

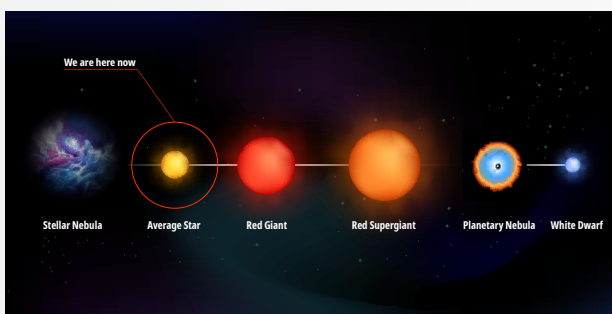
# The Sun and The Stars



Have you ever wondered where all those stars in the sky come from? Scientists have seen many „young“ stars in certain areas of the universe - the so-called **nebulae**. They therefore assume that this is where the stars are formed. A nebula consists of dense clouds of dust and gases. The most important gases are hydrogen and helium.

## But how do the stars in the nebulae form?

1. The gases inside the clouds continue to attract each other through their own gravitational pull and grow together.
2. The pressure inside increases enormously because the particles in the cloud are pressed together.
3. The rising pressure also increases the temperature. The hydrogen begins to fuse into helium. The energy released in the process makes the star glow.
4. This nuclear fusion in turn creates counterpressure and heat in the interior. The dense cloud therefore no longer contracts further, but forms into a stable and glowing sphere of gas.



## And when does a star go out?

### Let's take our sun as an example:

1. For around 4 billion years, our sun has been shining and making life on our earth possible. Slowly, it will continue to increase its luminosity and heat up our planet.
2. In about 5 billion years, so much helium will have accumulated in the core of the sun that the nuclear fire there will go out. The hydrogen around the core will begin to burn. This will release more and more energy. The sun will inflate to become a red giant.
3. The sun will expand to 150 times its current size. Then it will radiate 2,000 times more strongly. This will engulf the inner planets Mercury and Venus and heat the Earth to over 1,000 degrees Celsius. Life will no longer be possible here.
4. By now, so much helium will have accumulated in the core of the sun that its atomic nuclei will begin to fuse. And that's in addition to the burning hydrogen in the sun's envelope.
5. In addition, oxygen and carbon atomic nuclei will then form and collect in the centre of the sun as ash from the helium fusion.
6. The sun will no longer be able to hold its shell due to the high pressure and will repel. The envelope will be illuminated by the core and appear as a nebula from which new stars can be born again.
7. In the course of time, the core of the sun will cool down further and further and lose its luminosity. All that will remain will be a white dwarf of dense carbon and oxygen that will be as large as our Earth.

**It will be a very long time before the sun stops shining! Longer than there has ever been life!**

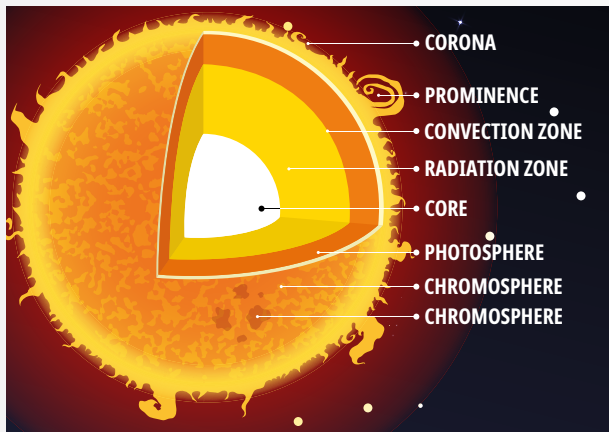


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## The structure of the sun

The sun consists of different layers.

In the core, the temperature is around 15 million degrees Celsius due to the continuous nuclear fusions. Around the core is the **plasma**. This layer conducts the light further to the surface. In the convection zone, the third layer, large masses of gas rise. They cool down again and sink into the interior. This process is called **convection**.

The brightest layer is the **photosphere**. The temperature here is around 6,000 degrees Celsius and the gas layer is impenetrable. Here, the energy from the interior is given to the outside as radiation.

The **solar atmosphere** is formed by the **chromosphere** and the **corona**.

The **chromosphere** glows reddish and the temperature is about 10,000 degrees Celsius.

