

# A star is born

During the day, our own Sun is the only **star** we can see in the sky. But when the Sun sets, hundreds of other stars are revealed. The stars are huge balls of hot hydrogen gas like our own Sun, but they are so far away that they appear only as twinkling lights in the night sky.

Stars come in many sizes and colours. Our Sun is a yellow star. Stars don't always stay the same. Stars have a life cycle. Stars move through different stages of the cycle depending on their size. Our Sun is a medium-sized star. It is in the middle of its life. It has about another 5 billion years left in it before it dies. Stars smaller than our Sun, called **dwarf stars**, live longer. The biggest of all stars are known as **super-giant stars**. They have short lives of only a few million years.



The life of a star

Eventually the nebulae form clumps. At this stage, it is not quite a star and is called a **protostar**.

Once the white dwarf has no more energy to release as heat and light it becomes a **black dwarf**.

Clouds of dust and gas, called a **nebula**, come together under the force of **gravity**. As the dust and gases squeeze together, the centre of the nebula heats up.

A nebula can capture the materials released from a **supernova** and go on to form a new solar system. Our solar system was formed this way.

If the core of a red super-giant star is greater than three times the mass of our Sun, it becomes a **black hole**. Black holes are so heavy and dense that their gravity sucks everything inside them, even light!



## Activities



### REMEMBER

1. When is a star considered to have become a star in its life cycle?
2. What type of star is our Sun?
3. What is a supernova?
4. Describe what would happen to an object if it came close to a black hole.

### THINK

5. Will our Sun eventually become a black hole? Explain your answer.
6. Will our Sun experience a supernova in its lifetime? Explain your answer.
7. Why is the gravity of a black hole so powerful?

### CREATE

8. Draw a flow chart that explains the life cycle of a star that is five times the mass of our Sun.

### ICT

9. Go to [www.jaconline.com.au/sciencealivevic/salevel5](http://www.jaconline.com.au/sciencealivevic/salevel5) and click on the Stars links to help you answer the questions below about the stars Betelgeuse, Sirius A and Proxima Centauri.
  - (a) What type of star is each one?
  - (b) Will any of these stars become a black hole?
  - (c) To which **constellation** does each star belong?

The temperature of the centre of the star increases to the point where **nuclear reactions** begin. The star begins to shine; releasing energy in the form of heat and light: A star is born.

Stars experience pushes and pulls. The nuclear reactions push the star outwards and gravity pulls it inwards. When the star is able to balance the pushes and pulls, it is called a **main sequence star**. Our Sun is a main sequence star.

Eventually a star's supply of gas runs out and it begins to die. As they die, stars that are similar to the size of our Sun swell up and turn red. At this time, these stars are called **red giant stars**. Slowly the outer layers of the star are blown off in explosions, leaving behind a core.

Stars much larger than our Sun swell into much larger red giant stars. These are known as **red super-giant stars**.

The core of the red giant is called a **white dwarf**. The gases and dust in a white dwarf are squeezed tightly in a very small space. They are very heavy for their size. A teaspoon of the material that makes up a white dwarf could weigh as much as a family car!

Red super-giant stars blow up in a huge explosion known as a **supernova**. New gases are scattered into space, and a very, very dense core is left behind. Two things can happen to the core. It can form a **neutron star** or a **black hole**.

A **pulsar** is a special type of neutron star that spins around and around giving off radio beams, like a lighthouse. These can be detected on Earth using **radio telescopes**.



### I CAN:

- describe the different stages of the life cycle of a star
- explain, in simple terms, the meanings of nebula, star, supernova and black hole.

# Closer to home

Some of the bright objects that you see in the night sky are not **stars** at all! **Planets** and other objects can also be seen. These objects reflect light from the Sun towards the Earth. Mercury, Venus, Mars, Jupiter and Saturn can be seen without a **telescope** at certain times of the year. Space rocks, such as **comets** and **meteoroids**, can put on spectacular displays as they get closer to the Sun or enter the Earth's atmosphere.

*Comets are rock pieces held together with ice and frozen gases. Scientists believe that comets formed from the left-over debris when the **solar system** formed. The solid part of most comets is often no more than a few kilometres across.*

*Many comets can be found about a **light-year** away from the Sun in a place called the Oort Cloud. A second cloud of comets is believed to exist past Neptune. At times, comets in these groups crash into each other. A collision can cause a comet to move away from the cloud towards the Sun.*

*When a comet gets closer to the Sun, the Sun begins to melt the ice and frozen gases. As they melt, they form a long bright tail called a **coma**. A coma could be tens of thousands of kilometres long and it always points away from the Sun.*



*As **meteors** pass through the Earth's atmosphere, they are heated to very high temperatures and break down into small pieces. Scientists believe that tons of meteor material fall to Earth every day. But by the time a meteor reaches the ground, it has usually broken up into fine grains.*

*Meteors look like streaks of light in the night sky. A **meteor shower** occurs when many meteors fall together. Some meteor showers can be seen around the same time every year.*

*Meteoroids are the rocky remains of comets or asteroids. These rocks are called **meteoroids** when they are in outer space, but are called **meteors** in the Earth's atmosphere. If they hit the Earth's surface, they are called **meteorites**.*