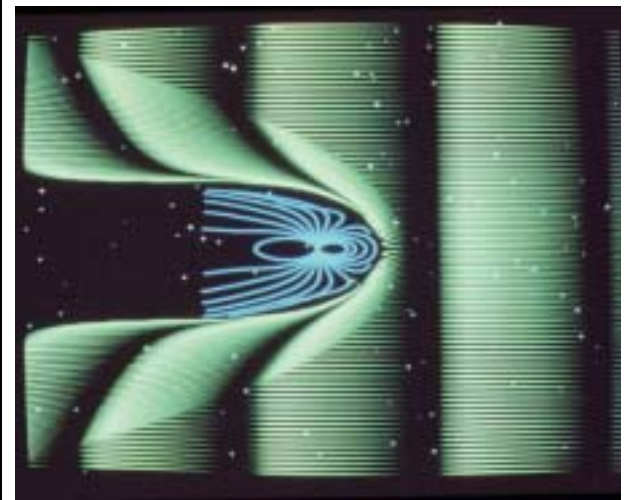
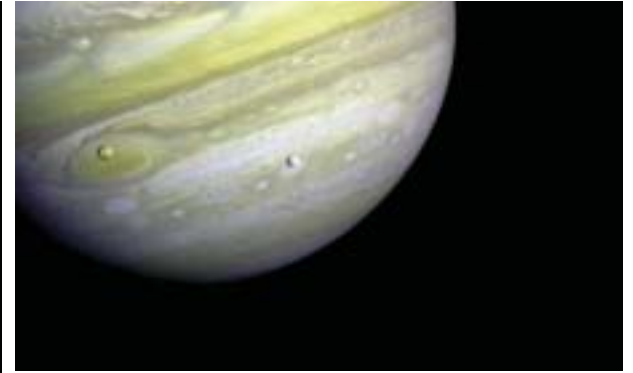
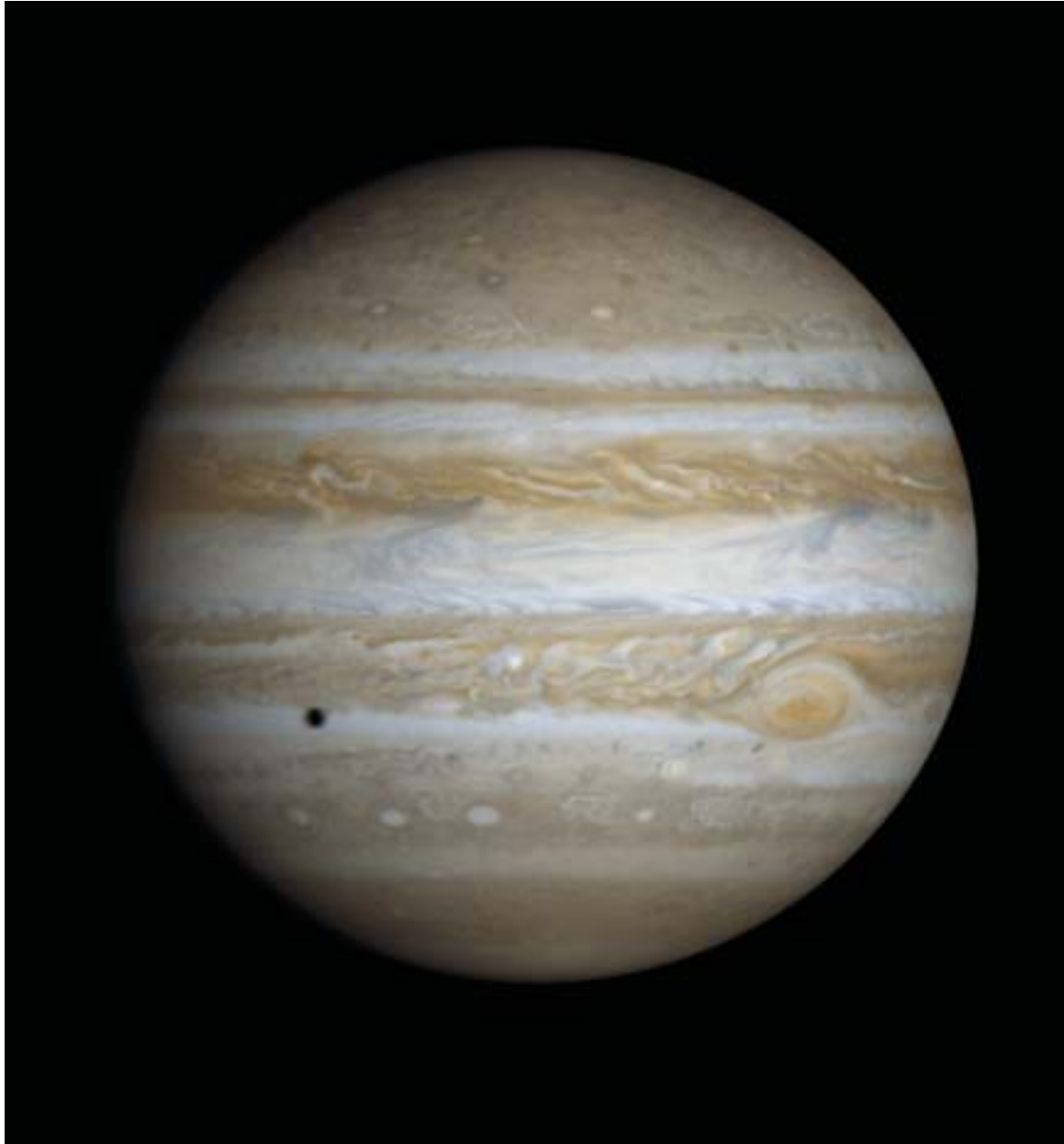




