

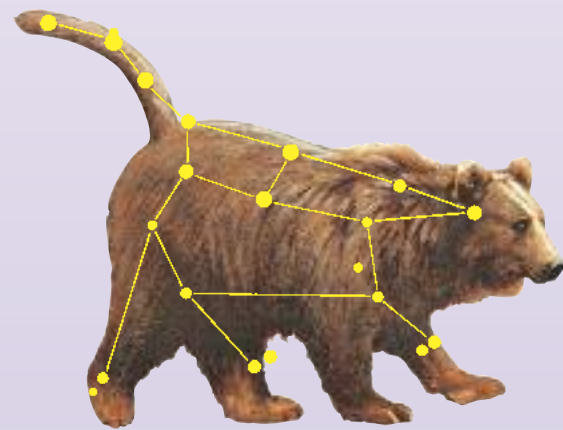
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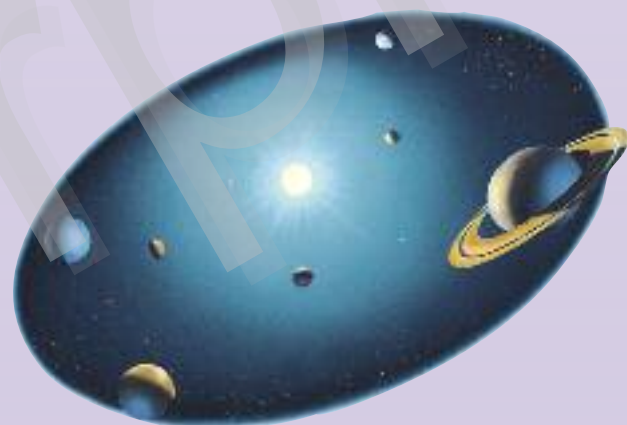
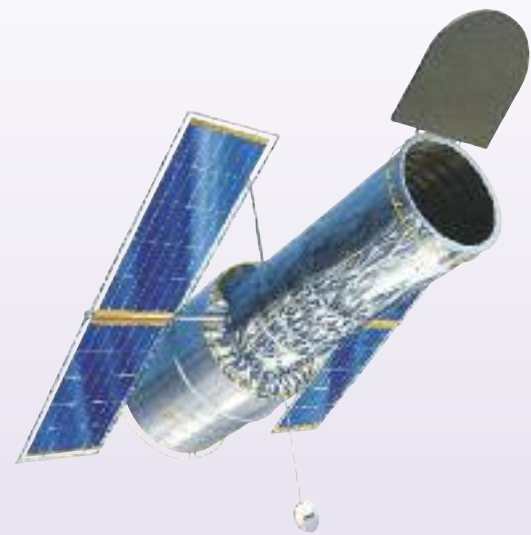
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ABOUT THIS BOOK

Each double page contains a brief introduction, explaining the general subject, followed by key words arranged in alphabetical order. To look up a specific word, turn to the index at the back of this book: this will tell you which page to go to. If you want to learn more about a subject, take a look at the factfile, or follow the arrows to read related entries.



INTRODUCTION

This explains the general subject and provides some basic knowledge.

ARROWS

These arrows show you where to look up other words mentioned in the entry. For example, (▶26) tells you to go forward to page 26 and (◀6) tells you to turn back to page 6.

PAGE NUMBER

Page numbers are easy to find at the side of the page.

JUPITER & SATURN

Jupiter is the largest planet in the Solar System. It is more massive than all the other planets combined. Jupiter is known as a "gas giant" because it is mostly made up of gas with no solid surface at all. Its neighbour, Saturn, another gas giant, is the second largest planet. Both planets are surrounded by "rings" of rock and dust. Saturn's rings, broad and bright, reach out more than 430,000 km from the planet. Jupiter and Saturn both have a large number of moons.

Cassini Giovanni Domenico (1625-1712) Italian astronomer who first observed four of Saturn's moons and also discovered the largest gap between Saturn's rings.

Galileo Mission A mission that sent a space probe to orbit Jupiter in 1989. It was the first spacecraft to orbit the planet.

Galileo Galilei (1564-1642) Italian astronomer who was the first person to use a telescope. He made many important observations and discoveries, including the discovery of Jupiter's moons. By observing that Venus, like the Moon, had phases, he confirmed that the planets all orbit the Sun.

