SKY WATCHING

The Stars

Carmel Reilly

MACMILLAN LIBRARY

Click here for Copyright & Acknowledgements

Contents

Glossary words

When a word is printed in **bold**, click on it to find its meaning.

WHAT DOES IT MEAN

Words within a **box** are explained in the 'What does it mean?' panel at the bottom of the page.

Sky watching

When we sky watch, we look at everything above Earth. This includes what is in Earth's **atmosphere** and the objects we can see beyond it, in space.

Why do we sky watch?

Sky watching helps us to understand more about Earth's place in space. Earth is our home. It is also a planet that is part of a space neighbourhood called the **solar system**. When we sky watch we learn about Earth, and our neighbours inside and outside the solar system.

What objects are in the sky?

There are thousands of objects in the sky above Earth. These are Earth's neighbours – the Sun, the Moon, planets, stars and flying space rocks (**comets**, **asteroids** and **meteoroids**). Some can be seen at night and others can be seen during the day. Although some are visible with the human eye, all objects must be viewed through a telescope to be seen more clearly.

When and how can we see objects in the sky?

Object in the sky	Visible with the human eye	Visible only through a telescope	Visible during the day	Visible at night
Earth's atmosphere	✗	✗	✗	✗
Sun	✓ (Do not view directly)	✗ (View only with a special telescope)	✓	✗
Moon	✓	✗	Sometimes	✓
Planets	Sometimes	Sometimes	Sometimes	✓
Stars	Sometimes	Sometimes	✗	✓
Comets	Sometimes	Sometimes	✗	✓
Asteroids	Sometimes	Sometimes	✗	✓
Meteoroids	Sometimes	Sometimes	✗	✓

WHAT DOES IT MEAN

space the area in which the solar system, stars and galaxies exist, also known as the universe

Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

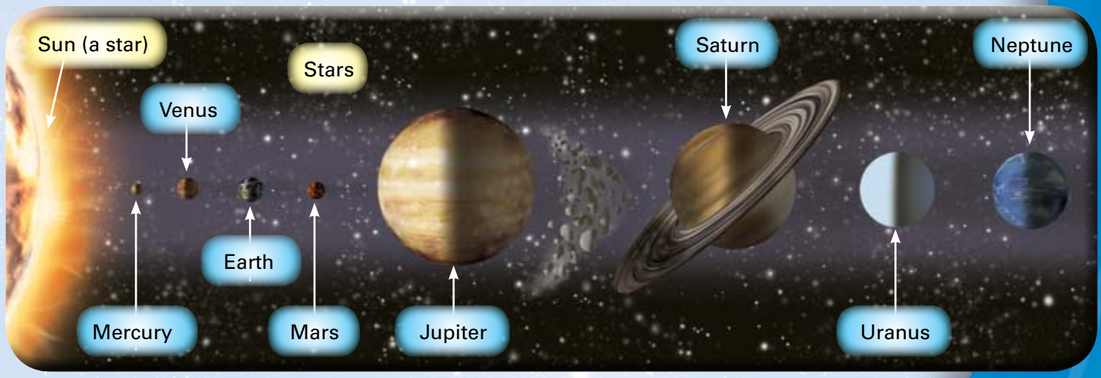
The stars

Stars are space objects that can be seen in the sky with the human eye. Stars are visible at night, but not during the day, apart from our Sun. Our Sun is a star, but it can only be seen during the day.

Star watching

Humans have always watched the stars. However, it was only after telescopes were invented 500 years ago that **astronomers** could finally see them more clearly. Now, because of space exploration and space science, we know much more about the stars. We know what they are made of, how they are born and die, and how they can affect Earth.

Sky watching can be done during the day or night, with or without a telescope. Just look up!



Stars can be found everywhere in space. The Sun is a star. This diagram shows the approximate relative sizes of the Sun and the planets. The distances between them are not to scale.

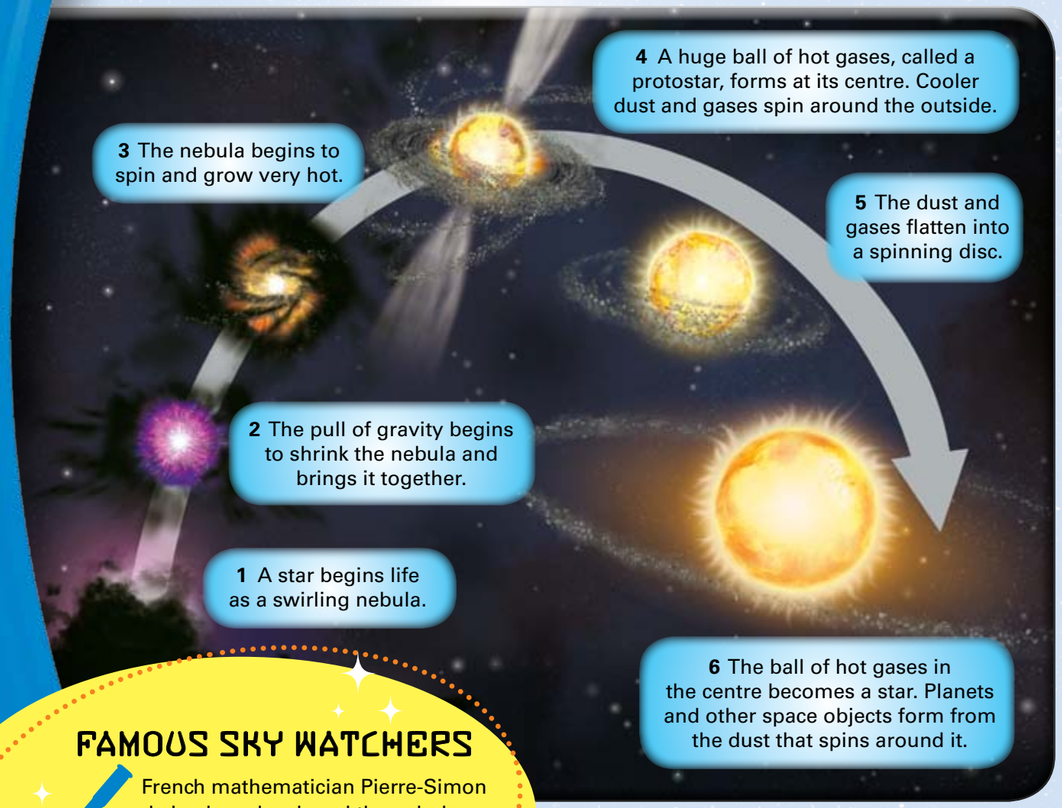
Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

What are stars?

Stars are formed from clouds of gas and dust floating in space. They are huge balls of gas that give out energy.

Stars are formed from gas and dust

Stars begin life as clouds of gas and dust called a **nebula**. Gravity then pulls the nebula together. The nebula begins to spin and forms a hot ball of gas, called a **protostar**. Over millions and even billions of years, this protostar slowly forms into a star.



It takes billions of years for stars like our Sun to form.

Famous sky watchers

French mathematician Pierre-Simon de Laplace developed the nebular theory in the late 1700s. He put forward the idea that our Sun and **solar system** began with a huge, shrinking, gas nebula.

