A Series of Impossible Questions

By Isabel Thomas

Why Do I Dream?

THINK DIGITAL ACADEMY

Your brain might seem to switch off when you go to sleep, but it’s actually hard at work doing jobs that it can’t do when you’re awake.

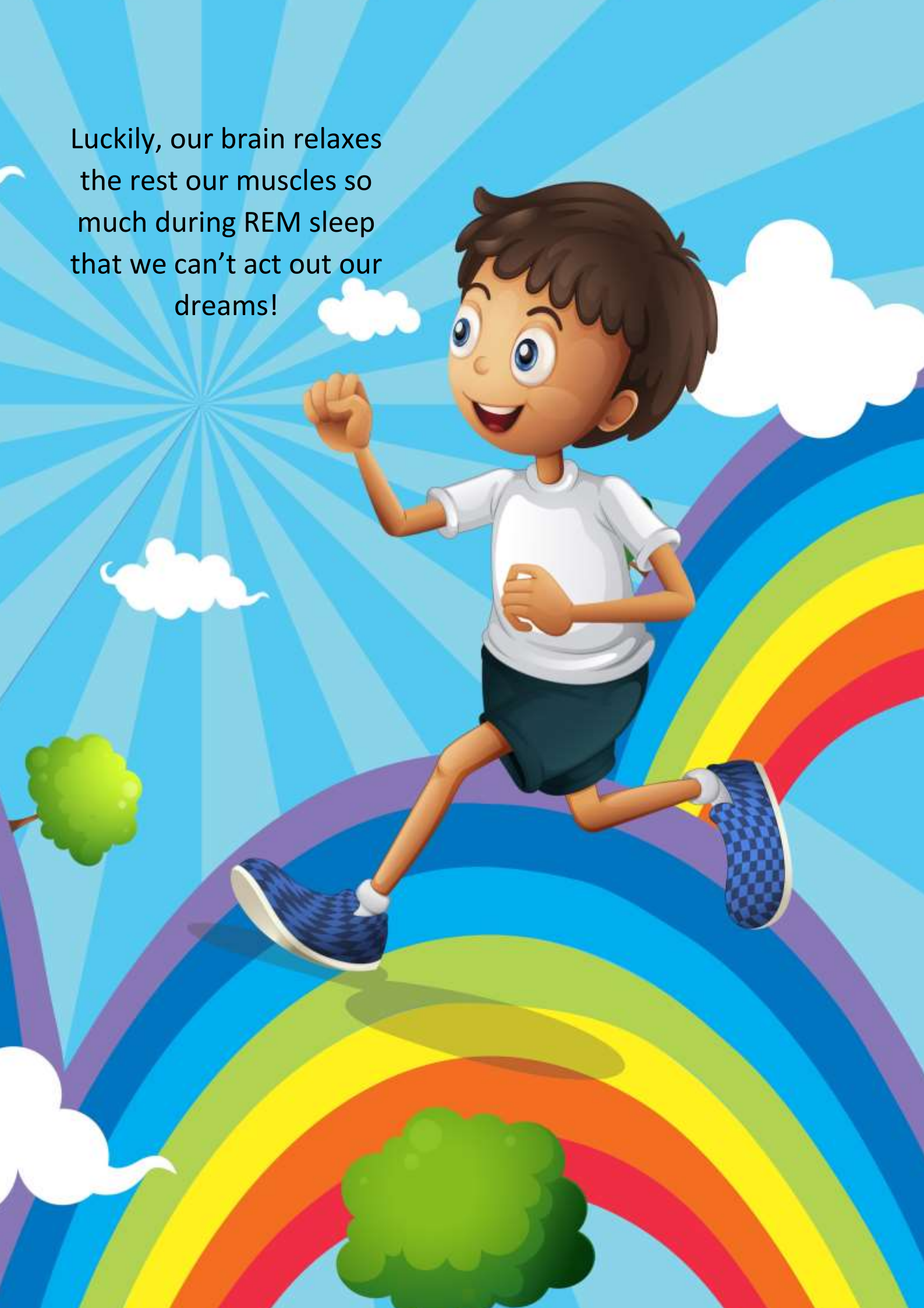
During the night, it cycles in and out of different stages of sleep, from light dozing to deep slumber.

During one stage of sleep called Rapid Eye Movement (REM) sleep, our brains can be even more active than when we’re awake. . You can tell if someone is in REM sleep because their eyes flicker behind their closed eyelids, and they breathe more quickly.