Ganymede The largest of Jupiter's moons. Bigger than the planet Mercury, it measures 5268 km across and is the largest moon in the Solar System. Ganymede has an icy surface with dark plains covered in grooved patterns and craters.

Gas giants The four large planets in the Solar System: Jupiter, Saturn, Uranus and Neptune. They mostly consist of gases with no solid surface.

Jupiter's Great Red Spot The white ovals are air currents flowing past the spot.

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Enceladus One of Saturn's moons. It measures 498 km across. Enceladus's surface is mostly made up of water ice.

Europa Jupiter's fourth largest moon. It measures 3130 km across. Europa has an icy surface, which may have a water ocean beneath it.

Jupiter's four largest moons are called the Galileos after Galileo who discovered them in 1610.

Callisto **Ganymede** **Europa** **Io**

Io Jupiter's third largest moon. It measures 3643 km across. Io is covered with active volcanoes and pools of molten rock. It is the most volcanically active place in the Solar System.

Jovian planets Another name for the gas giants. The word "Jovian" means "belonging to Jupiter".

Saturn is seen from the surface of Titan.

Great Red Spot A giant storm in Jupiter's atmosphere. The storm has been raging for at least 300 years.

Great White Spot A large storm that occurs in Saturn's atmosphere about every 30 years.

Huygens, Christaan (1639-1695) Dutch astronomer who discovered the moon Titan and spent much of his career studying the rings of Saturn.

Saturn's rings are made up of billions of blocks of rock and ice, some bigger than houses.

From Earth, it is possible to identify three of Saturn's rings: an outer ring (ring A), separated from two inner rings (B and C) by the Cassini Division.

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Ringlet A very fine planetary ring. Saturn's rings are made up of hundreds or thousands of ringlets.

Titan Saturn's largest moon. It measures 5150 km across, and is the second largest moon in the Solar System. Titan is the only moon in the Solar System known to have a thick atmosphere.

Zones The lighter of the striped cloud bands that surround Jupiter.

FACTFILE

JUPITER

- Diameter: 142,884 km
- Days: 9.8 Earth days
- Year: 11.8 Earth years
- Average distance from the Sun: 778 million km
- Surface temperature: -150 °C
- Atmosphere: hydrogen and helium
- Gravity (Earth = 1g): 2.4g
- Number of moons: 51
- Mass (Earth = 1): 318
- Density (water = 1): 1.3
- Name: the Roman king of the gods

SATURN

- Diameter: 120,514 km
- Days: 10.2 Earth days
- Year: 29.5 Earth years
- Average distance from the Sun: 1427 million km
- Surface temperature: -150 °C
- Atmosphere: hydrogen and helium
- Gravity (Earth = 1g): 1.1g
- Number of moons: 62
- Mass (Earth = 1): 95.2
- Density (water = 1): 0.7
- Name: the Roman god of farming

BOLD WORDS

These highlight useful words that do not have their own entry.

KEY WORDS AND ENTRIES

Key words are arranged alphabetically across each double page. Each entry provides a short explanation of what the key word means.

FACTFILE

The factfile provides extra information on the subject. Facts are presented in easy to read bullet points.