What does it mean

gravity the force that attracts all objects towards each other

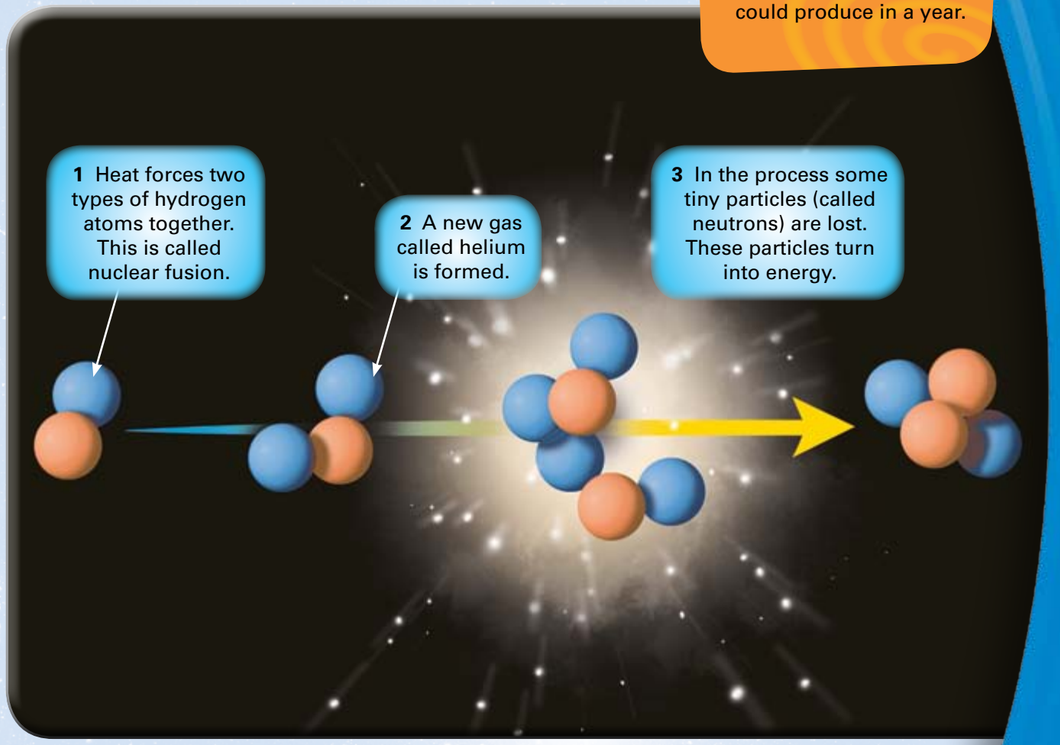
Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

Stars produce energy

Stars are huge balls of gas that give off energy in the form of heat and light. They do this by a process called **nuclear fusion**. Stars are made up mostly of **hydrogen**. In nuclear fusion, the particles of hydrogen join together and make another gas called **helium**. When this happens, energy is given off as heat and light.

Star fact

Stars give out huge amounts of energy. Our Sun is a medium-sized star. Every second the Sun gives out about the same amount of energy as 2 billion power plants could produce in a year.



The intense heat inside stars is what allows nuclear fusion to begin.

What does it mean

nuclear fusion a process that releases energy when two or more atoms (the smallest part of substance) join together to form a single new atom

Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

What do stars look like from Earth?

From Earth, stars look like tiny, twinkling lights in the night sky. However, our closest star, the Sun, looks very different. It is a giant ball of light in the daytime sky.

Stars look like thousands of points of light

At night we see thousands of stars in the night sky. They seem tiny because they are so far away. However, many are as big as our Sun.

V Alpha Centauri is a star seen in the night sky. It is billions of times further away from Earth than the Sun.

Star fact

The distance from Earth to stars is measured in light-years. This is the time it takes for light to travel in a year. The nearest star to our Sun is Alpha Centauri. It is 4.3 light-years away.

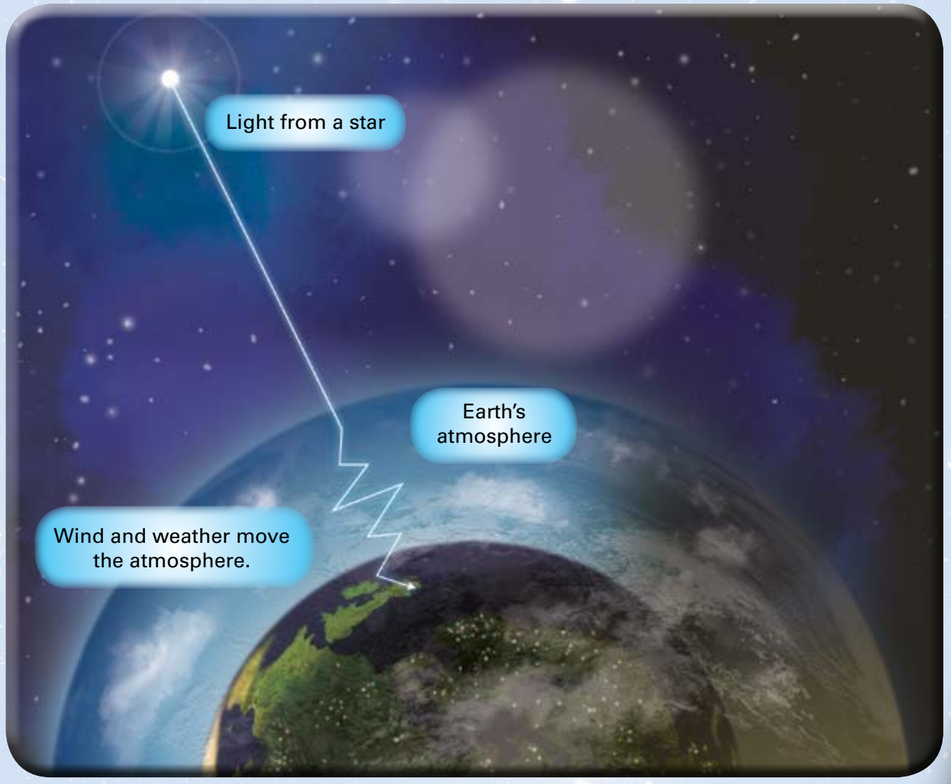
Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

Stars twinkle

Stars seem to twinkle in the night sky. This is because of the **atmosphere** around Earth. Stars are far away and their light is faint. When this light reaches Earth, it travels through the atmosphere, which is always moving. As the atmosphere moves, the light from stars is carried in different directions. This makes the stars seem to twinkle.

FAMOUS SKY WATCHERS

In 1838, German **astronomer** Friedrich Bessel became the first person to measure the distance between Earth and a star outside our **solar system**. Over his lifetime, he made a list of the positions of more than 50 000 stars.



Λ The light from stars bends as it passes through the atmosphere. This makes stars appear to twinkle.

Our Sun is a star

The star we can see most clearly from Earth is the Sun. All stars are like the Sun and give out heat and light. However, not all stars are as large as the Sun.

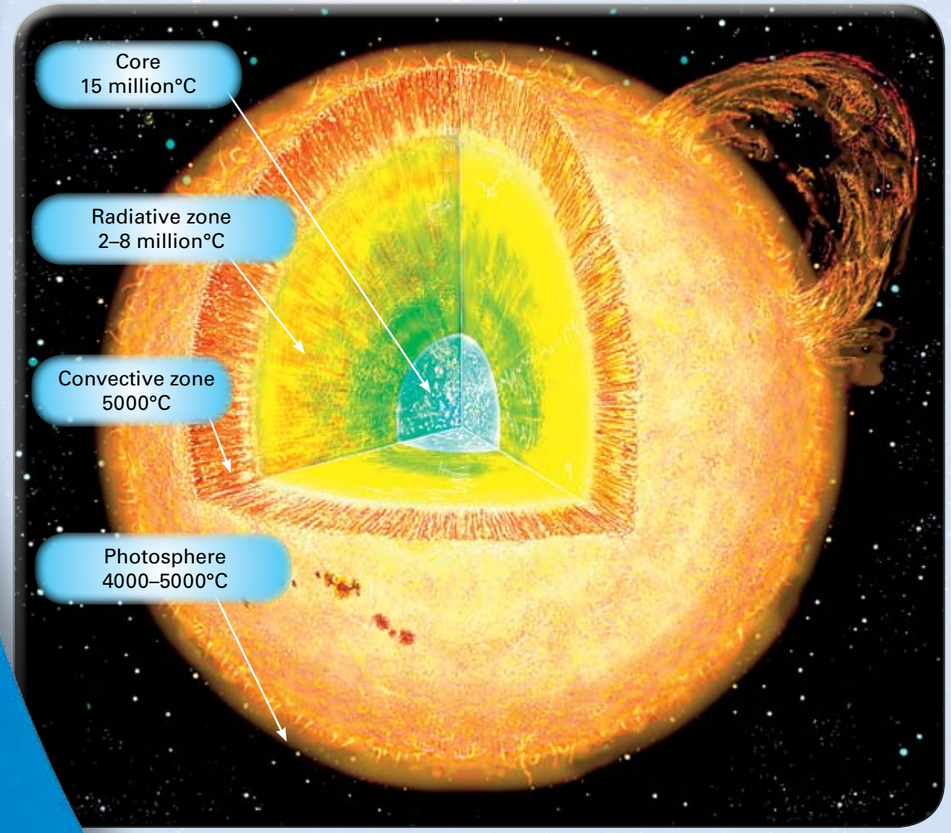
Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

What are stars made of?

Scientists have discovered that stars are made of gases. They have a core of hot, thick gas. This is surrounded by two layers of cooler gas and a surface, called a photosphere.

