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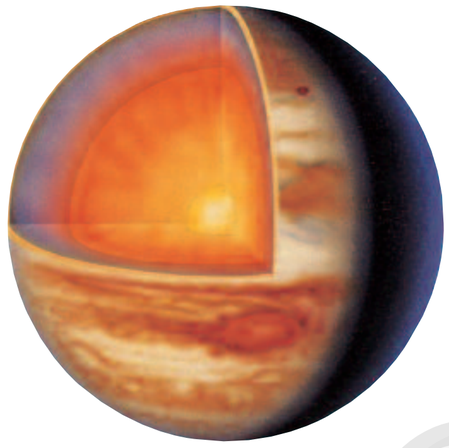
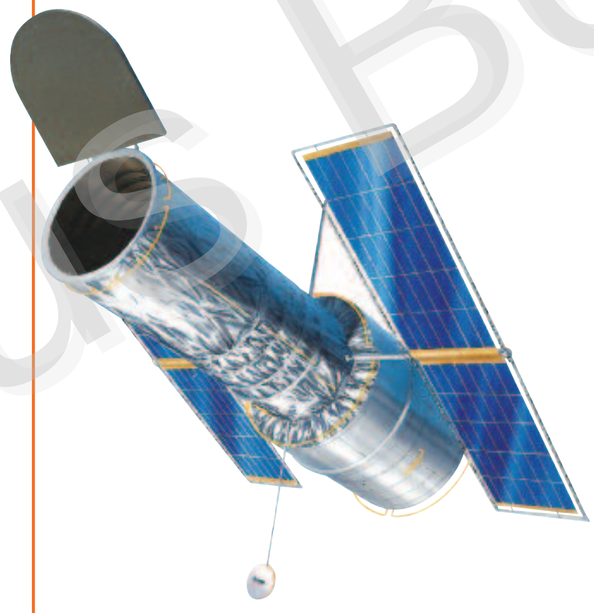
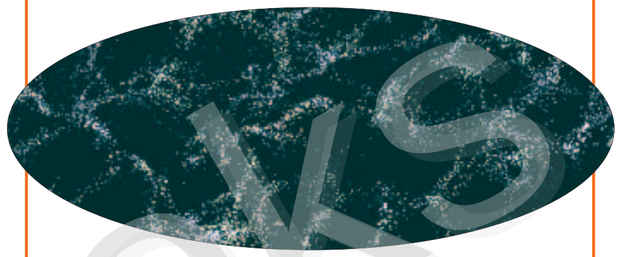




