

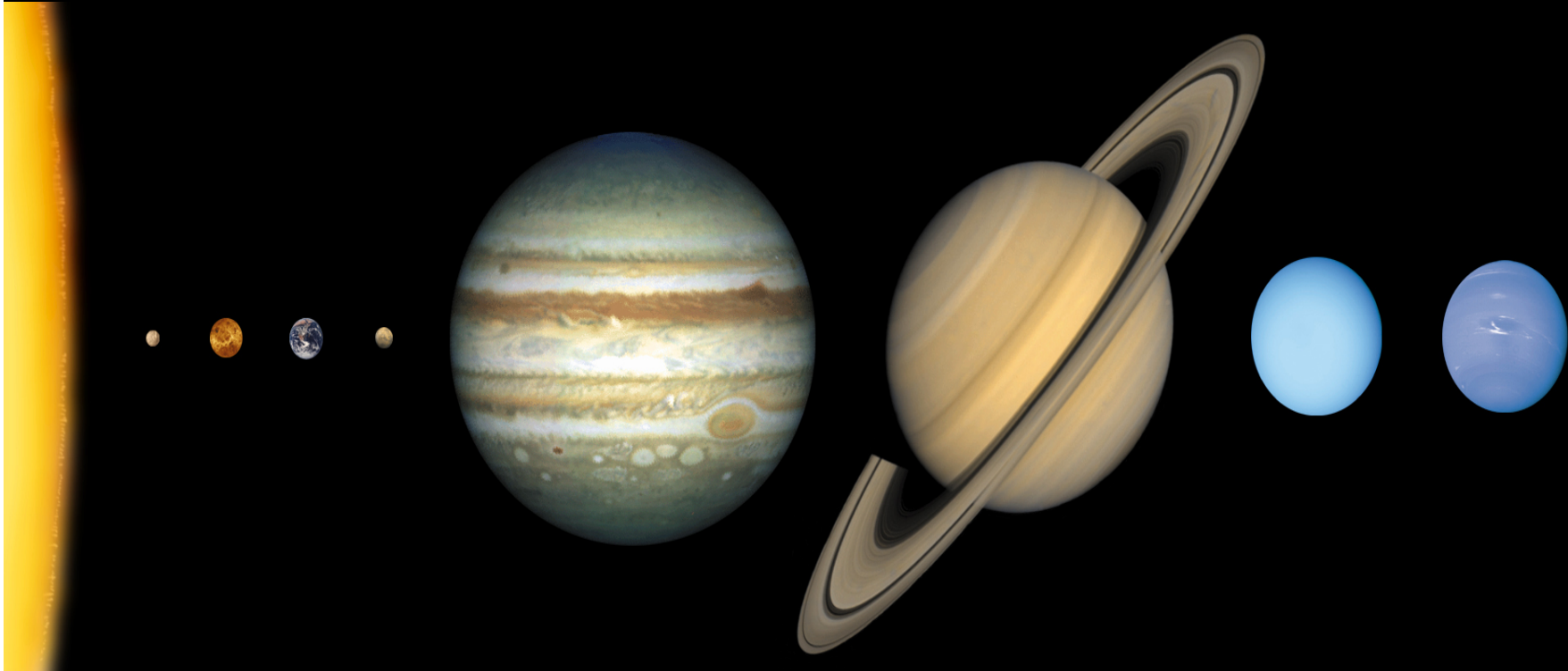
# Solar System Series: Jupiter



Brian Colville

Peterborough Astronomical Association  
Novice Astronomy Class  
June 5, 2026  
Brett Hardy

Size Scale



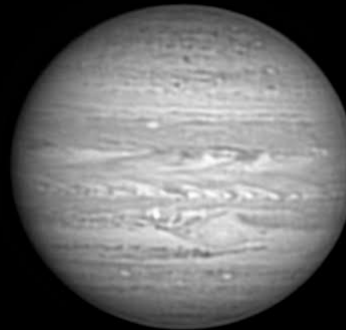
## Jupiter By the Numbers

- 5<sup>th</sup> planet from the Sun
- Gas giant
- 90% hydrogen, 10% helium – trace amounts of methane & ammonia
- A planet of extremes
- Largest planet in our solar system
- More than twice the mass of all the planets combined
- Radius: 69,911 km (86,881 mi)
- More than 1,000 Earths could fit inside
- Shortest day @ 9.9 hours
- 778 million km, 5.2 AU from Sun
- 43 minutes for light to reach Jupiter
- One orbit around the Sun takes 12 years
- Obliquity 3 °
- High speed winds as high as 539 km/h at equator