Stars have a core

The centre of a star is called the core. Although the core is small, it is heavy because it is full of tightly packed gases. The core is where energy is made by **nuclear fusion**.



This is the make-up of our Sun, which is a typical star.

Stars have two layers of gas around the core

Stars have two layers of cooler gases that lie between the core and the surface. They are called the radiative and convective zones. Energy made in the core travels very slowly through these zones to the star's surface.

Stars have a surface

The surface of a star is called the photosphere. This is where the star's energy flows out into **space**. The photosphere is also the beginning of a star's **atmosphere**. A lot of solar activity takes place in this zone.

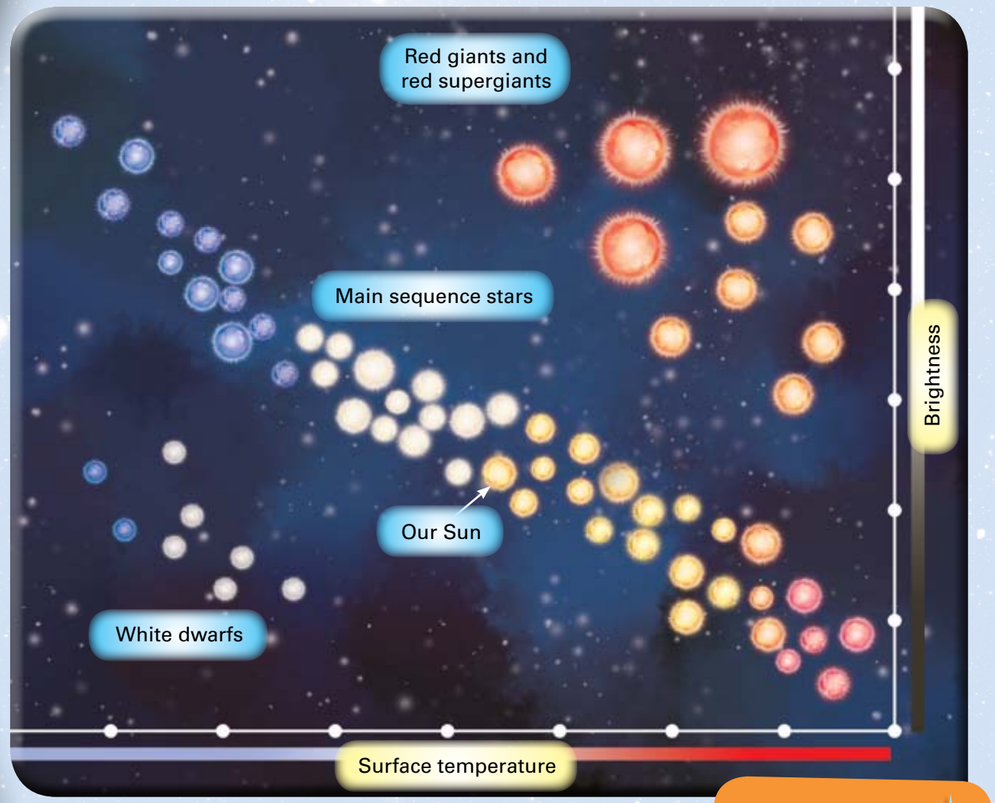
It can take hundreds of thousands of years for energy from the core to reach a star's surface. It is this energy we see shining from stars billions of kilometres away.

Star fact

Conditions on the surface of a star are violent. The heat from the centre of a star boils up on the photosphere. Stars send out huge spikes, called spicules, and loops of gas, called prominences. They can reach thousands of kilometres into space.

Are all stars the same?

Stars come in many colours, temperatures and sizes. **Astronomers** can find a star's temperature and age by looking at its light. Astronomers group stars according to their colour and **luminosity**. Most stars are main sequence stars, some sit in clusters and many are in pairs, known as binary stars.



A graph called a Hertzsprung–Russell diagram helps astronomers to place stars into particular groups. This is done by plotting a star's brightness against its temperature, as well as noting its colour.

WHAT DOES IT MEAN

luminosity the amount of energy given off by a star in the form of brightness

Star fact

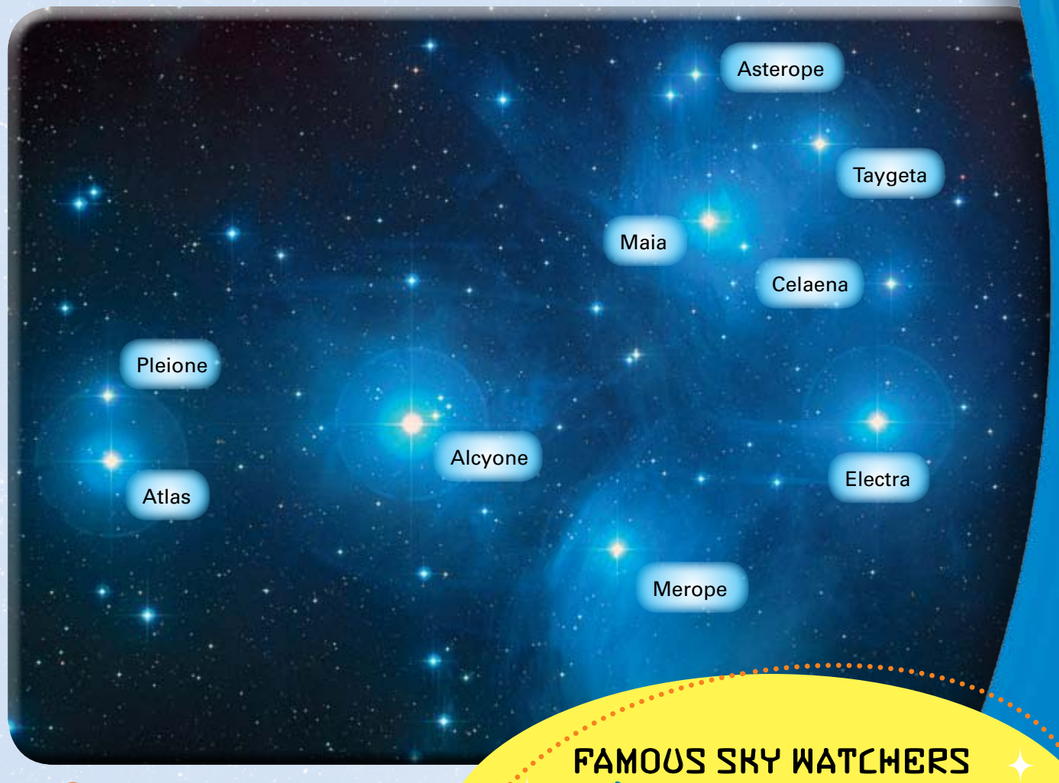
Small yellow or orange stars live for longer than large blue or white stars. This is because large stars burn their fuel about ten times more quickly than small stars.

Most stars are main sequence stars

Stars begin their lives as main sequence stars. They burn **hydrogen** in their cores, creating **nuclear fusion**. Some of these stars are average in size and some are huge. Main sequence stars are grouped by astronomers according to the colours they give out. Stars that look blue and white are the hottest. Yellow, orange and red stars are the coolest.

The hottest stars are blue and white

Blue and white stars are the hottest main sequence stars. Smaller bluish-white stars have a surface temperature from about 7500°C to 10 000°C. The surface of larger, brighter blue stars can be as hot as 60 000°C.



This group of blue-white stars is called the Pleiades. These stars are about 375 light-years from Earth.

FAMOUS SKY WATCHERS

Cecilia Payne-Gaposchkin was a British-American astronomer who studied the temperature of stars. In 1925 she became the first astronomer to suggest that hydrogen was the most common element within a star.

Cooler stars are yellow, orange and red

Yellow, orange and red stars have cooler surface temperatures than blue or white stars. The hottest of the yellow stars has a surface temperature of about 7500°C. Orange stars have a surface temperature of between 3500°C and 5000°C. Red stars are the coolest, at between 2000°C and 3500°C.