THE UNIVERSE



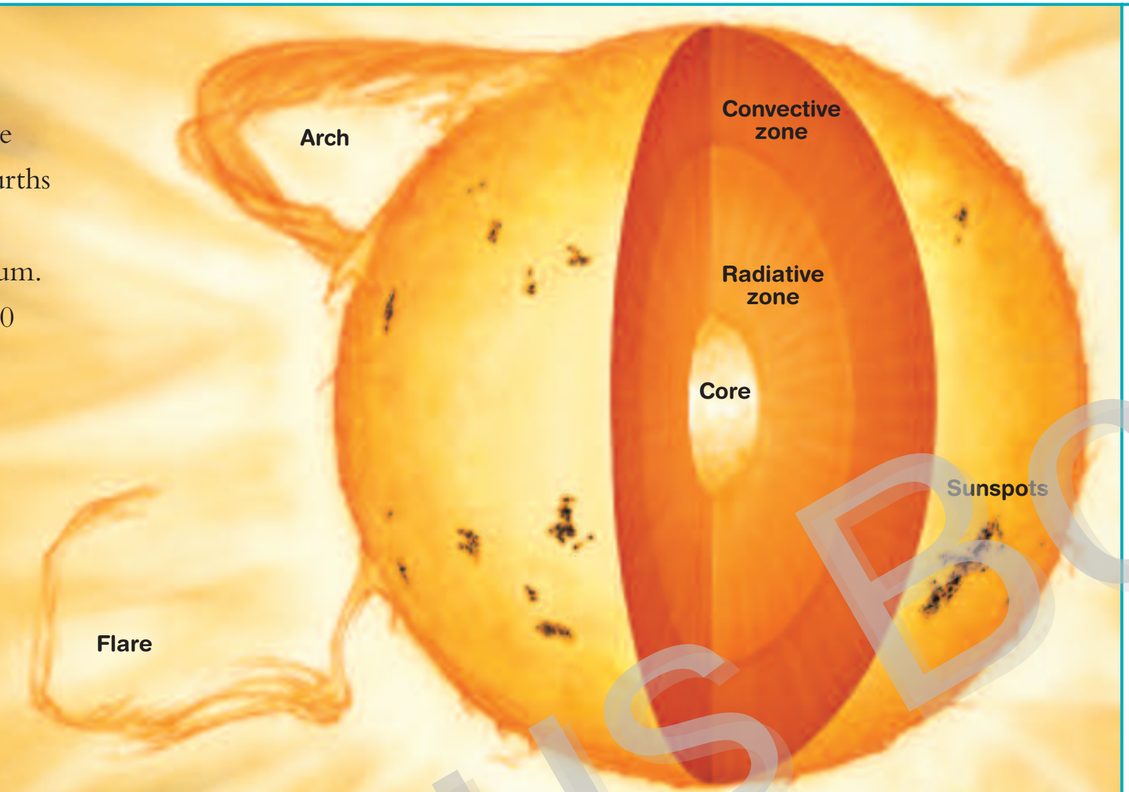
THE UNIVERSE consists of everything that we know to exist: stars, planets, rocks, people and so on. It even includes empty space. Nearly all the visible matter in the Universe is contained in galaxies. About 100 billion galaxies are grouped into giant clouds, called super-clusters, spread out like a net *(above)*.

The Universe probably began in a huge explosion about 13.7 billion years ago. All matter, energy—even time itself—were created during this "Big Bang". The Universe inflated like a balloon *(below)*, with galaxies moving away from one another.

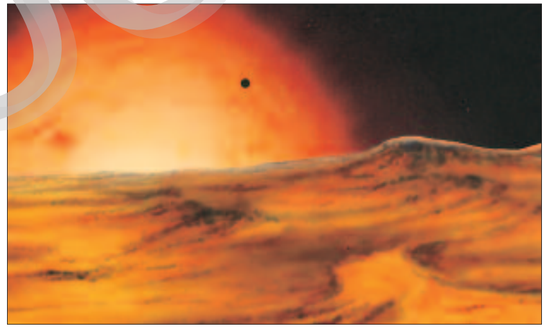
THE SUN

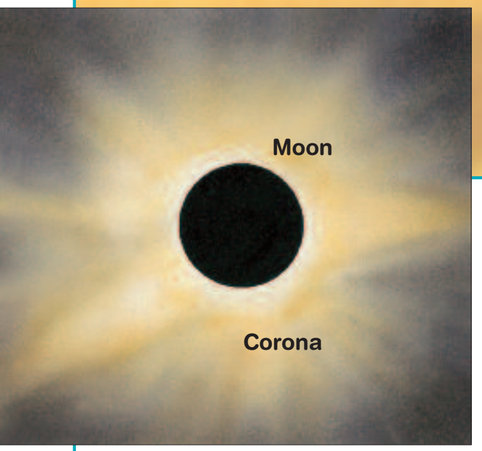
THE SUN is a star, just one of billions of stars in the Milky Way Galaxy. Although nearly 1,400,000 Earths could fit inside it, it is below average size for a star.

The Sun consists almost entirely of hydrogen and helium. At its centre is the core, a region where the pressure is 200 billion times what it is on Earth's surface. Here temperatures are about 15 million°C, hot enough for hydrogen to turn into helium. This chemical reaction produces massive amounts of energy, which keeps the Sun shining. The energy flows out from the core through the radiative zone to the convective zone. Here, hot gas bubbles to the surface before sinking back down to be reheated.