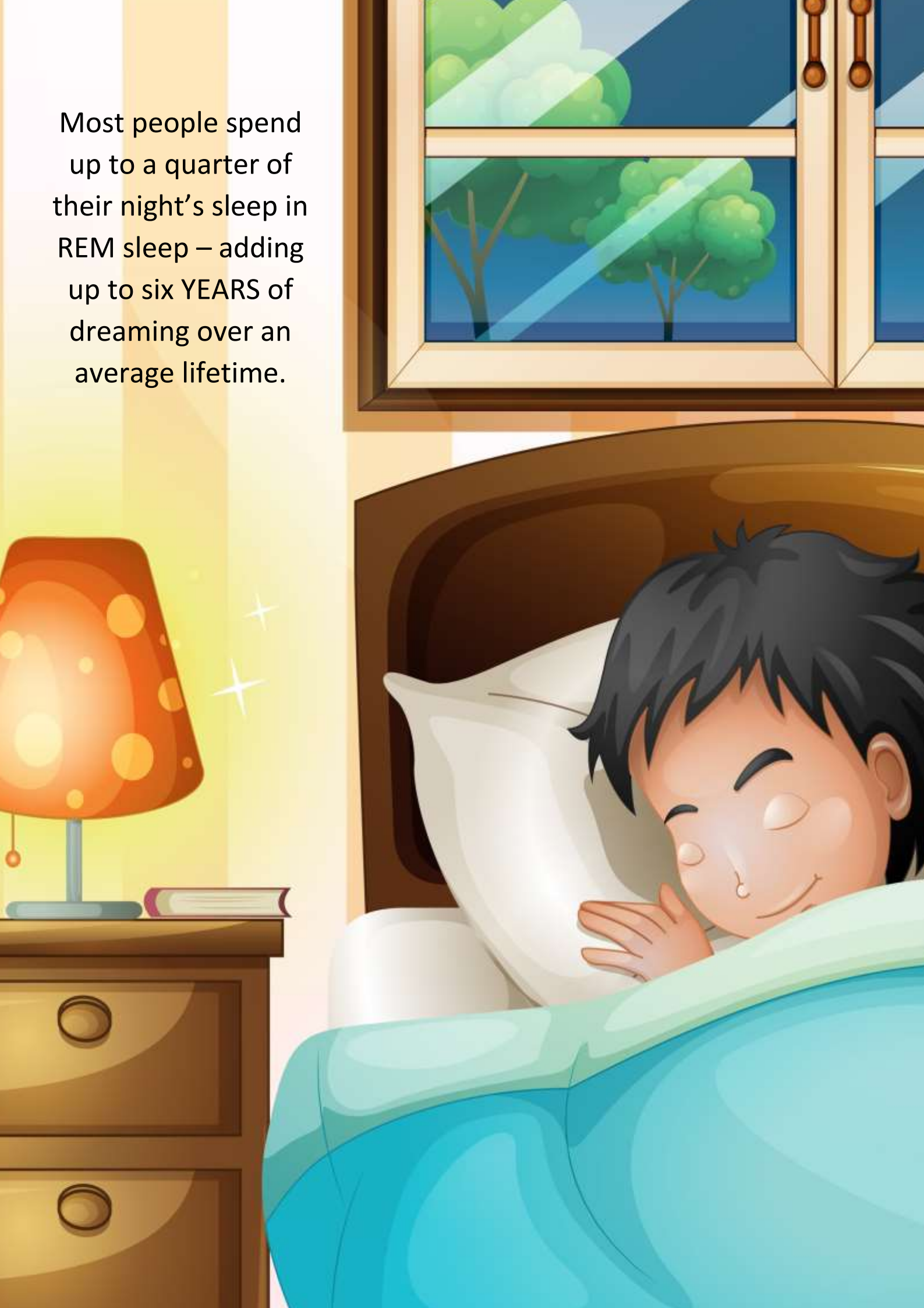
If someone wakes up during REM sleep, they can often remember the thoughts, pictures and even feelings that were dancing through their sleeping mind.

However, if they are woken up from other stages of sleep, this is far less likely. This tell us that most dreams (and nightmares) seem to happen during REM sleep.

Luckily, our brain relaxes the rest our muscles so much during REM sleep that we can't act out our dreams!