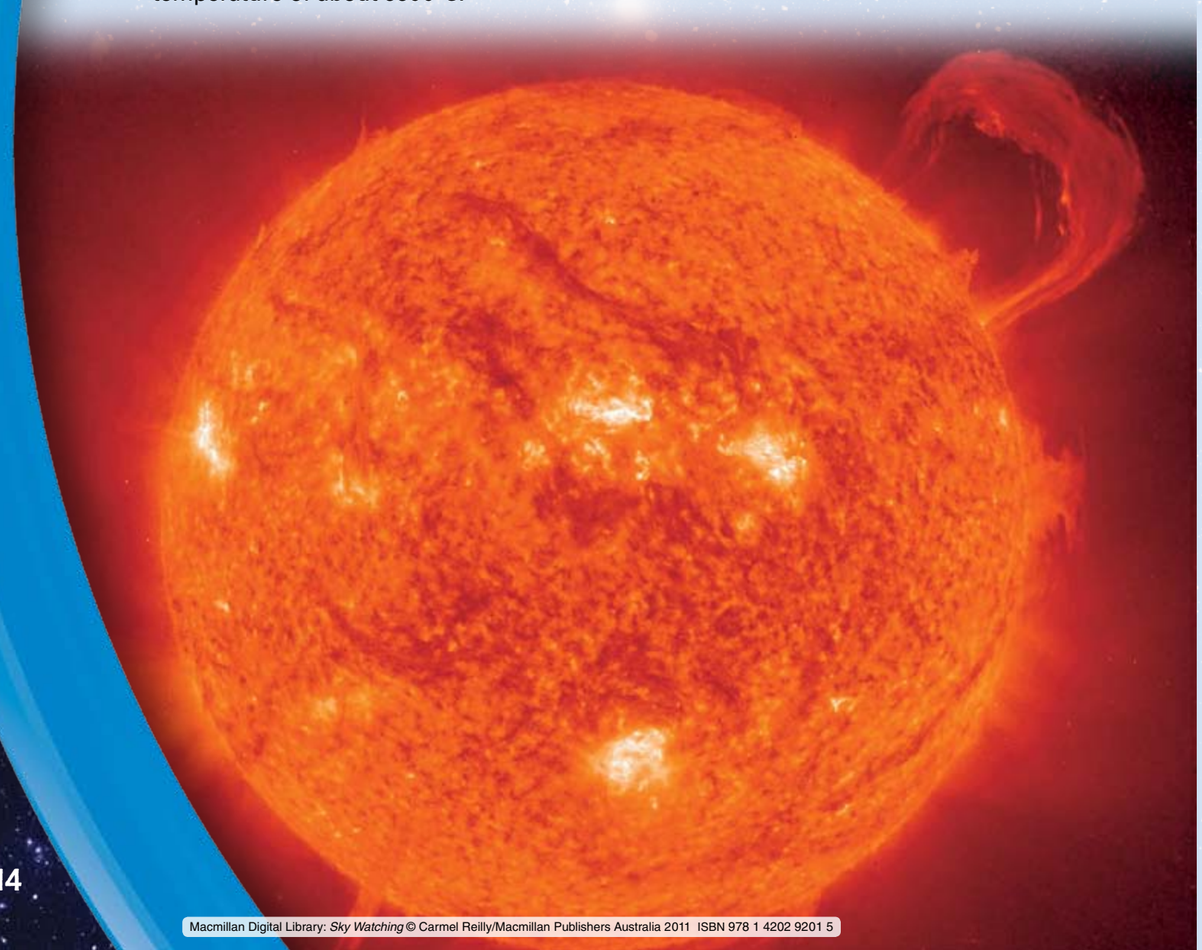
Some stars are part of a cluster

Astronomers have found many large groups, or clusters, of stars in our **galaxy** and beyond. They are known as global clusters and open star clusters.

Gravity brings global clusters together

Global clusters are large groups of stars that are held together by their own **gravity**. These groups of stars are very old and often have millions of members.

Our Sun is a yellow main sequence star. It has a surface temperature of about 5500°C.



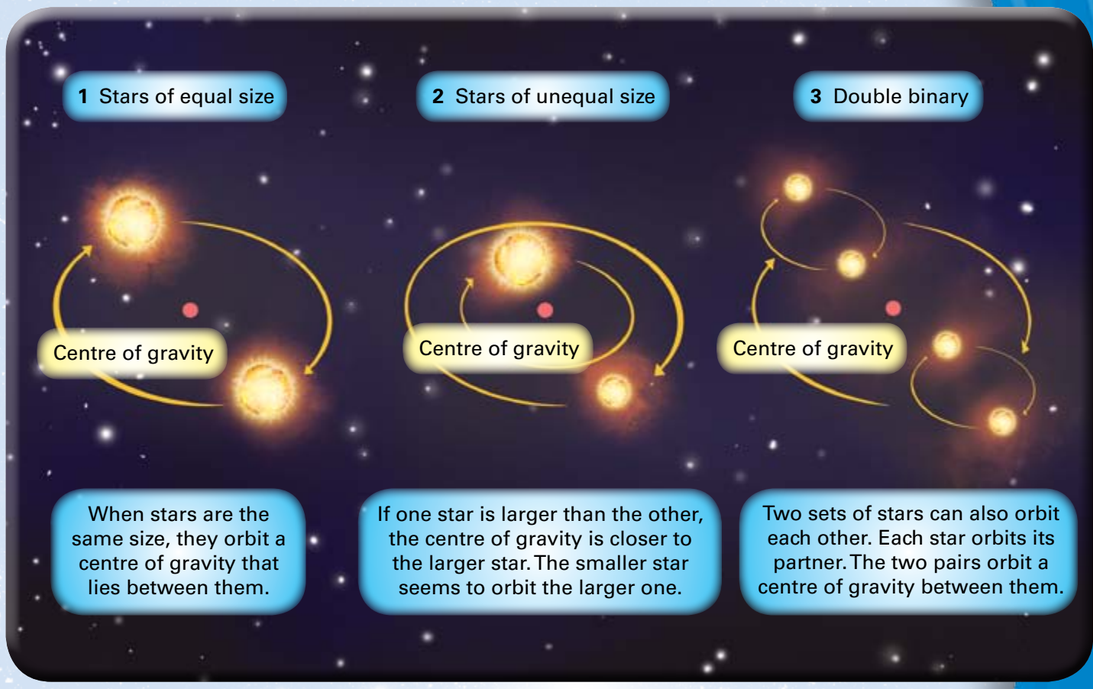
Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

Open star clusters are groups of young stars

Open star clusters are young stars that were formed from the same **nebula**. As these stars grow older, they move further apart.

Many stars are binary stars

Many stars are double stars, or binary stars. They are stars that **orbit** each other. Astronomers believe that more than half of the stars in the galaxy are binary stars.



There are different types of binary stars. They can change from one to another as they grow older. Some stars orbit so close that **gases** can pass between them.

FAMOUS SKY WATCHERS

The earliest known observation of a double, or binary star, was made by Giovanni Riccioli in 1650. Using a telescope, he was able to see that Mizar, which is a star in the **constellation** of Ursa Major, was actually not one but two stars.

Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

What are the stages in the life of a star?

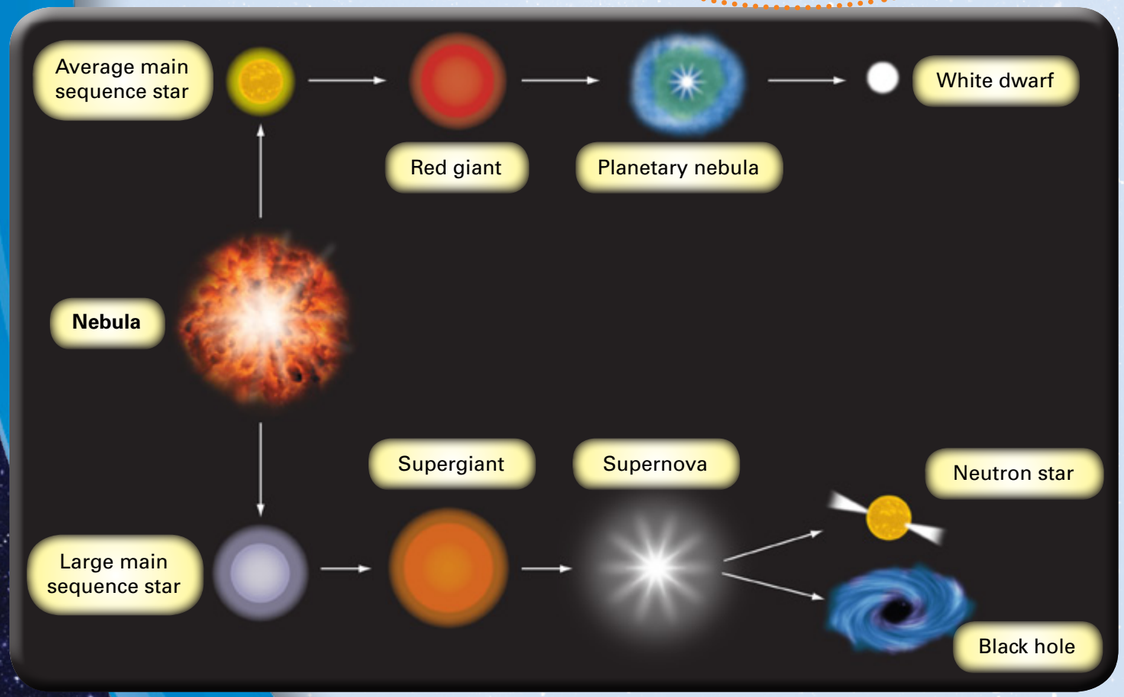
Stars spend most of their lives as main sequence stars. As smaller to medium-sized main sequence stars come to the end of their lives, they turn into red giants. When red giants start to die, they puff off their outer layers in the form of planetary nebula. What is left behind is called a white dwarf.