National Aeronautics and
Space Administration

Jupiter 24





With its numerous moons and several rings, the **JUPITER** system is a “mini-solar system.” Jupiter is the most massive planet in our solar system, and in composition it resembles a small star. In fact, if Jupiter had been between fifty and one hundred times more massive, it would have become a star rather than a planet.

On January 7, 1610, while skygazing from his garden in Padua, Italy, astronomer Galileo Galilei was surprised to see four small “stars” near Jupiter. He had discovered Jupiter’s four largest moons, now called Io, Europa, Ganymede, and Callisto. Collectively, these four moons are known today as the Galilean satellites.

Galileo would be astonished at what we have learned about Jupiter and its moons in the past 30 years. Io is the most volcanically active body in our solar system. Ganymede is the largest planetary moon and has its own magnetic field. A liquid ocean may lie beneath the frozen crust of Europa. An icy ocean may also lie beneath the crust of Callisto. Jupiter also has at least 24 smaller moons. The 20 outer moons are probably asteroids captured by the giant planet’s gravity.

At first glance, Jupiter appears striped. These stripes are dark belts and light zones created by strong east-west winds in Jupiter’s upper atmosphere. Within these belts and zones are storm systems that have raged for years. The southern hemisphere’s Great Red Spot has existed for at least 100 years, and perhaps longer, as Galileo reported seeing a similar feature nearly 400 years ago. Three Earths could fit across the Great Red Spot.

Jupiter’s core is probably not solid but a dense, hot liquid with a consistency like thick soup. The pressure inside Jupiter may be 30 million times greater than the pressure at Earth’s surface.

As Jupiter rotates, a giant magnetic field is generated in its electrically conducting liquid interior. Trapped within Jupiter’s magnetosphere—the area in which magnetic field lines encircle the planet from pole to pole—are enough charged particles to make the inner portions of Jupiter’s magnetosphere the most deadly radiation environment of any of the planets, both for humans and for electronic equipment. The “tail” of Jupiter’s magnetic field—that portion stretched behind the planet as the solar wind rushes past—has been detected as far as Saturn’s orbit. Jupiter’s rings and moons are embedded in an intense radiation belt of electrons and ions trapped in the magnetic field. The Jovian magnetosphere, which comprises these particles and fields, balloons one to three million kilometers toward the Sun and tapers into a windsock-shaped tail

extending more than one billion kilometers behind Jupiter—as far as Saturn’s orbit.