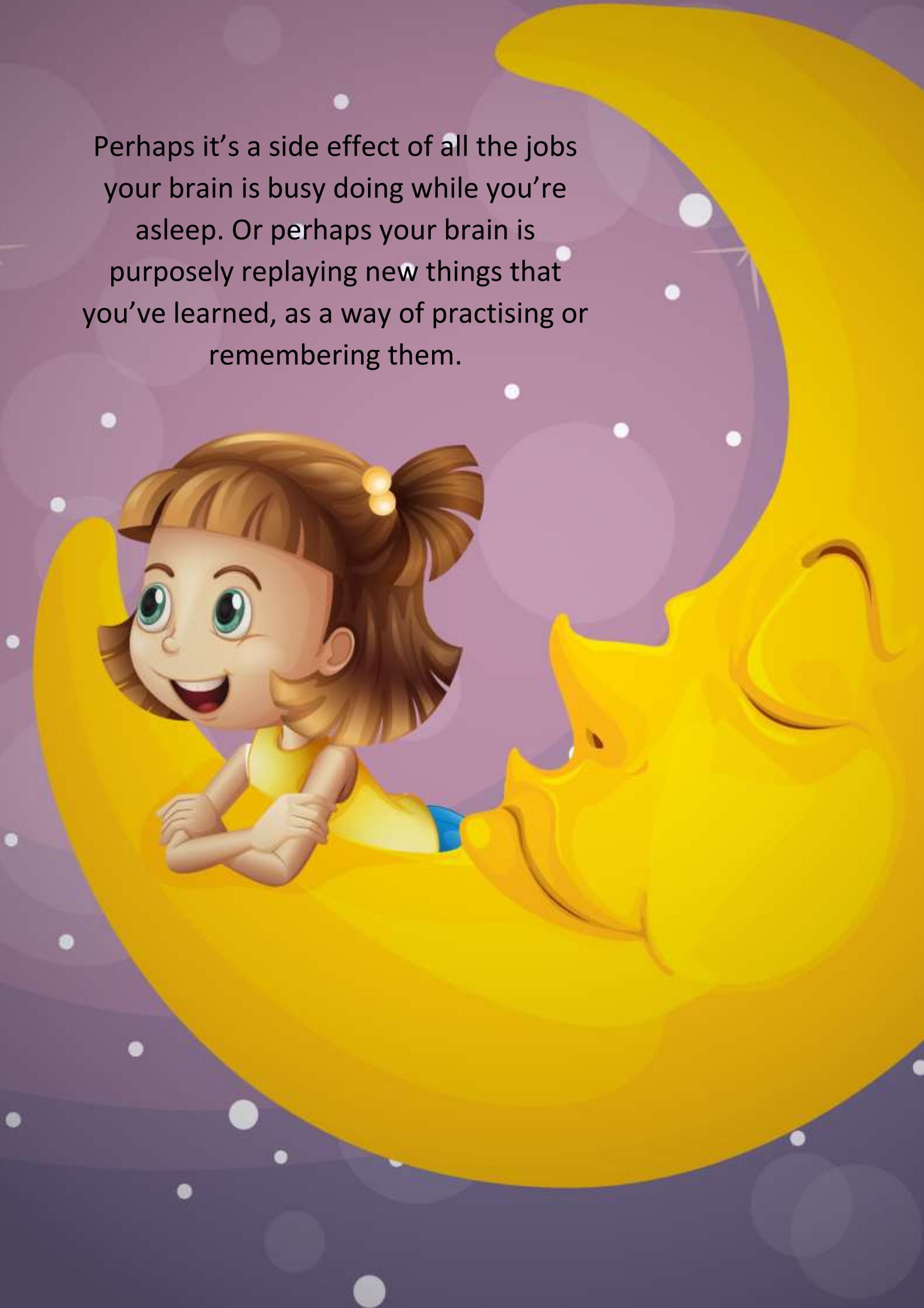


Most people spend up to a quarter of their night's sleep in REM sleep – adding up to six YEARS of dreaming over an average lifetime.



We know what dreams are. We know when they happen. But we don't yet know why our brains spend six years making up stories.

Perhaps it’s a side effect of all the jobs your brain is busy doing while you’re asleep. Or perhaps your brain is purposely replaying new things that you’ve learned, as a way of practising or remembering them.




How Do I Know
I'm Not
Dreaming Now?

You could ask someone to tickle you to see if you awake! But seriously, this is a question that scientists have tried to answer too.

Our brains use the information collected by our senses to ‘build’ a picture of the world inside our heads. Brains are so good at world building, that they keep on doing it even when we sleep.

This is why it’s possible for you to dream about people and places you’ve never seen before, and experiences you’ve never had – like having conversations with a pet.

Hundreds of years ago, a philosopher (someone who loves to ponder impossible questions) began to wonder – if dreams can seem real, how do we know that the 'real' world isn't just another dream? Are we actually dreaming all the time? Since then, all kinds of different people have tried to figure out the answer to this question.

One answer comes from a group of scientists who have nothing to do with brain OR sleep science! Physicists are scientists who study what the universe is made of.

Over the last 100 years, they have discovered that the universe is built form particles and rays that we simply can’t detect with our human senses. These hidden details of the universe are incredibly complicated, but also incredibly consistent.