## Surface & Structure

- Gas giant
- Orange stripes are called belts
- Windy clouds of ammonia and water, floating in an atmosphere of hydrogen and helium travelling in an easterly direction
- Lighter bands are called zones travelling in a westerly direction
- Great Red Spot
- Failed star?



IR 680nm



RGB



IR + RGB

## Atmosphere

- Colourful bands, zones and storms
- Three distinct cloud layers
  - Top layer ammonia ice
  - Middle layer ammonium hydrosulfide crystals
  - Lower layer water ice and vapour
- Colourful bands made by plumes rising from the warm interior made of sulfur and phosphorus gases
- Storms persist for many years
- Great Red Spot (twice the size of Earth) for more than 350 years
- Storms extend far below the cloud tops: 100 - 500 km
- Strong jet streams driving the belts and zones extend 3,200 km below cloud tops
- Giant polar cyclones at both poles form an octagon shape in the north and a pentagon in the south
- Violent lightning storms
- Many mysteries remain



Rick Stankiewicz

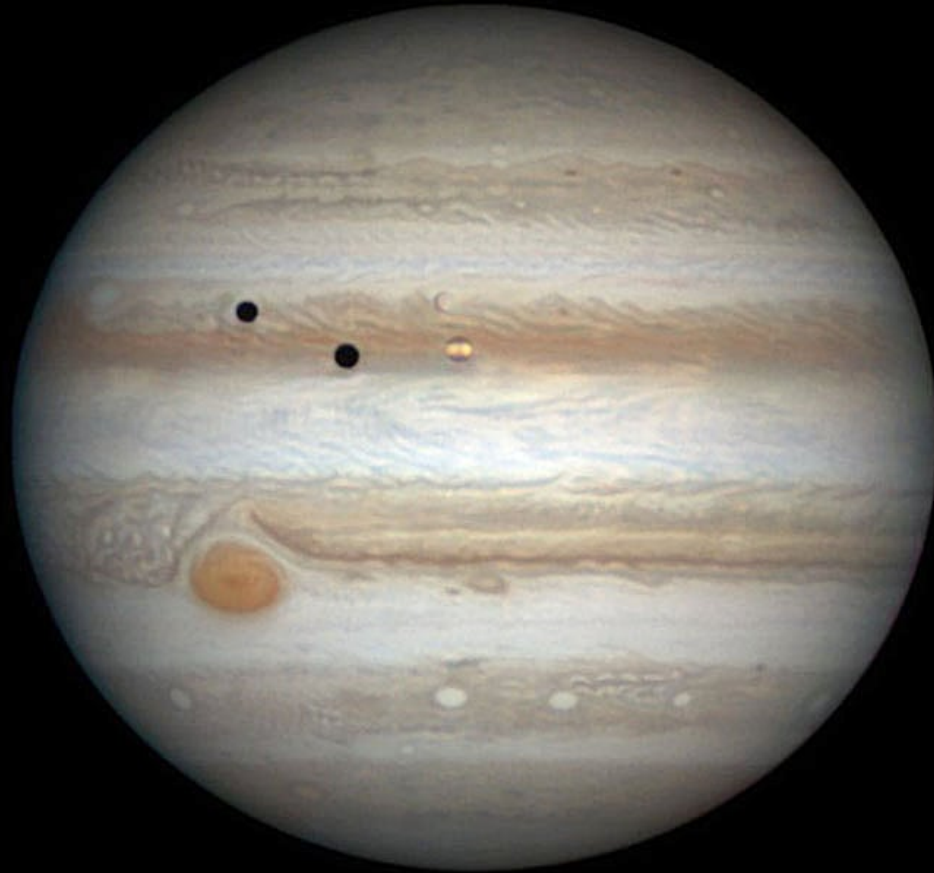
## Moons

- At least 95 moons
- Many are the size of asteroids
- Four largest are Ganymede, Callisto, Europa and Io
- Discovered by Galileo Galilei January 7, 1610
- Known as the Galilean Moons
- Io is the most volcanic object in the solar system
- Ganymede is the largest moon in the solar system, larger than Mercury
- Europa has a global ocean below a thick crust of ice
- Callisto's surface is heavily cratered



