

# The Solar System Report

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As far as we know, there are eight planets locked in orbit around the Sun. Only one, our own Earth, supports life as we understand it. But there are countless other suns throughout countless galaxies scattered across the expanse of the universe. We still don't know if life exists on another planet in some other galaxy.

But we do know more and more all the time about our own solar system. During the past 15 years, space probes such as the Mars Surveyor and Voyager missions have given us tremendous detail about the planets in this system. Tiny by comparison to the Milky Way, our solar system is awesome, nevertheless, when considered in human scale.

## Mercury

Named for the wing-footed messenger of the Roman gods Mercury races around its orbit at a dizzying speed of 30 miles (48 kilometres) per second, making the Mercurial year only 88 Earth days long. In contrast, one rotation around its axis—or a single day—takes almost 59 Earth days.

## Geology

Mariner 10 gave us a wealth of information about Mercury when it approached the planet in 1974 and 1975. Because Mercury has no water and barely any atmosphere, no erosion has taken place on its surface. We see Mercury much the way it was soon after it formed.

## Core

We learned that Mercury has an extremely weak magnetic field, which could indicate a hot metallic core, such as molten iron. Geologists think Mercury may be the most iron-rich planet in the solar system.

## Crust

Mercury's crust seems to be silicate, like that of Earth.

## Craters

The planet's surface, viewed for the first time via Mariner's cameras, is covered by craters. The battering occurred during the early period of the solar system when clumps of material were ramming into each other to form the planets.

## Atmosphere

Mercury doesn't have what we think of as an atmosphere—that is, a gaseous envelope that produces clouds and weather or protects the surface of the planet from some of the harmful solar radiation. The weak magnetic field on Mercury captures only the barest perceptible trace of charged particles from the Sun.

## Venus

Shrouded in the cloak of mystery, Venus, our nearest planetary neighbour, takes the name of the Roman goddess of love. For some unknown reason, Venus rotates on its axis in retrograde—that is, in the reverse direction of its revolution around the Sun.

### Geology

Geologically, Venus appears to have some similarities to Earth. Its crust is probably granitic, overlying a basaltic mantle and a iron-nickel core. The geologic activity that we are familiar with on Earth seems not to exist on Venus, except for the presence two volcanoes along a fault line.

### Atmosphere

Venus's veil of mystery is really an impenetrable, heavy layer of sulphuric acid clouds above an atmosphere consisting of about 96 percent carbon dioxide.

### Greenhouse effect

Sunlight entering Venus's atmosphere is converted to heat radiation and is prevented from escaping by carbon dioxide—a phenomenon we call the “greenhouse effect.” Surface temperatures reach 800 degrees Fahrenheit (341.33 degrees Celsius), and the atmosphere appears to be constantly flashing with lightning.

### Weight of atmosphere

For an idea of the weight of Venus's atmosphere, consider that walking on the surface of Venus would be comparable to walking on the ocean floor at a depth of half a mile.

## Earth

For about 500 million years after its initial formation, the Earth remained at a rather stable 2000 degrees Fahrenheit (874.68 degrees Celsius). Closest to Venus, it comprised predominantly of iron and silicates, the Earth also contained small amounts of radioactive elements, mostly uranium, thorium, and potassium. As these elements decayed, they produced radiation that gradually heated the Earth, melting the iron and silicates. The iron sank to the centre, forcing the lighter silicates to the surface and causing the violent processes that formed the Earth's surface as we know it and that continue to form it even today.

### Geology

Between the iron core and the solid rock crust lies a mantle of heavy silicate rock that is 1800 miles thick (2880 kilometres). The mantle is neither solid nor liquid, but has a viscous, yielding consistency upon which the crust actually floats. The crust is not a single, solid mass, but rather a collection of separate plates, along whose boundaries the geologic processes continue to work on the planet's surface.

### Atmosphere

The Earth's atmosphere extends more than 400 miles (640 kilometres) into space. From sea level to a height of about 60 miles, the atmosphere is 78 percent nitrogen, 21 percent oxygen,

and the remaining 1 percent a combination of argon, carbon dioxide, neon, helium, krypton, xenon, and tiny amounts of some other gases.

## **Moons**

The Earth's single moon is large in comparison with the natural satellites of all the other planets except for Pluto. Astronomers actually consider the Earth-Moon system to be a double planet. Its size gives the Moon a significant gravitational influence on the Earth, causing our oceans to have tides.

## **Mars**

Because it is so visible, and its atmosphere is so thin and transparent, we know more about Mars than we do any other planet, except Earth. Days on Mars are roughly the same as an Earth day, since Mars takes 24 hours and 37 minutes to rotate upon its axis, but its year is 687 Earth days long. Its distance from the Sun can vary by about 36 million miles because of its eccentric orbit.

