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BECOME A STARGAZER

Hello! My name is Felicity and I am a cat who loves to watch the stars. And you want to know more about what you can find up there in the night sky. So let me be your guide to the wonders of stargazing.

BE PREPARED

I bet you are desperate to head out and start stargazing. But if you really want to enjoy being out under the stars, there are a few things you need to know first.

WHAT YOU NEED

The best stargazing happens in winter because the Sun rises late and sets early, leaving lots of hours of darkness in between. The winter sky also has the brightest stars. But winter nights can be very, very cold. (And even summer nights can get chilly.) You will be spending a few hours outside, not moving much, so you need to make sure you can stay warm.

Here are the essential things to take with you.

WHERE TO GO

If you live in a place where there is a lot of light at night, it can make it hard to spot stars. So look for a dark site close to home, like:

- A park with trees that hide the streetlights.
- Playing fields on the edge of town.
- A hill you can climb to get above the lights.

If you've chosen well, the sky will look darker than the view outside your door. The stars will look brighter and more colourful, they'll twinkle a lot more, and there'll be more of them.

WHO TO GO WITH

And because you'll be away from the safety of lights and other people, you need to be careful. So...

- Always take an adult along.
- Carry a phone.
- Tell someone where you're going, how long you'll be and what time you'll be back.

Now you're ready to set off on an exciting adventure of discovery!

WHY LOOK AT THE SKY?

Why do people watch the sky at night? Astronomers watch the sky with big telescopes to explore our solar system, galaxy and universe. Cats like me or people like you also watch the sky to explore what we can see beyond our planet Earth. Sometimes I watch it because it is simply amazing to watch the universe spinning round.

PEOPLE HAVE ALWAYS WATCHED THE SKY

The position of the Moon and the appearance of certain stars or groups of stars (known as constellations) often happen at the same time every year. So since ancient times, farmers have watched the night sky to know when to plant and when to harvest their crops.

In the past, unusual sights in the sky, like a strangely coloured Moon, comets or shooting stars, were believed to signal something good or bad happening. In fact, ancient astronomers were expected to interpret whether such sightings were good or bad. (And they got into a lot of trouble if they were wrong!)

Just as stars appear at certain times, they also appear in the same place in the sky. So sailors have also always used the stars to help guide them, especially when they were sailing out of sight of land.

What's in a name?

Many of the names that the stars have date back thousands of years, mostly from ancient Greece. For the ancient Greeks, the sky was a place inhabited by gods, great heroes and fantastic creatures. So if the shape of a constellation made them think of one of these heavenly beings, they named it after it.

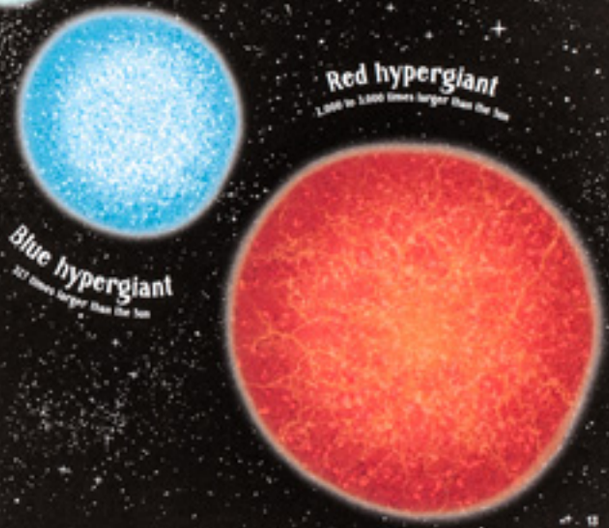
The names of all the stars and constellations might seem pretty strange to us now, but for the ancient Greeks all of these names would have been as familiar as the names of A-list celebrities are to us.

WHAT ARE STARS?

All stars are hot balls of gas. And did you know that the best time to see a star is on a sunny day?

This is because our Sun is, in fact, a star! The Sun is the closest star to Earth, which is why it looks bigger and brighter than all the lights in the sky. The Sun is enormous – if the Earth was the size of a pea, the Sun would be the size of a beach ball. It is also incredibly hot (about 15,000,000°C in the middle), which is why it blazes so brightly, and can burn you even though it's 140 million kilometres away.

During the day the Sun is bright white, but at sunset it turns orange, and then red. It is the atmosphere between the Sun and us that makes it appear to change colour.



STAR COLOURS

Although all stars are hot balls of gas, not all stars are exactly the same – some are bigger, some are smaller; some are hotter, some are cooler.

If you placed our Sun next to some of those other tiny dots in the sky, you would discover that our Sun is not the largest sun in the universe, or even our Galaxy.

In the night sky you will see red, orange, blue and white stars. This is because these stars have different temperatures. The hottest are the white and blue ones, and the coolest are orange and red. Think of a piece of metal heating up in a fire. It starts off a dull red, then changes to orange, then white, and eventually glows blue. Stars are just the same.

Here are some of the types of stars in the sky and their relative sizes.

Cygnus: the Swan

For many, Cygnus is THE summer constellation, because it is overhead as darkness falls. If it's really dark you can join up its fainter stars to form a swan with outstretched wings, flying down the Milky Way. On the tip of its tail is the bright star Deneb, which marks one corner of the Summer Triangle (the other two stars in the Triangle are in Aquila and Lyra). Deneb also features in Cygnus's Northern Cross asterism (shaped like a cross!), which is formed from the five principal stars of the constellation. On a clear, dark night you'll notice a bright patch on one side of the Swan's neck. This is the Cygnus Star Cloud, made of millions of distant stars. It's an incredible sight through binoculars.