## Moon Transits

- Transits of the Galilean Moons produce shadows moving across the face of Jupiter
- Observing the movements of these moons in orbit around Jupiter is visible in telescopes



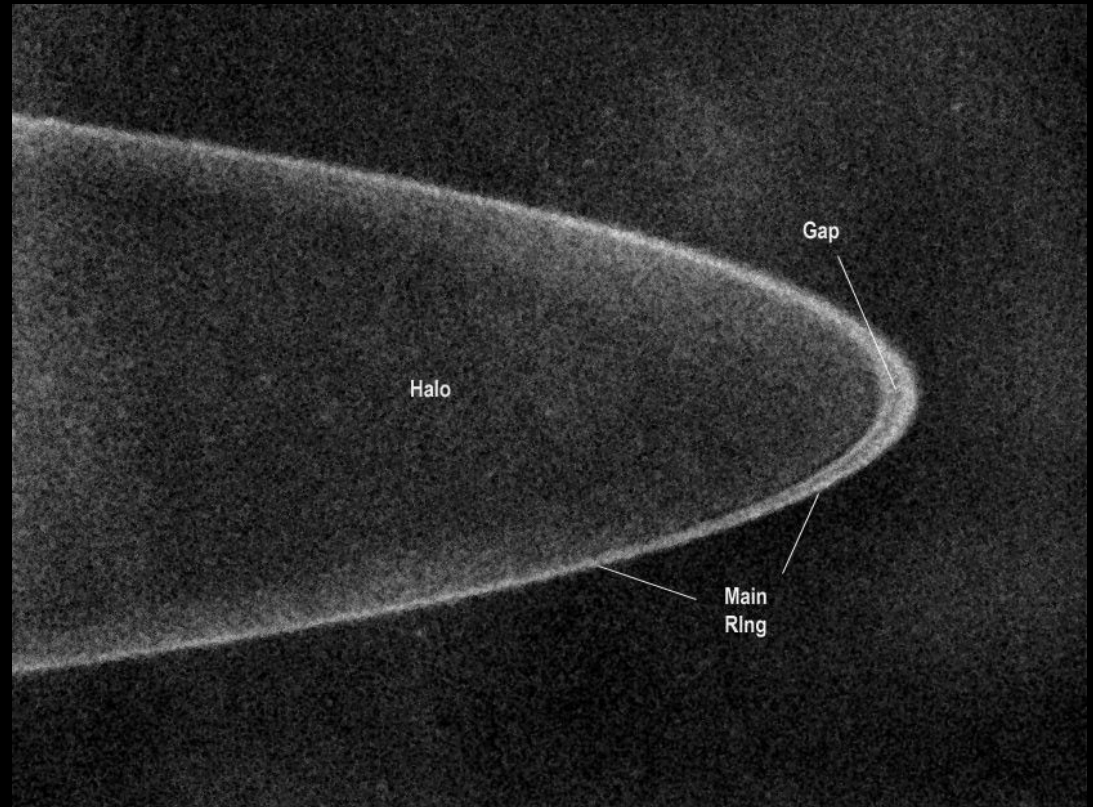
## Life in our Solar System?

- Europa has a global subsurface ocean below a thick icy crust
- All the ingredients for life are thought to be present:
  - energy from tidal heating due to Jupiter's gravity
  - liquid water
  - nutrients from water's interaction with a rocky core
- Europa Clipper spacecraft due to arrive April 2030
- Will conduct 49 close flybys to determine if Europa has conditions habitable for life
- Callisto and Ganymede are also thought to have subsurface oceans



## Ring System

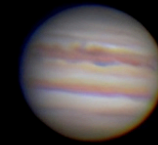
- Discovered by Voyager 1 in 1979
- 1,000 km wide
- Very faint best visible when backlit by the Sun
- Composed of small dark particles the size of dust created by meteoroids impacting the small innermost moons