THE SUN

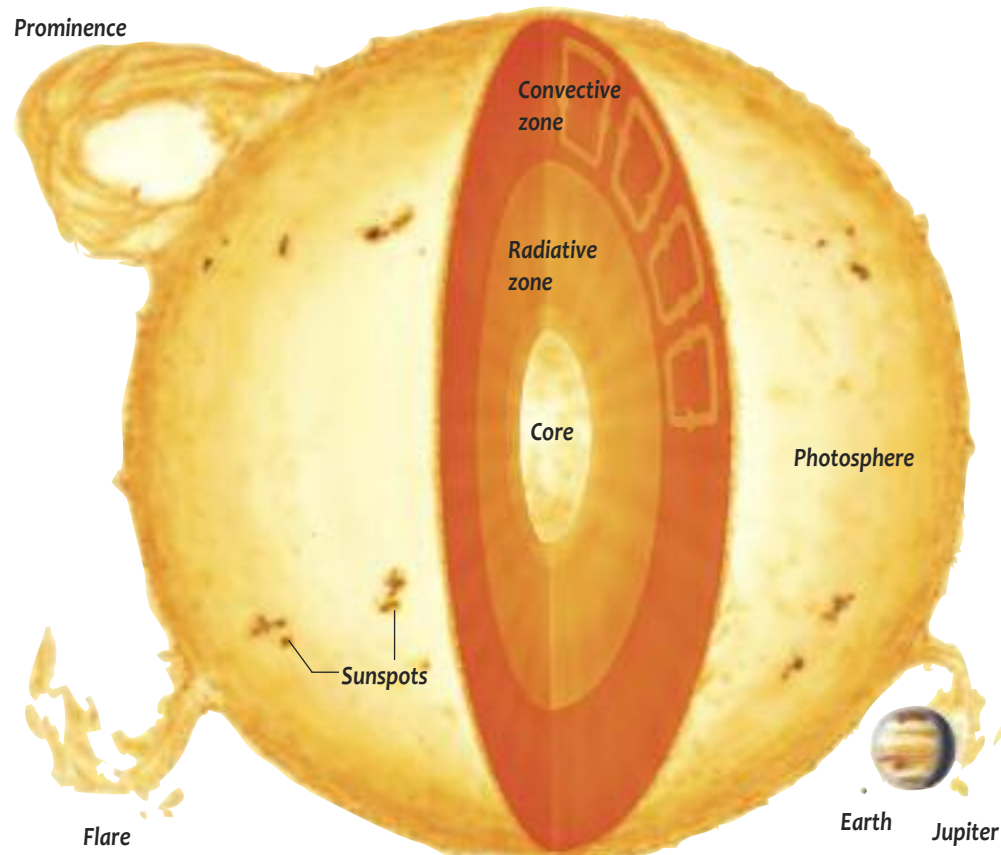
The Sun is a star at the centre of our Solar System. It is one of billions of stars in the Milky Way Galaxy, itself one of billions of galaxies in the Universe. Like all stars, the Sun is an enormous spinning globe of glowing gas that produces massive amounts of energy by converting hydrogen into helium. To us on Earth, the Sun is of crucial importance since no life could exist without it. The Sun is about 4.6 billion years old. It will keep shining for around another 5 billion years.

Chromosphere A thin layer of the Sun's atmosphere around 2000 km deep, just above the photosphere and beneath the corona. The chromosphere can reach temperatures of up to 20,000°C.

Convective zone The uppermost inner layer of the Sun. Hot gas bubbles up to the surface of the convective zone before sinking down to be reheated again.

Corona The Sun's hot outer atmosphere. The corona extends for millions of kilometres into space. It is visible from Earth only during a total solar eclipse.

Flare An explosion of hydrogen in the Sun's atmosphere, releasing enormous amounts of energy.



The Sun with a segment taken out to reveal its internal layers (above)

Granules Bubbles in the Sun's photosphere. Granules occur where heat rises up from the convective zone.

Heliosphere A magnetic "envelope" that surrounds the Sun and extends to the edge of the Solar System. The heliosphere is created by the solar wind.

Infrared radiation A form of electromagnetic energy (☛ 29). Infrared radiation is what we feel as heat. More than half of the energy the Sun gives off is in the form of infrared radiation.

Nuclear fusion The process by which the Sun generates energy. Inside the Sun's core, hydrogen atoms fuse together to form atoms of helium. The energy released through this process is the source of the Sun's light and heat as well as other forms of radiation.

Photosphere The surface of the Sun, from where the Sun radiates its energy. The photosphere is the part of the Sun that we can see. The photosphere is only about 500 km thick and, at 5500°C, is much "cooler" than the Sun's core. It is in a state of constant motion, like water boiling in a kettle.

Plasma Gas that is heated to such a high temperature that its atoms become electrically charged. The Sun's inner layers and atmosphere are in a plasmic state.

Prominence A flaming arch of gas that leaps off the photosphere and out into the corona. Prominences are held up by the Sun's magnetic field (☛ 6)



About five billion years from now, the hydrogen that the Sun uses as fuel will start to run out, and the Sun will balloon into a red giant (☛ 23), engulfing Mercury, Venus and Earth. Above is an artist's impression of what the Earth's surface may look like when this happens.



The Sun grows to the size of a red giant.

Radiation The transmission of heat, light and other forms of energy. Radiant energy travels in waves. Different forms of radiation are classified in the electromagnetic spectrum (☛ 29).

Radiative zone One of the inner layers of the Sun. Energy radiates out through this layer from the Sun's core.