Aquila: the Eagle

This constellation close to the Milky Way is named after the Greek god Jupiter's pet eagle. If you connect its fainter stars you can just about see its wings, but I think it looks more like a kite. Its brightest star is Altair, one of the three bright stars that make up the popular Summer Triangle asterism.

Lyra: the Lyre

This tiny, compact constellation represents the lyre (harp) played by the legendary Greek poet Orpheus. Old star charts often show it held by an eagle, but all you'll see is its brightest star, beautiful blue Vega, and a little box of fainter stars beneath it. Vega shines at another corner of the Summer Triangle.

Sagittarius: the Archer

Sagittarius is seen low in the south on summer nights, but only from somewhere dark with a low horizon. It is named after an archer – not a human archer, but Chiron the centaur, a mythical half human, half horse. Like many of the creatures in the night sky, poor Chiron was attacked by Hercules.

Sagittarius's nickname is the Teapot because part of it looks like a teapot tipped down to the right, ready to pour tea. There are several interesting fuzzy patches in Sagittarius, so sweep your binoculars around and you'll eventually come across a speckly star cluster or a misty nebula (a glowing cloud of gas and dust where stars are being born).

Hercules: the Hero

If the night sky has a superhero, it is Hercules, famous for having fought many of the other creatures in the starry sky. Yet his constellation is small and a little boring. The most interesting feature is the small but beautiful Great Hercules Cluster, or M13. This looks like a tiny faint star, but a telescope reveals that it is thousands of stars packed into a ball.

Ophiuchus: the Serpent Bearer

Ophiucus is the ancient Greek for 'Serpent Bearer', but I don't know anyone who sees a man holding a snake. It's more like a child's drawing of a house. Located off to one side of the Milky Way, the most interesting thing about Ophiucus is its brightest star, Rasalhague, on the roof peak of the house (or the eye of the serpent bearer).

Scorpius: the Scorpion

To the right of Sagittarius lies Scorpius, named after the scorpion that killed the hunter Orion in Greek mythology. It does look like a scorpion with a stinger on its tail, but north of the equator you'll only see its head and claws because the horizon gets in the way. It's still worth looking at because its brightest star, Antares, is such a beautiful orangey red.

THE AUTUMN SKY

Sky-watchers like me celebrate the start of autumn because the nights get longer and by midnight the sky is full of stars.

The main constellations of Ursa Major and Minor, Pegasus, Cassiopeia, Perseus, Andromeda and Triangulum are large and close together with bright stars that are easy to identify. Ursa Major and Minor contain two of the most famous features of the night sky: the Big Dipper and the Pole Star. Many of the other constellations have been named after the story of the great Greek hero Perseus who rode the winged horse Pegasus and saved the beautiful Andromeda from a horrible monster.

Autumn sky extras

- The Great Square of Pegasus asterism.
- With the naked eye, you can see a galaxy in the middle of Andromeda more than 2 million light years away!
- Use binoculars or a small telescope to find a pair of star clusters called the Double Cluster between Perseus and Cassiopeia. They look like two piles of sugar grains.

How the Moon was made

Did you know that the Moon hasn't always been there? Four-and-a-half billion years ago, the Earth was very different from now. Earth was still a 'baby' world, a battered-looking ball of hot rock being pelted by countless other rocks from space, or meteors.

Then a particularly large meteorite, perhaps up to half our planet's size, came along.

It struck the Earth and shattered into a million million pieces. It caused quite a big smash in the Earth's surface as well.

For many millions of years the shattered bits of the asteroid and the Earth floated around the Earth.

Over time all these bits came together into a kind of ring (like the rings that exist around the planet Saturn) orbiting the Earth.

And after many more millions of years, all the material in that ring began to form into a single body again. But this time one that maintained a steady orbit around the Earth.

Lunar eclipses

The Earth goes around the Sun, and the Moon goes around the Earth, so sometimes they all line up with the Earth in the middle. When this happens, the Earth casts a shadow on the Moon. This is called a 'lunar eclipse'. If the Moon goes totally dark it's a 'total lunar eclipse'; if only part of it goes dark it's a 'partial lunar eclipse'.

No two lunar eclipses are alike. Sometimes the Earth's shadow makes the Moon look like an orange Halloween pumpkin. Sometimes the Moon goes more the colour of red wine.

Solar eclipses

Occasionally, the Moon passes between the Sun and Earth, blocking out the Sun. This is a 'solar eclipse'. In these cases, the Moon looks like a black disc against the shining brightness of the Sun.

Because looking directly at the Sun for too long can damage your eyes, you need to wear special protective lenses to watch a solar eclipse. Astronomers put special material over their telescopes to protect their eyes.

A total eclipse of the Sun is very rare, but magical. The Moon moves slowly across the face of the Sun until it vanishes, leaving just a black hole with a silvery blue halo.

Then things get weird. Birds burst into song, thinking it is dusk; the air feels chilly, and bands of shadow ripple across the ground. After a few minutes, the Sun bursts into view again, and everything returns to normal.