## **Geology**

The blood-red colour of Mars inspired the Romans to name the planet for their god of war, but the colour actually is caused by iron oxide rust on the planet's surface. Canal-like configurations on the surface of Mars have long inspired scientists to maintain the hope of finding water, which might mean that life exists on the planet.

## **Atmosphere**

Mars probably developed its atmosphere by spewing gases from its interior, as Earth did. But Mars, with a mass barely more than 10 percent of Earth's, had insufficient gravity to retain the lighter gases. Today, the Martian atmosphere is mostly carbon dioxide.

## **Moons**

Two tiny moons orbit Mars. They are tiny, irregularly shaped satellites with heavily cratered surfaces. The larger of the two is called Phobos and the smaller is called Deimos. Phobos is only about 14 miles (23 kilometres) across and Deimos is only about 8 miles (13 kilometres) across.

## **The Asteroid Belt**

Based on the distances between the nine known planets, there should be a tenth planet between Mars and Jupiter. Indeed, where the planet should be there is a band of asteroids, some as large as 620 miles (1000 kilometres) across, some just tiny pebbles.

## **Jupiter**

Jupiter is the largest of the planets in our solar system and is named for the king of all the Roman gods. It is not considered a terrestrial planet in that its “surface” is a swirling mass of liquid hydrogen with a core of iron about the size of the Earth.

### **Atmosphere**

Besides hydrogen, the atmosphere contains helium, methane, and visible clouds of icy ammonia that blow across the face of the planet. A spot at least twice the diameter of Earth on Jupiter’s surface is probably a 13,000-mile-wide storm that has been raging for thousands of years. The spot’s dark red colour suggests that it may tower thousands of miles above the lighter-coloured clouds.

### **Moons**

Jupiter has 16 moons, the largest of which are Europa, Ganymede, Io, and Callisto. Each of these major moons has surface characteristics distinctly different from the others. When Jupiter is nearest the Earth, the moons can be seen clearly through field glasses as they move around the giant planet.

## **Saturn**

Saturn is the second largest planet in the solar system, but probably the lightest because it is the least dense. In fact, because the ratio of size to weight is so large, Saturn would probably float in water, if a large enough body of water existed. Like Jupiter, Saturn is a ball of gas and liquid, with a possible solid core about the size of Earth.

### **Atmosphere**

Like Jupiter, Saturn’s atmosphere is torn by violent storms that rage endlessly. Some storm systems are larger than Europe and Asia combined. The entire atmosphere is enveloped by a hydrogen haze. Beneath the haze the atmosphere is mostly hydrogen and helium with some methane and ammonia ice crystals.

### **Moons**

Two Voyager probes observed Saturn in 1980 and 1981 and sent evidence back to Earth that Saturn has between 21 and 23 moons, more than any other planet. One of Saturn’s moons, Titan, is larger than Mercury and Pluto. All of the moons of Saturn are made of water ice, some containing rock.

### **Rings**

The most distinguishing feature of Saturn is, of course, its rings. They begin about 7000 miles (11,200 kilometres) from the “surface” of Saturn and extend, with gaps, to about 35,000 miles (56,000 kilometres). The rings are composed of dust and relatively small particles of ice and are clearly visible from Earth through a small telescope.

## Uranus

Most surprising of all the planets is Uranus, the seventh planet from the Sun. Uranus lies at roughly a 90-degree angle to the Sun, so that one of its poles constantly points almost directly at the Sun as it rotates. Oddly enough, the temperature at both poles is about the same.

## Atmosphere

Uranus is a non-terrestrial planet whose surface is a superheated ocean of water. A dense atmosphere of mostly hydrogen and helium provides the pressure that both heats the water to thousands of degrees and prevents it from boiling away. The high temperatures in return prevent the pressure from solidifying the water.

## Moons

Also surrounding Uranus are 15 moons. Until Voyager 2 began sending information back to Earth about Uranus in January 1986, only five moons were known - Oberon, Titania, Umbriel, Ariel and Miranda.

## Rings

Like Saturn, Uranus is surrounded by rings. This discovery was made by astronomers in 1977, when they observed an occultation, which is the eclipse of a star by a planet. They noticed that the star's light flickered for 35 minutes before the occultation by Uranus. Then, after Uranus passed in front of the star, the light reversed its flickering before becoming fully visible again.

## Neptune

The giant blue planet inspired ancient peoples to name it after the god of the deep blue sea. We know less about Neptune than we do about the other eight planets, although Voyager 2 gave us new information.

## Pluto

Originally, the ninth planet of our solar system, Pluto was reclassified as a 'dwarf planet' in August of 2006. Pluto was predicted by Percival Lowell, who noticed that there were unexplained irregularities in the orbits of Uranus and Neptune. In 1930, Clyde Tombaugh actually discovered Pluto exactly where Lowell had predicted it would be. The name Pluto is in keeping with the tradition of Roman gods and is appropriate—Pluto was the god of the underworld, and the planet is a dark and frozen place—but it was chosen because the first two letters are Percival Lowell's initials.