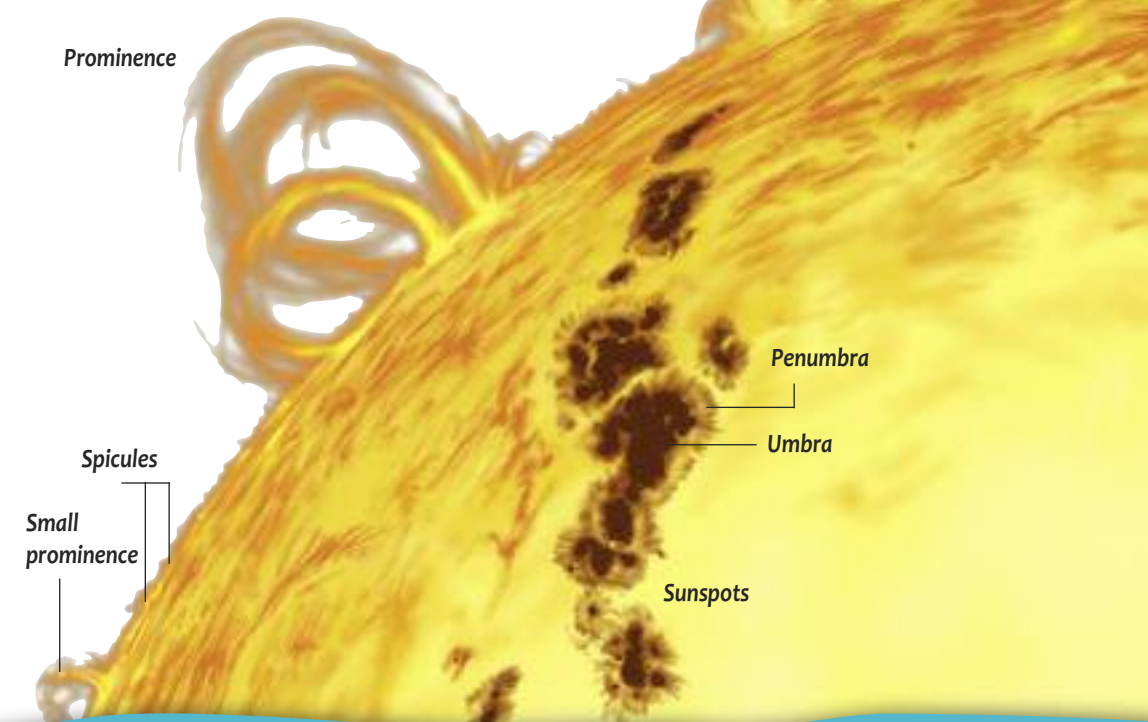
Solar core The innermost part of the Sun. The core is a region of high pressure (200 billion times that on the Earth's surface) and intense heat (about 15 million°C). This is where the energy that keeps the Sun shining is produced by nuclear fusion. Energy flows out from the core through the radiative zone to the convective zone.

Solar eclipse The passage of the Moon between the Sun and the Earth, blocking out some or all of the Sun's light (see diagram opposite).

Solar wind A stream of subatomic particles (☛ 28) that flows steadily away from the Sun. This occurs because gases in the corona have too much energy to be held in by even the Sun's strong gravitational field (☛ 6).

Spicule A narrow, flaming jet of gas that leaps up to 10,000 km above the photosphere then falls back.

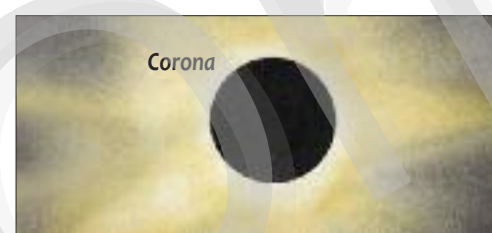
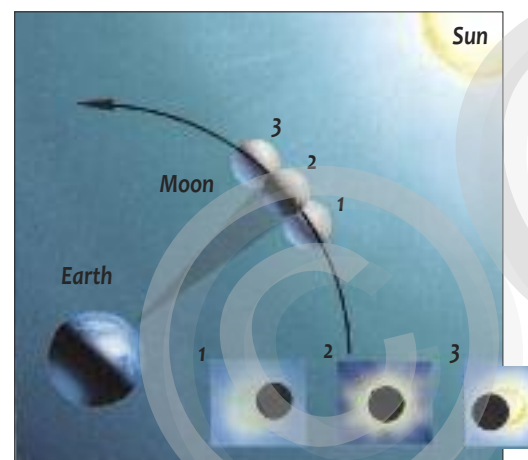
Sunspot A darker, cooler area that appears temporarily on the Sun's photosphere. Sunspots are places where lines of magnetic force (☛ 6) pass through the photosphere. They usually occur in small groups. The dark inside of a sunspot is called the **umbra** and the lighter outside is called the **penumbra**.



