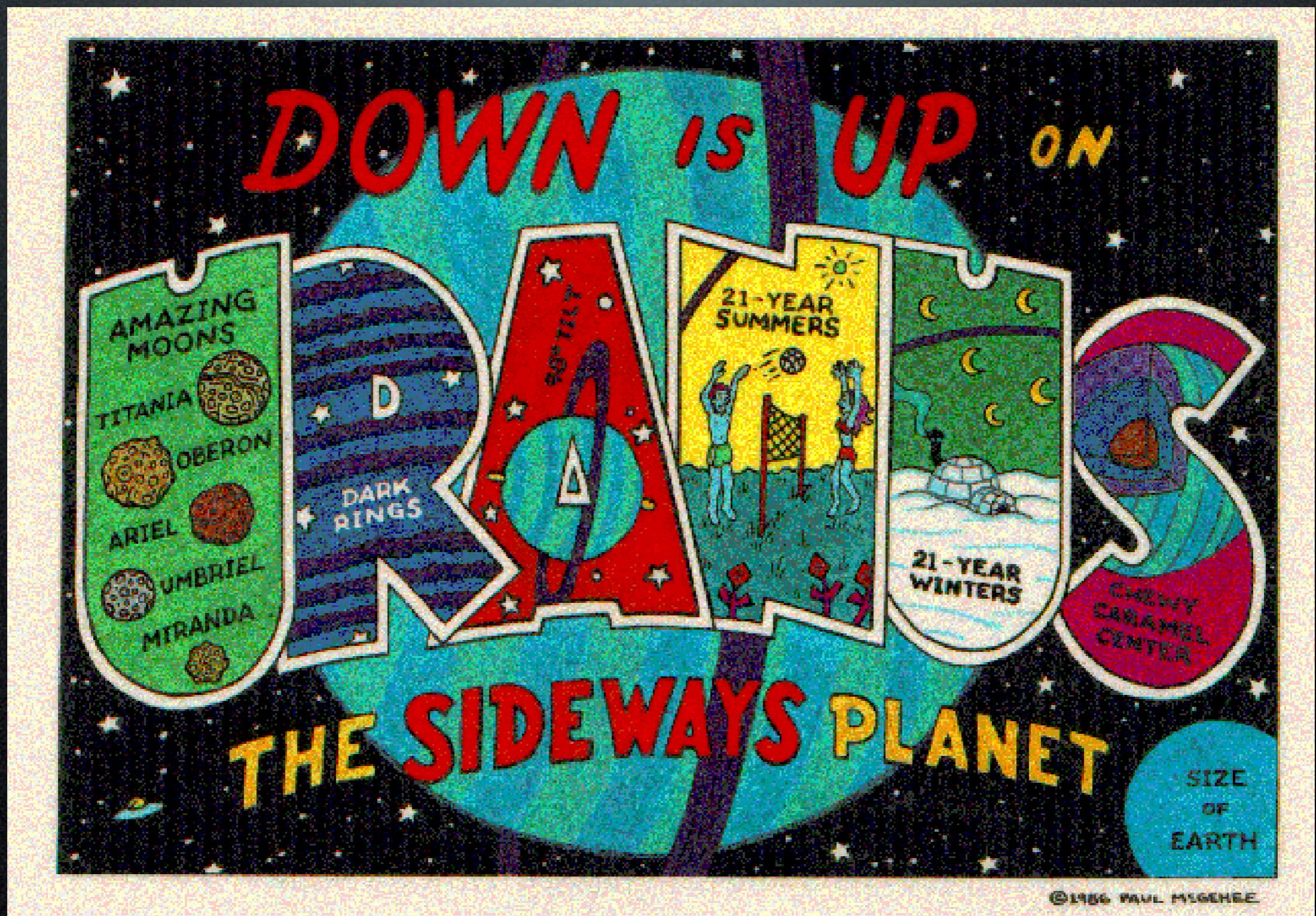
- A. 5
- B. 11
- C. 20
- D. 30

# Saturn



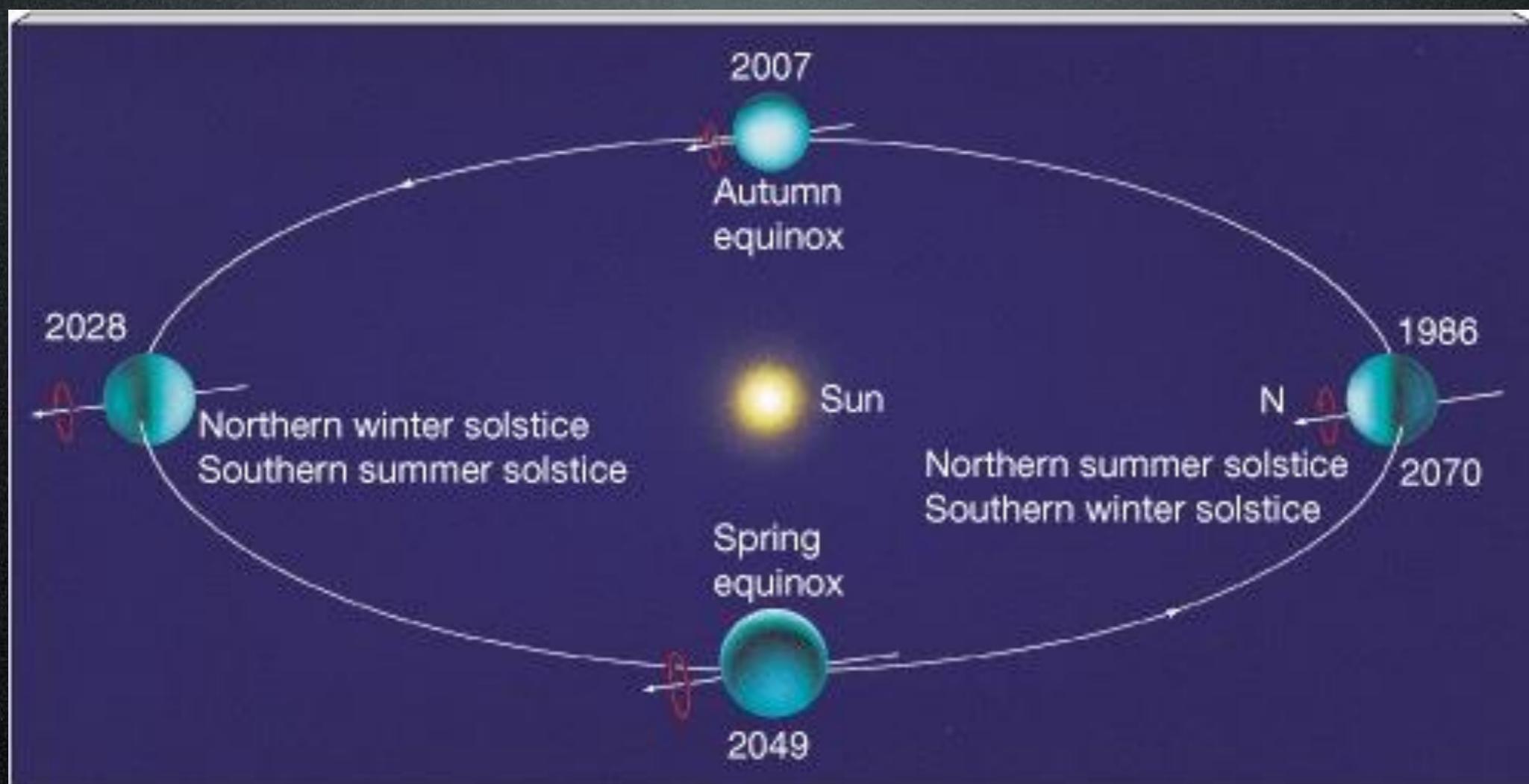


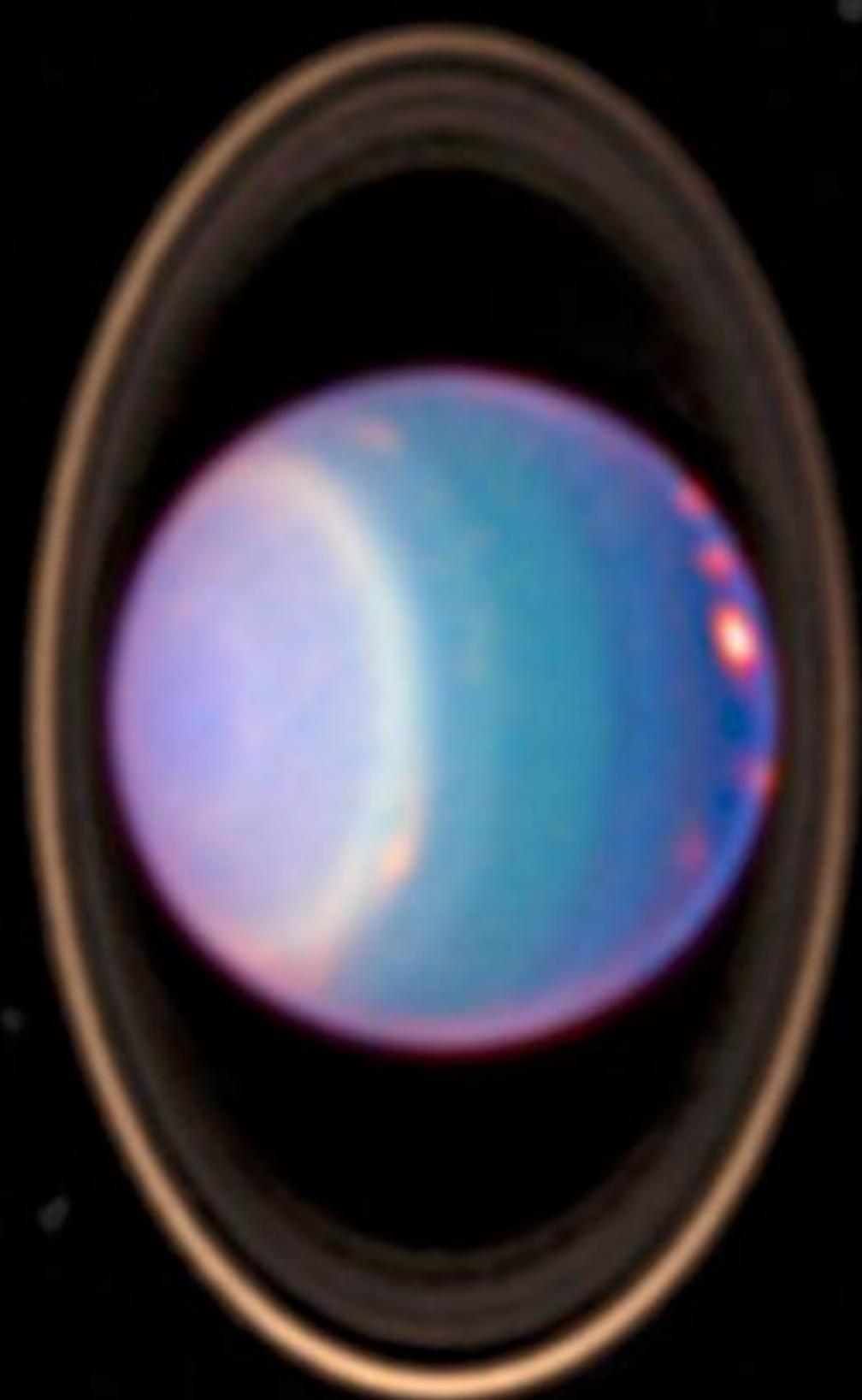
# Uranus



# The Tilted Planet

- Uranus is turned over on its side.





# Neptune





# Concept Test

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Which two planets account for over 90% of the planetary mass in the Solar System?

- A) Venus and the Earth
- B) Mars and Jupiter
- C) Jupiter and Saturn
- D) Uranus and Neptune

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