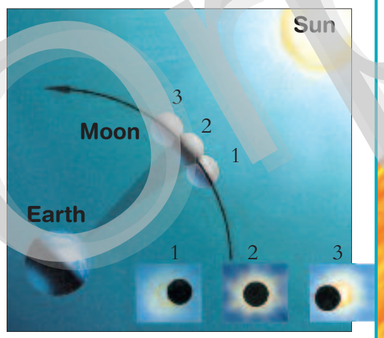
In about seven billion years' time, the Sun's fuel of hydrogen will start to run out. The Sun will balloon in size, becoming a red giant. The tiny disc on the left *(above)* represents the Sun as it is today. The disc on the right shows it as a red giant, one hundred times larger. Eventually the gigantic Sun will engulf the closest planets, Mercury and Venus. This *(below)* is what will happen to Earth's landscape at the same time. Its oceans and atmosphere will disappear, and its rocky surface will melt in temperatures of 1500°C.





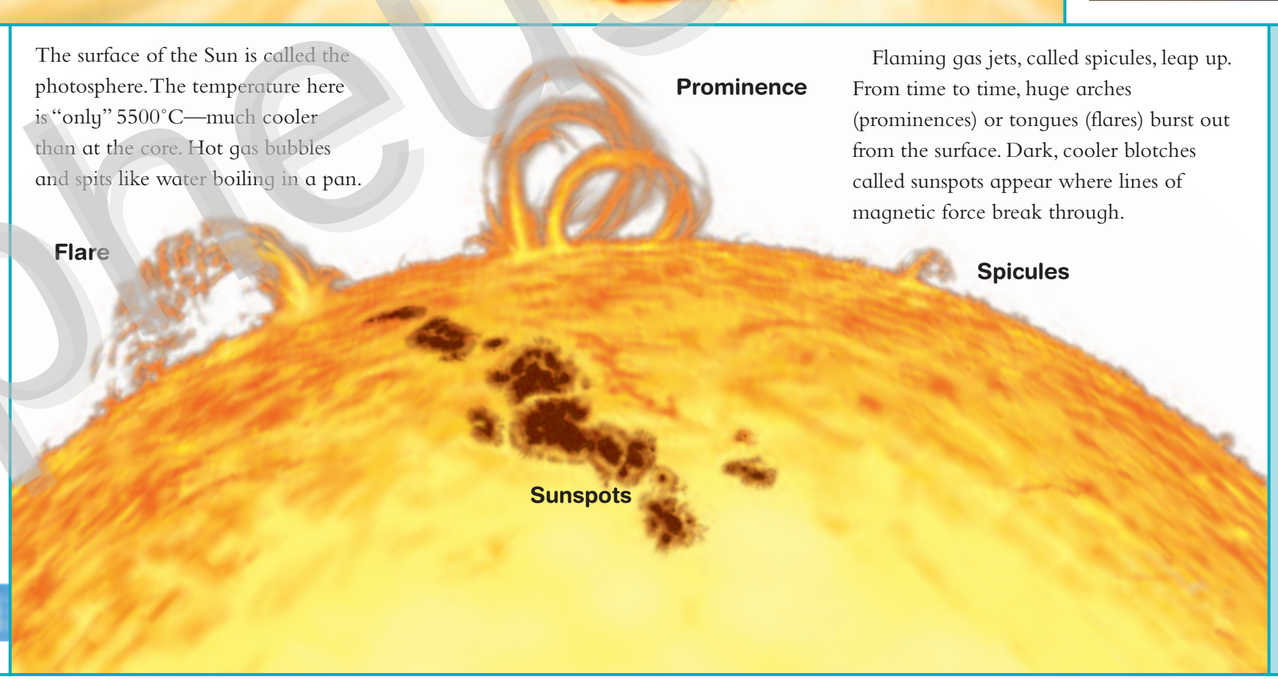
By coincidence, the Sun and Moon appear to be exactly the same size in the sky. When the two line up in an eclipse of the Sun, the Moon covers it almost exactly. The sky darkens and the Sun's milky-white atmosphere, the corona, becomes visible. Eclipses last a maximum of 7 minutes 31 seconds.