Discovered in 1979 by NASA’s *Voyager 1* spacecraft, Jupiter’s rings were a surprise: a flattened main ring and an inner cloud-like ring, called the halo, are both composed of small, dark particles. A third ring, known as the gossamer ring because of its transparency, is actually three rings of microscopic debris from three small moons: Amalthea, Thebe, and Adrastea. Jupiter’s ring system may be formed by dust kicked up as interplanetary meteoroids smash into the giant planet’s four small inner moons. The main ring probably comes from the tiny moon Metis.

In December 1995, NASA’s *Galileo* spacecraft dropped a probe into Jupiter’s atmosphere. Carrying six scientific instruments, the probe survived the crushing pressure and searing heat for nearly an hour, collecting the first direct measurements of Jupiter’s atmosphere, the first real data about the chemistry of a gas planet. Following the release of the probe, the *Galileo* spacecraft began a multi-year orbit of Jupiter, observing each of the largest moons from close range several times.

Fast Facts

Namesake	King of the Roman Gods
Mean Distance from Sun	778.4 million km
Orbital Period	11.86 years
Orbital Eccentricity	0.048
Orbital Inclination to Ecliptic	1.3°
Inclination of Equator to Orbit	3.12°
Rotational Period	9 h 55 m
Diameter	142,984 km
Mass	318 times Earth’s
Density	1.33 g/cm ³
Gravity	2.36 of Earth’s
Atmosphere (Primary Components)	Hydrogen and Helium
Atmospheric Temperature at 1-bar Pressure Level	165 K
Known Moons (28) in Increasing Distance from Jupiter	

Metis, Adrastea, Amalthea, Thebe, Io, Europa, Ganymede, Callisto, S/1975 J1, Leda, Himalia, Lysithea, Elara, S/2000 J1, J3, J7, J5, Ananke, S/2000 J6, J4, J9, J10, Carme, Pasiphae, S/2000 J2, J8, Sinope, S/1999 J1
1 (4 parts)

Rings

Significant Dates

- 1610** Italian astronomer Galileo Galilei discovers four moons orbiting Jupiter (Io, Europa, Ganymede, and Callisto—the Galilean satellites).
- 1973** *Pioneer 10*, the first spacecraft to reach Jupiter, passes within 130,354 km of Jupiter’s cloud tops.
- 1974** *Pioneer 11* passes within 43,000 km of Jupiter’s cloud tops, providing first images of polar regions.
- 1979** *Voyager 1* passes within 350,000 km of Jupiter’s center and discovers a faint ring and three moons.
- 1979** *Voyager 2* passes within 650,000 km of Jupiter’s center, providing detailed imagery of Jovian ring and Io volcanism.
- 1992** *Ulysses* uses Jupiter’s gravity to enter solar polar orbit.
- 1995** *Galileo* arrives at Jupiter; atmospheric entry probe survives to pressure depth of 23 bars.
- 1995–present** *Galileo* orbits within Jupiter’s system, studying planet, rings, satellites, and magnetosphere.
- 2000–01** *Cassini* observes Jupiter while en route to Saturn.

About the Images

- (Left)** Strong east-west winds create latitudinal bands in Jupiter’s atmosphere (*Cassini*).
- (Right, top)** Two of Jupiter’s moons, volcanic Io (above the Great Red Spot) and icy Europa (right) are seen as they orbit about 350,000 and 600,000 km (respectively) above the planet’s clouds (*Voyager 1*).
- (Right, center)** Very small dust-sized particles in Jupiter’s main ring and a hint of the surrounding halo can be seen in this composite of several images (*Galileo* and *Voyager*).
- (Right, bottom)** Artist’s conception of magnetic field lines (blue) extending from pole to pole form a “cage” around Jupiter, which is stretched behind the planet as the solar wind (green) rushes past.

References

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