Larger main sequence stars become supergiants. Supergiants later become supernovas. They turn into neutron stars or black holes.

V Our Sun is an average main sequence star. In billions of years' time it will become a red giant and finally a white dwarf star.

Famous sky watchers

Since the late 19th century, much of what we know about stars has come from the work of mathematicians and physicists. The theories of physicists like Albert Einstein and Niels Bohr have helped scientists to work out many things about stars, including the stages of their lives and how long they might live.



Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

Stars begin as main sequence stars

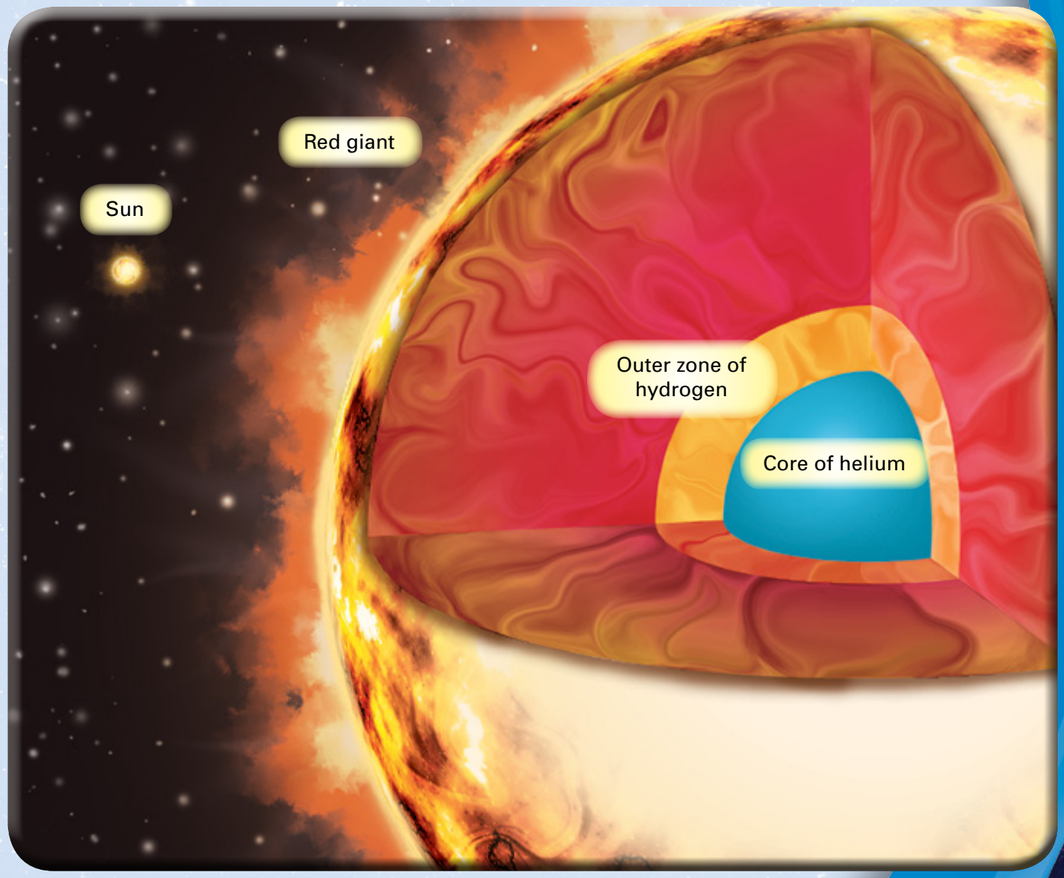
Main sequence stars change **hydrogen** into **helium** to create energy. Stars spend most of their lives in this form. When the hydrogen in a star starts to run out, the star must start using its helium. When this happens, the star begins to change.

Smaller main sequence stars turn into red giants

As a smaller main sequence star starts to burn its helium, it grows up to 100 times larger and brighter. A star at this stage is called a red giant. As the red giant runs out of helium, it begins to change again. Its core shrinks and its outer shell falls away.

Star fact

In about 5 billion years, our Sun will turn into a red giant star. It will become about 30 times larger than it is today. The inner planets, including Earth, will be destroyed by its heat.

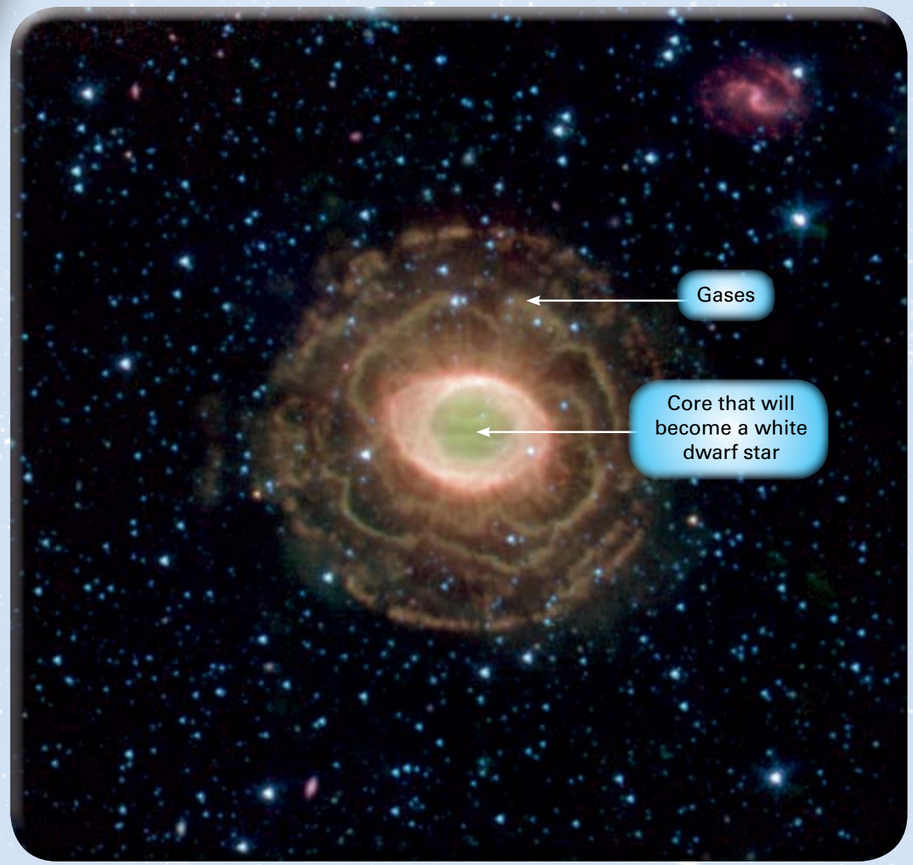


Stars only last as red giants for a few million years because they quickly burn up the helium in their core.

Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

Red giants shed their outer layer

When a red giant's shell falls away, **gas** is left behind. This gas is lit up by the hot core underneath. The glowing gas is called a **planetary nebula**. Planetary nebulas last for a few thousand years.



A planetary nebula is made of gas that is given off by a red giant star before it becomes a white dwarf. This one is called the Ring Nebula and it is located about 2000 light-years from Earth.

FAMOUS SKY WATCHERS

In 1781, the German-British **astronomer** William Herschel was the first to use the term 'planetary nebula'. This is what he called the clouds he could see forming in **space**. He did not realise they were collapsing stars, but thought they looked like huge planets.

Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

White dwarfs remain

When the planetary nebula blows away, the core of the star is left behind. This core is called a white dwarf star. A white dwarf is very hot and **dense**. Its temperatures can be as high as 100 000°C. Because white dwarf stars are small and faint, only those closest to Earth can be seen. A white dwarf cannot make its own energy, which is why it gradually cools down and fades away.

This white dwarf is called G29–38. It began as a star that was about three times as large as our Sun.

Star fact

The **matter** in white dwarf stars is very dense and heavy. If a white dwarf were the size of a mobile phone, it would be as heavy as a large elephant.

Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

Larger main sequence stars turn into supergiants

The largest main sequence stars become supergiants. They are much larger than red giant stars. Supergiants can be up to 1000 times bigger than our Sun. They are different colours depending on their heat. Supergiants end their lives in supernovas, which are huge, colourful explosions.

Star fact

Most red giant stars might last for 1 or 2 billion years. However, supergiant stars will only live for 30 million years at most.

Supergiants are different colours

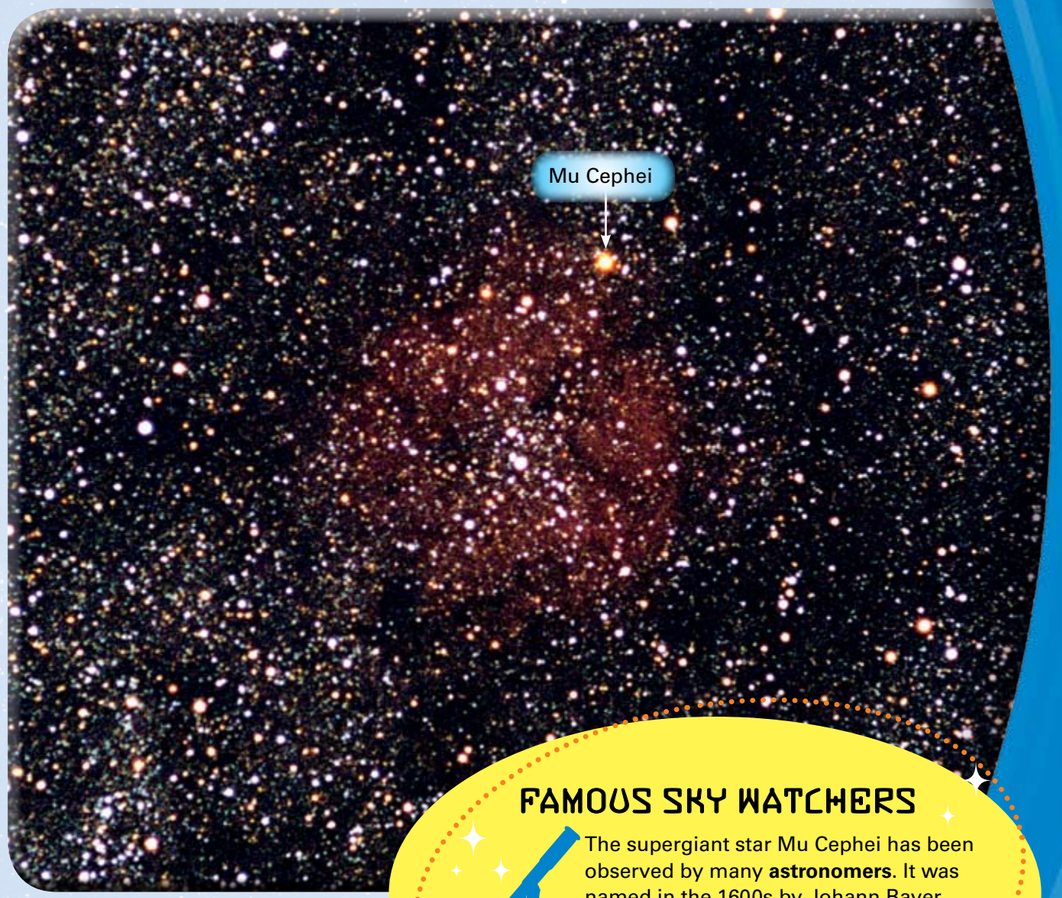
The colour of a supergiant depends on how hot it is. Like smaller stars, supergiants can be blue, white, yellow or red. Blue supergiants are the hottest. Red supergiants are the coolest.

If a supergiant was at the centre of our **solar system** instead of the Sun, it would reach as far as the planet Mars (the central orbit of the three pictured).

Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

Supergiants grow hotter and heavier

Supergiant stars are larger than other stars, which is why they burn up their **helium** more quickly. They grow extremely hot because of their size and because they have huge amounts of helium to burn. The intense heat inside them allows them to create heavy elements at their core, like iron. The core finally becomes so heavy that it collapses under its own weight. This sends a shockwave through the star that leads to an explosion called a supernova.



Mu Cephei is one of the largest and brightest supergiant stars that can be seen from Earth.

FAMOUS SKY WATCHERS

The supergiant star Mu Cephei has been observed by many **astronomers**. It was named in the 1600s by Johann Bayer. In 1783, William Herschel studied the star and made note of its red colour. In 1843, John Hind discovered that it is a variable star, which means that it changes in brightness.

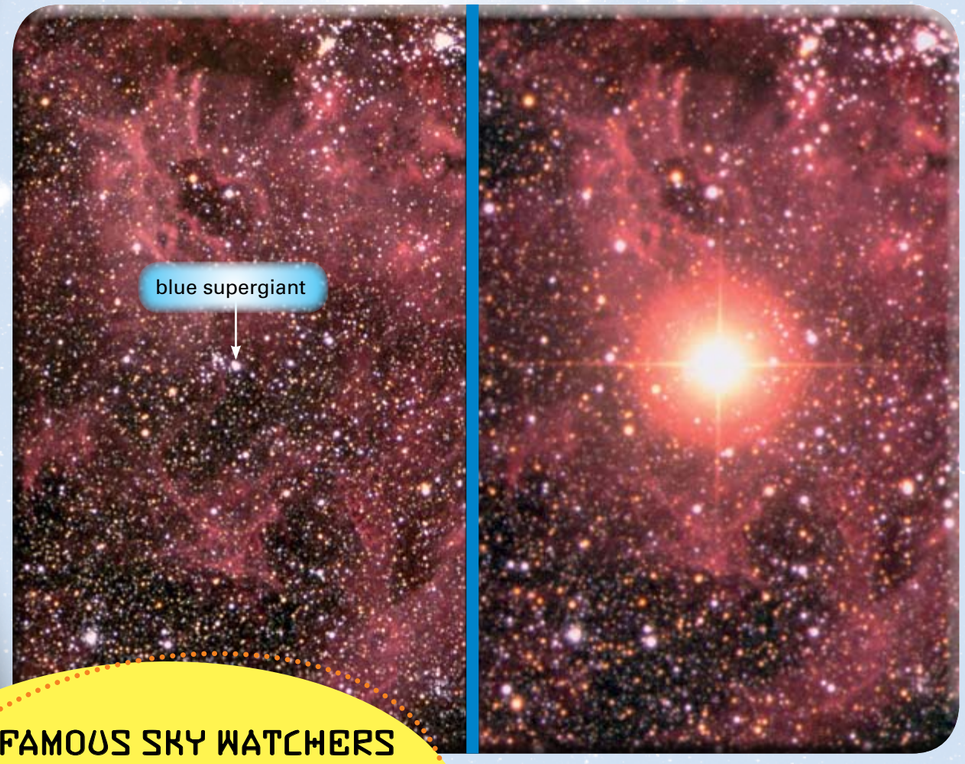
Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

Supergiants turn into supernovas

When a supergiant explodes, it becomes a supernova. A supernova is extremely hot and glows very brightly for a few days. As the supernova expands, its glow begins to fade. A supernova can last for a few weeks or for hundreds of years.

Supernova 1987A could be seen for 85 days

In February 1987, a supernova appeared from a blue supergiant star. It was in a **galaxy** close to the **Milky Way**, called the Large Magellanic Cloud. Over the next 85 days, the supernova became larger and brighter. It was so bright that it could be seen from Earth without a telescope.



The photo on the left shows the blue supergiant before it exploded. The photo on the right shows it after it exploded and became Supernova 1987A.

FAMOUS SKY WATCHERS

In 1572, Danish **astronomer** Tycho Brahe gave supernovas their name. Not knowing what he was really observing when he first saw one, he called it a *nova* (or new) star.

Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

Some supernovas turn into neutron stars

After a supernova fades, the core of the star is left behind. This is a tiny, **dense** object, called a neutron star. Neutron stars are not made of **gas**. They have iron crusts and liquid centres. They are so heavy that their **gravity** is thousands of times stronger than that of a main sequence star.

Star fact

A neutron star is about the size of a small city but weighs as much as the Sun. Some neutron stars are so heavy that they collapse under their own weight and become black holes.

Some supernovas turn into black holes

When a very large star dies, a black hole can be created. A black hole forms where a star's core used to be. Its gravity is so strong that nothing falling within its range can escape from it. A black hole looks black because its pull of gravity is so strong that even light cannot escape it.

Scientists believe this super-massive black hole is at the centre of the Milky Way. It is called Sagittarius A* and everything in the galaxy **orbits** around it.

Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

Do stars move?

Stars move in two ways. They **orbit** the **galaxy** as they travel through **space**. At the same time, each star **rotates** on its **axis**.

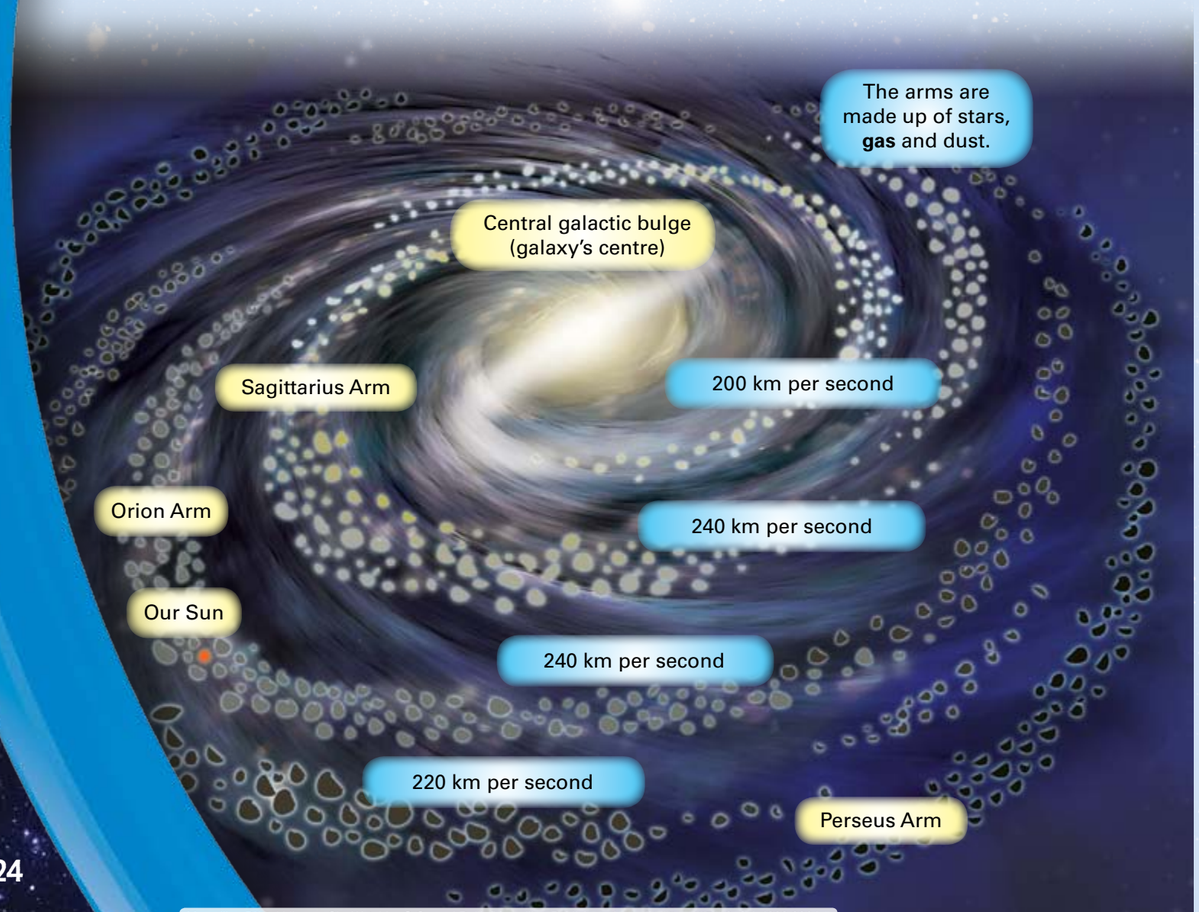
Stars orbit the centre of the galaxy

There are billions of stars in our galaxy, the **Milky Way**. These stars, along with all other objects in the galaxy, orbit a point of **gravity** at the galaxy's centre.

V Some parts of the galaxy move more quickly than others. The part of our galaxy where the Sun lies moves at around 250 kilometres per second.

Star fact

Stars in the Milky Way travel at between 200 and 250 kilometres per second. Even at these speeds it takes them hundreds of thousands of years to complete their orbit of the galaxy.

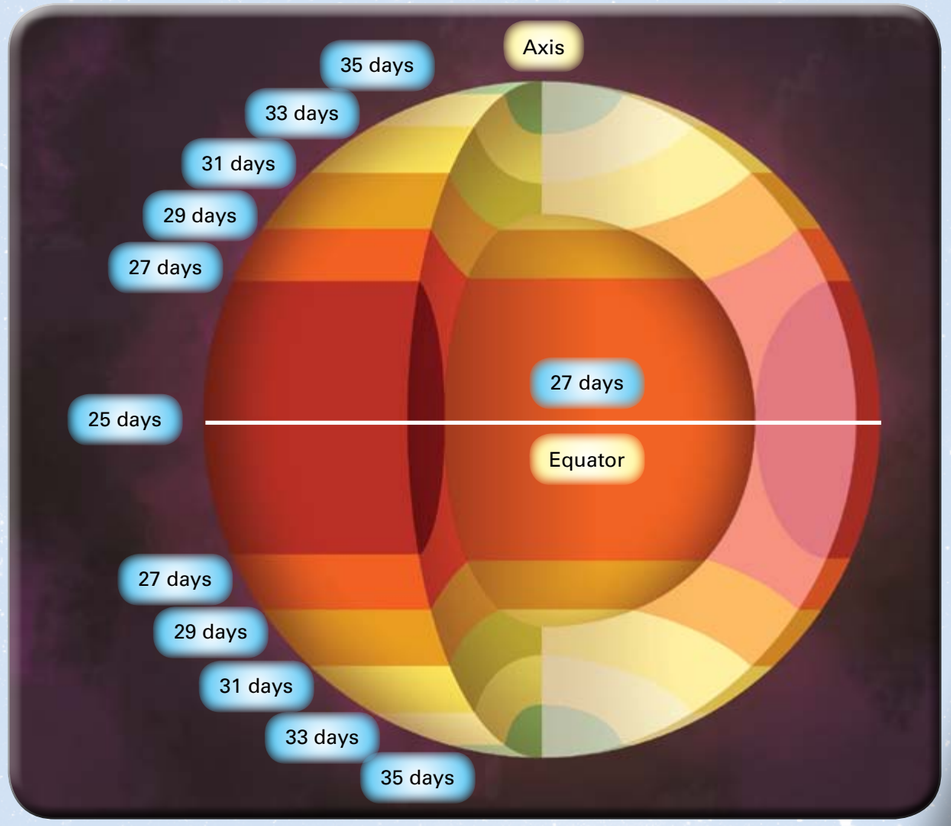


Stars rotate

Each of the stars in our galaxy rotates on its axis. It takes our Sun about one month to fully rotate. However, some stars can rotate in just a few hours. Some parts of the same star rotate at different speeds.

Some parts of a star rotate faster than others

Because a star is made of gas, some parts of it rotate more quickly than others. Gas at the top and bottom of a star takes longer to rotate than gas near the star's **equator**. The inner part of the Sun rotates at about the same speed as its equator.



Λ The Sun is like all stars. Different parts of it rotate at different speeds, so take different numbers of days to complete one rotation.

WHAT DOES IT MEAN

equator an imaginary line around the middle or widest part of a space object, such as a star or planet

How do stars affect Earth?

One star, the Sun, affects our planet a great deal. Without it, Earth would not exist. Other stars do not directly affect Earth, but they have always been an important part of life on our planet.

Stars such as the Sun provide the energy that allows life to exist.

Star fact

For thousands of years, travellers have used the stars to help them get around at night. From the position of the stars, you can find north, south, east and west.