Because its orbit is slightly tilted, the Moon usually passes above or below the Sun as seen from Earth. Occasionally, the Moon passes directly between the Sun and Earth, causing its shadow to fall on our planet, an event known as an eclipse. Partial eclipses, when only part of the Sun is covered over, are visible over a wide area. Total eclipses, when the Sun is completely hidden, can be seen from only a narrow region.



The surface of the Sun is called the photosphere. The temperature here is "only" 5500°C—much cooler than at the core. Hot gas bubbles and spits like water boiling in a pan.

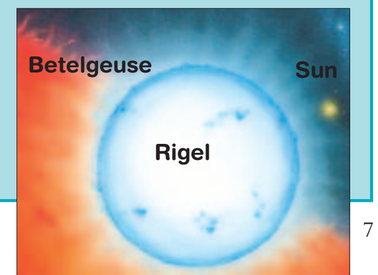
Flaming gas jets, called spicules, leap up. From time to time, huge arches (prominences) or tongues (flares) burst out from the surface. Dark, cooler blotches called sunspots appear where lines of magnetic force break through.



SUN DATAFILE

Diameter: 1.4 million km
Density (water=1): 1.4
Mass (Earth=1): 330,000
Rotation period at equator: 25.4 days
Rotation period at poles: 34 days
Average distance from Earth: 149.6 million km
Surface temperature: 5500°C
Composition: hydrogen (74.4%); helium (24.9%)

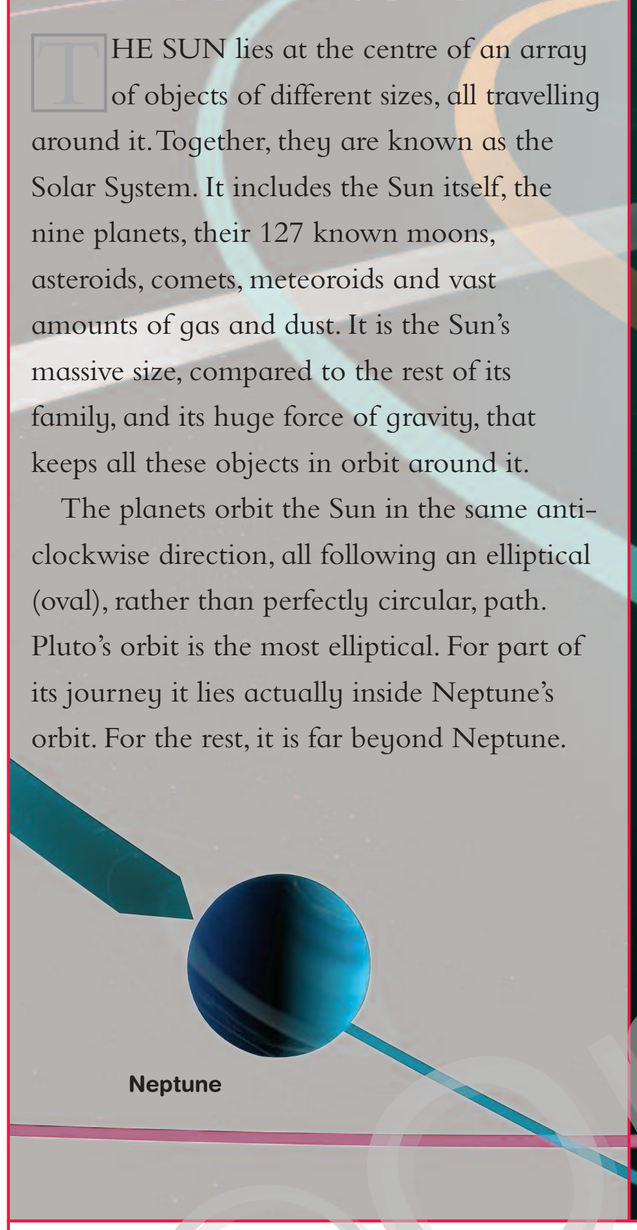
The Sun compared in size to a young blue star and a red giant.