New Horizons image Feb. 24, 2007

## Magnetosphere

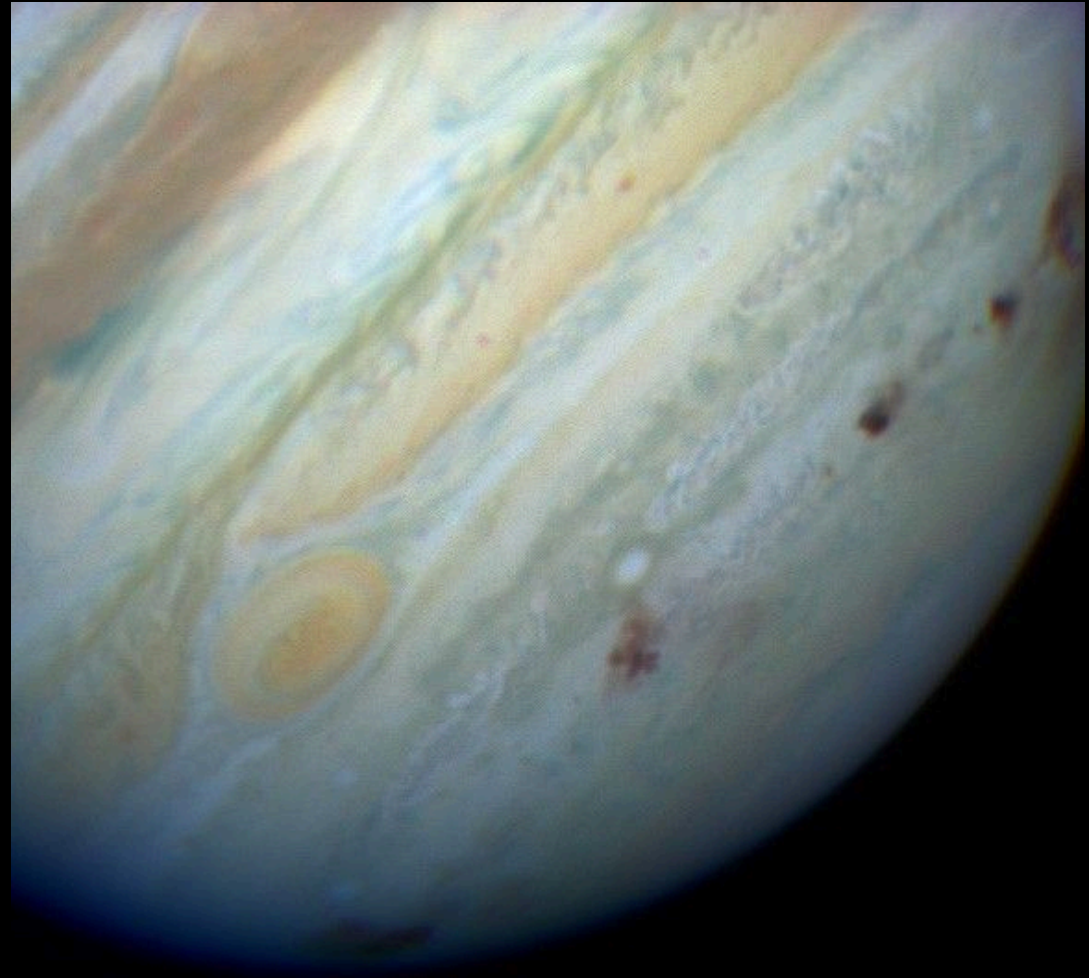
- Jupiter has the most powerful magnetosphere
- 16 to 54 times as powerful as Earth's
- It extends 1-3 million km toward the Sun and out to the orbit of Saturn
- Traps charged particles creating an intense radiation belts that can damage spacecraft
- responsible for aurorae at the planet's poles
- Deep in the atmosphere hydrogen gas is compressed into a liquid
- Electrons are squeezed off the hydrogen atoms making it act as a conducting metal
- Jupiter's fast rotation creates electrical currents with the liquid metallic hydrogen producing an intense magnetic field