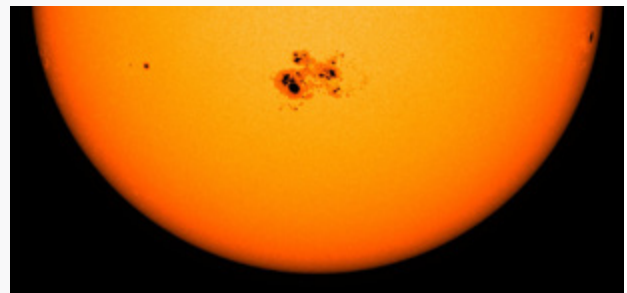
On the very outside is the **corona**. This layer consists of thin gas and is only visible during a total solar eclipse. Then it can be seen as a white, luminous ring of light.

## Explanation of terms:



### Solar flare:

- > Sudden, violent bursts of radiation.
- > Arise from electromagnetic processes within the chromosphere.



### Sunspots:

- > Dark spots on the surface of the sun.
- > Caused by a local disturbance of the sun's magnetic fire.
- > Only half of the stains last longer than two days, but some spots last several months.
- > Can grow up to 1,000 kilometres.



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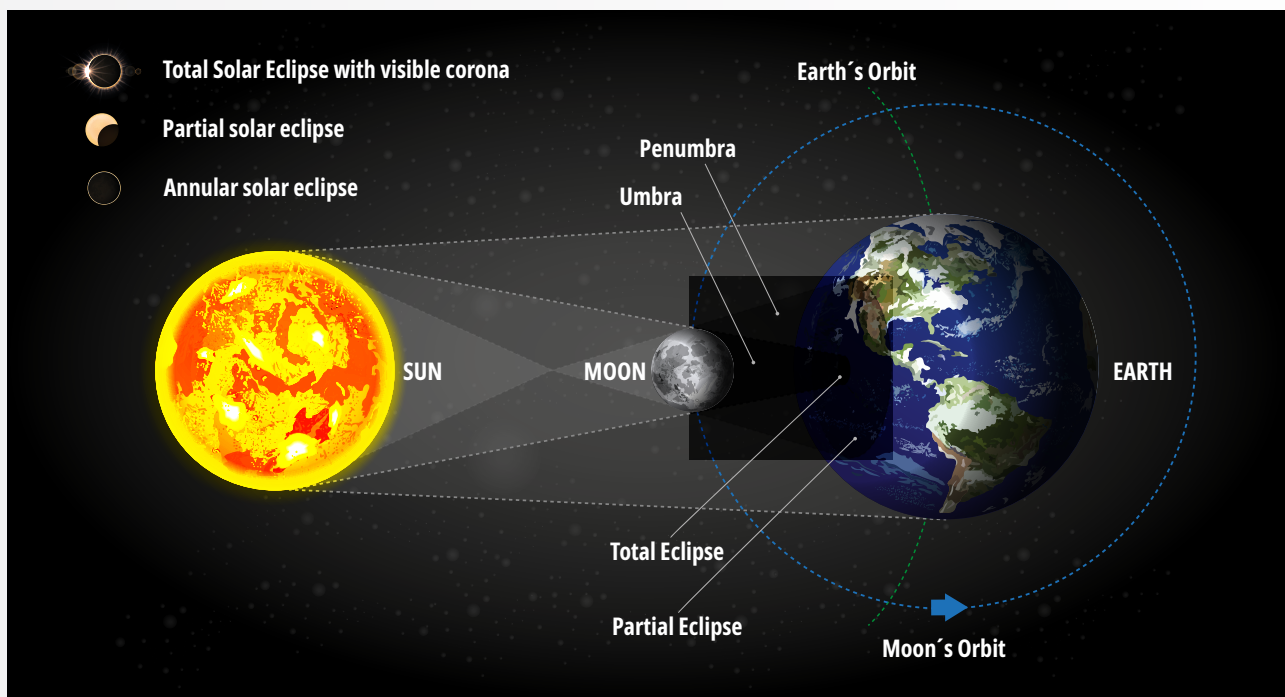


## Solar eclipse

A solar eclipse occurs when the moon covers the sun as seen from Earth. The Moon, Sun and Earth must all form a line. The sun is larger than the moon, but it is also further away. That is why we see both celestial bodies of the same size on the horizon. When the moon and the sun are at the same height as the earth, the moon forms a shadow and casts it on the earth. If the moon moves completely in front of the sun, this is called a total solar eclipse. A partial solar eclipse occurs when the moon only partially moves in front of the sun.

Unfortunately, solar eclipses are not always visible in all countries around the world this is because the Earth and the Moon are constantly rotating. You can see the next partial solar eclipse in Germany on 25 October 2022. The next total solar eclipse will occur on 03 September 2081.

**ATTENTION:** Please do not look at the sun without a suitable solar filter! This can lead to blindness. Use special solar eclipse glasses to observe a solar eclipse. You can also get these here with us!



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