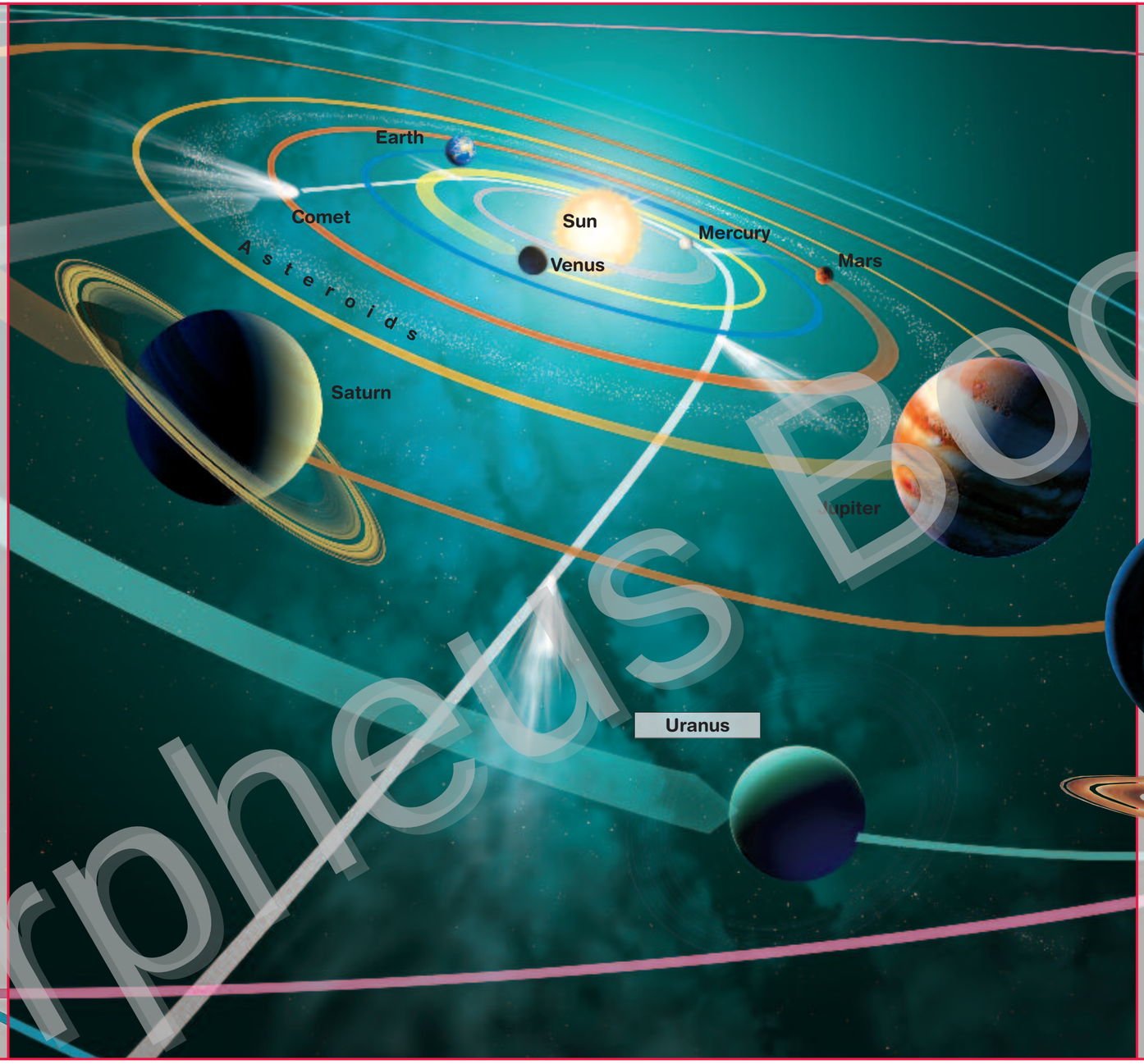


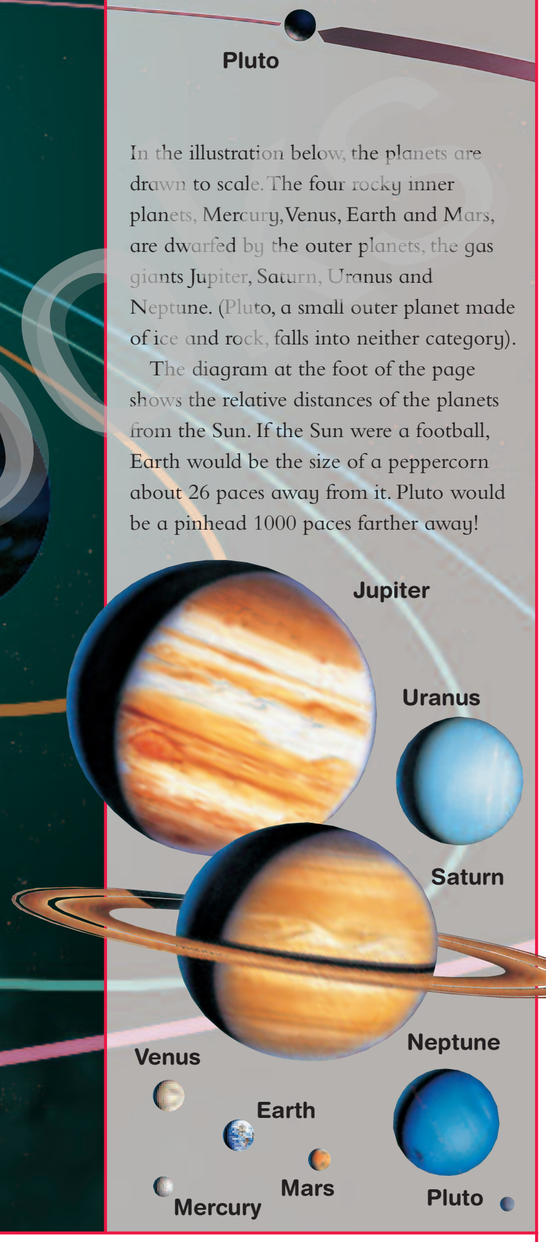
THE SOLAR SYSTEM

THE SUN lies at the centre of an array of objects of different sizes, all travelling around it. Together, they are known as the Solar System. It includes the Sun itself, the nine planets, their 127 known moons, asteroids, comets, meteoroids and vast amounts of gas and dust. It is the Sun's massive size, compared to the rest of its family, and its huge force of gravity, that keeps all these objects in orbit around it.

The planets orbit the Sun in the same anti-clockwise direction, all following an elliptical (oval), rather than perfectly circular, path. Pluto's orbit is the most elliptical. For part of its journey it lies actually inside Neptune's orbit. For the rest, it is far beyond Neptune.







In the illustration below, the planets are drawn to scale. The four rocky inner planets, Mercury, Venus, Earth and Mars, are dwarfed by the outer planets, the gas giants Jupiter, Saturn, Uranus and Neptune. (Pluto, a small outer planet made of ice and rock, falls into neither category).

The diagram at the foot of the page shows the relative distances of the planets from the Sun. If the Sun were a football, Earth would be the size of a peppercorn about 26 paces away from it. Pluto would be a pinhead 1000 paces farther away!