Rodger Forsyth

## Earth's Shield?

- Jupiter's powerful gravity influences the orbits of comets and asteroids
- Comet Shoemaker-Levi 9 impacts July 1994



Hubble Space Telescope & NASA

## Exploration

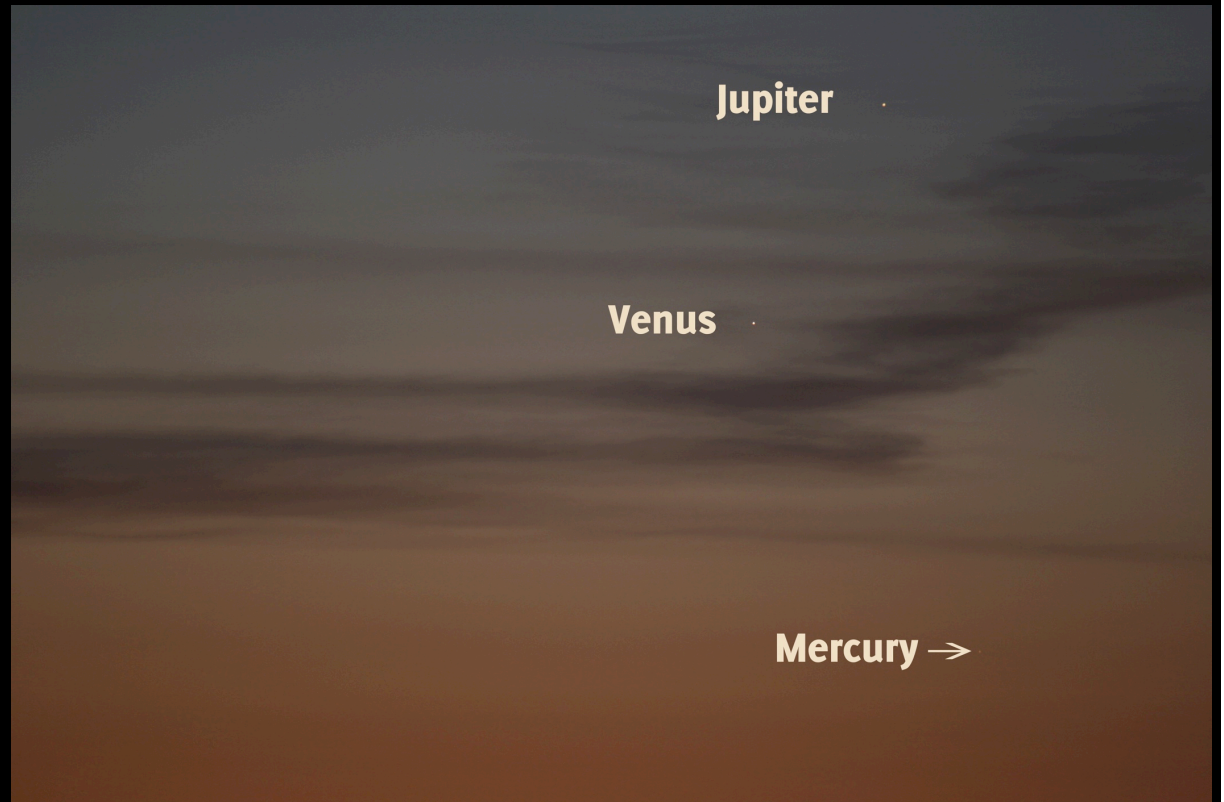
- Pioneer 10 spacecraft  
December 3, 1973
- Pioneer 11 spacecraft  
December 2, 1974
- Voyager 1 spacecraft March 5,  
1979
- Voyager 2 spacecraft July 9,  
1979
- Galileo spacecraft December 7,  
1995 – September 21, 2003
- Juno spacecraft July 15, 2016 –  
present
- Europa Clipper arrives April  
2030
- JUICE (Jupiter Icy Moons  
Explorer) ESA mission arriving  
July 2031



Rick Stankiewicz

## Observing Opportunities

- Visible in the west until June
- In conjunction for July
- August returns to the morning sky just before sunrise



Rick Stankiewicz

Novice Astronomy Class  
September 4, 2026  
Citizen Science