FACTFILE

- Diameter:** 1,400,000 km
- Rotation period at equator:** 25.4 days
- Rotation period at poles:** 34 days
- Surface temperature:** 5500 °C
- Core temperature:** 14,000,000 °C
- Composition:** hydrogen (73.4%), helium (24.9%), traces of oxygen, carbon and other elements
- Mass (Earth = 1):** 330,000
- Average density (water = 1):** 1.4

- ★ The Sun contains more than 99% of all the matter in the Solar System.
- ★ About three-quarters of the Sun is made up of hydrogen.
- ★ The Sun is so big that approximately 1,400,000 globes the size of the Earth could fit inside it.
- ★ Never look directly at the Sun or look at it through binoculars or a telescope. This can blind you or seriously damage your eyesight.
- ★ If the Earth were any closer to the Sun it would have been too hot for life to develop. If it were any farther away from the Sun it would be too cold for life.
- ★ It takes about eight minutes for light to travel from the Sun to the Earth.

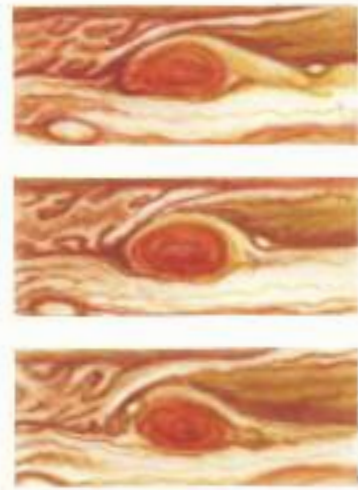


A solar eclipse. By coincidence, the Sun and Moon appear the same size in our sky. When the Moon passes between the Earth and the Sun it may partially or fully block out the Sun. During a total eclipse, the Moon covers the Sun's surface entirely and we can see the corona.

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Gas giants The four large planets in the Solar System: Jupiter, Saturn, Uranus and Neptune. They mostly consist of gases with no solid surface.

Saturn rotates very quickly. This produces a distinct bulge at its equator.

Jupiter's bright colours of red, orange, yellow and brown, are produced by the elements sulphur and phosphorus.

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Saturn as seen from the surface of Titan.

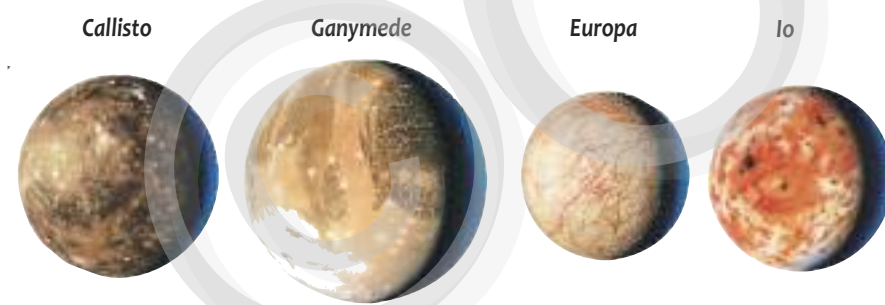


Io is covered with volcanoes and lava pools.

Belts The darker of the striped cloud bands that surround Jupiter.

Callisto Jupiter’s second largest moon. It measures 4800 km across. For its size, it has more craters than any other planet or moon in the Solar System.

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Number of moons: 63
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Name: the Roman king of the gods

SATURN

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Year: 29.5 Earth years
Average distance from the Sun: 1427 million km
Surface temperature: -180 °C
Atmosphere: hydrogen and helium
Gravity (Earth = 1): 1.16
Number of moons: 62
Mass (Earth = 1): 95.2
Density (water = 1): 0.7
Name: the Roman god of farming