Energy from the Sun helped create Earth

Earth was created from **gas** and dust **orbiting** the Sun billions of years ago. The Sun's energy helped to create life on Earth. Earth's **atmosphere** uses the heat of the Sun to keep the planet warm.

What if there were no stars?

If there was no Sun, life on Earth would not exist. There would not be any energy to provide heat and light. Without a Sun, Earth itself would never have formed. Without other stars, the night-time sky would be very dark and drab.

Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

The distant stars help us find our way

Although the distant stars have no direct effect on Earth, they have always played an important part in life on the planet. People have always been curious about the stars. In ancient times, people made maps of the stars. The stars are also used in **navigation**, especially at sea. Stars also feature in the music, stories, poetry and art of all cultures around the world.

What if there were no stars?

If there were no distant stars, there would be no change to the planet Earth itself. However, life on Earth would be a little different. The night skies would be dimmer, and would not have been used for navigation. Stars would also not feature in our art and storytelling.

Ancient **astronomers** saw patterns in the stars and gave them names. This is called the Sagittarius constellation.

Famous sky watchers

Ptolemy was a Greek astronomer. He made lists and maps of more than a thousand stars and 48 constellations.

Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

What is the future for stars?

Most of the stars in space are so large that almost nothing can destroy them. Stars are born, have long lives and die. However, even death is not really the end for stars.

Almost nothing can destroy stars

Most stars are so large that their **gravity** catches smaller space objects. These smaller objects usually go into **orbit** around the star. Some are pulled towards the star and are destroyed on impact. The only thing strong enough to destroy a star is a black hole.

Stars die

Most stars live long lives. As they use up their **hydrogen** fuel, they begin to die. Red giants become white dwarfs and fade away. Over millions of years, they become colder and crumble away. The same thing happens to neutron stars that are formed from supergiants.

All of the **matter** from stars breaks down and returns to space as **gas** and dust.

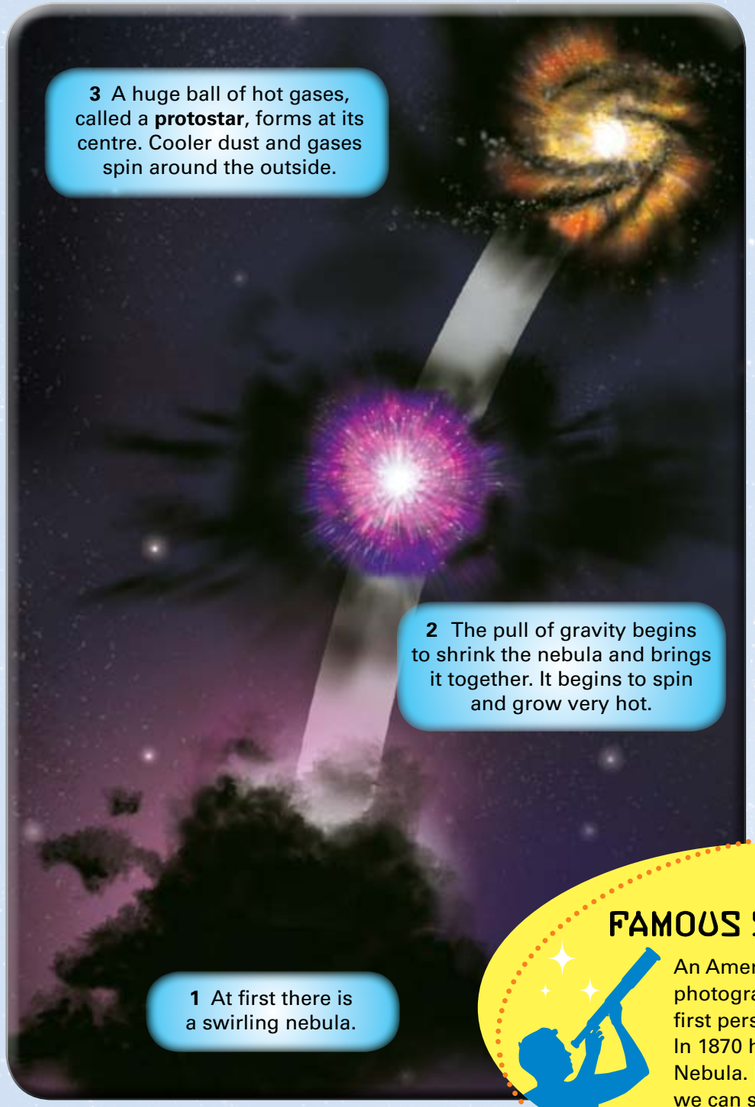
Star fact

Our Sun and **solar system** are made of matter left over from older stars and space objects. When our Sun dies, the matter left behind will go towards forming new stars.

Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

New stars form

Matter is given off by a dying star. It forms a cloud of gas and dust called a **nebula**. A nebula floats in space, gathering more matter. When it grows large, it starts to develop gravity. Gravity pulls the nebula together. As it is pulled together, the nebula starts to spin and a new star begins to form.



The gas and dust left over from stars is used to build new stars.

Famous sky watchers

An American **astronomer** and photographer Henry Draper was the first person to photograph a nebula. In 1870 he photographed the Orion Nebula. It is the brightest nebula we can see from Earth.

Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

What are the best ways to star watch?

Stars can be seen with the human eye on a clear night. If you use binoculars or a home telescope, you will be able to see more stars.

Star watching at home

To watch the stars at home, you will need a map of the night sky and binoculars or a telescope. Choose just one part of the sky that you can see from the map. Can you match the stars you see with your eyes with those on the map? Now look at the same part of the sky using binoculars. Can you see more stars?

Star watching online

Research more about the stars online. What can you learn about the stars you can see in your part of the world from these websites? The Your Sky website is a good place to start (see below).

Useful equipment for backyard astronomy

Equipment	What it is used for
 **Binoculars or a telescope**	A pair of binoculars or a telescope will help you see more stars.
 **Star map**	A star map will help you to identify the stars and **constellations** you can see.
 **Compass**	A compass will help you face the right direction when reading star map.
 **Torch with red cellophane over the light bulb**	Use a torch to help you read the star map. Putting red cellophane over the light bulb end of the torch will prevent its light from affecting your night vision.

Useful websites

Stars: www.enchantedlearning.com/subjects/astronomy/stars

Your Sky: http://fourmilab.ch/yoursky/

Stars: http://imagine.gsfc.nasa.gov/docs/science/know_l2/stars.html

Star Child: http://starchild.gsfc.nasa.gov/docs/StarChild/StarChild.html

Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5

Glossary

asteroids	small, rocky or metal space objects that orbit the Sun
astronomers	people who study stars, planets and other bodies in space
atmosphere	the layer of gases that surrounds a planet, moon or star
axis	an imaginary line through the middle of an object, from top to bottom
comets	small, rocky and icy space objects that have long, shining tails that appear when orbiting near the Sun
constellation	a group of stars that seem to form a pattern in the night sky
dense	heavy for its size
equator	an imaginary line around the middle or widest part of a round space object, such as a star or planet
galaxy	a large system of space objects, including stars, planets, gas and dust
gas	a substance that is not solid or liquid, and is usually invisible
gravity	the force that attracts all objects towards each other
helium	an air-like substance that is colourless and odourless; the second most common gas in the universe
hydrogen	an air-like substance that is colourless, odourless and can easily catch on fire; the most common gas in the universe
luminosity	the amount of energy given off by a star in the form of brightness
matter	a substance of a particular kind, such as gas and dust
meteoroids	small space objects that are made of rock and metal, ranging from metres wide to the size of a pea
Milky Way	the galaxy that is home to our solar system
navigation	the process of working out a position and plotting a route to follow
nebula	a cloud of gas and dust in space
nuclear fusion	a process that releases energy when two or more atoms (the smallest part of substance) join together to form a single new atom
orbit	to travel around another, larger space object
planetary nebula	an outer layer of gas that is thrown off by a star in its last stages of life
protostar	a young star, in the form of a cloud of gas and dust, that has not yet started to create energy in its core
rotates	turns or spins around a fixed point or an axis, like a spinning top
solar system	the Sun and everything that orbits around it, including planets and other space objects
space	the area in which the solar system, stars and galaxies exist, also known as the universe

INDEX

Macmillan Digital Library: *Sky Watching* © Carmel Reilly/Macmillan Publishers Australia 2011 ISBN 978 1 4202 9201 5