Physicists all around the world get the same results whenever they measure them. This is a clue that reality is far too strange and complex for our brains to conjure up … even in our wildest dreams!

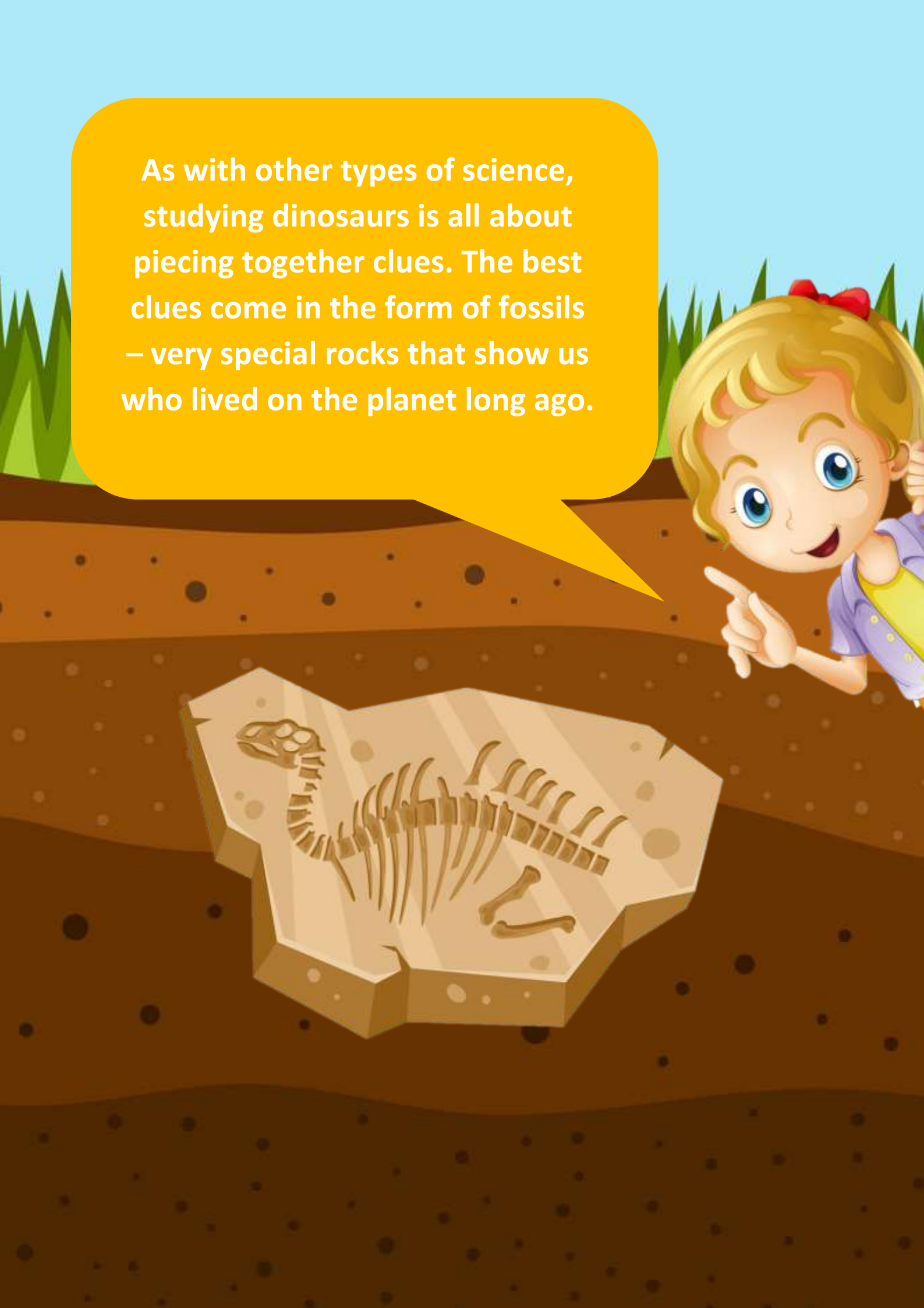
How Do We Know What Dinosaurs Were Like?


The last dinosaurs died nearly 66 million years ago, long before humans were around to meet, draw or photograph them

Yet we see dinosaurs everywhere – starring in movies, drawing crowds to museums, roaring at us from t-shirts and terrorising the toy cupboard.

Many people find it easier to describe a Tyrannnosaurus rex than a tapir, even though tapirs are still alive! How do palaeontologists (scientists who study dinosaurs) know so much about creatures that are so long extinct?

As with other types of science, studying dinosaurs is all about piecing together clues. The best clues come in the form of fossils – very special rocks that show us who lived on the planet long ago.

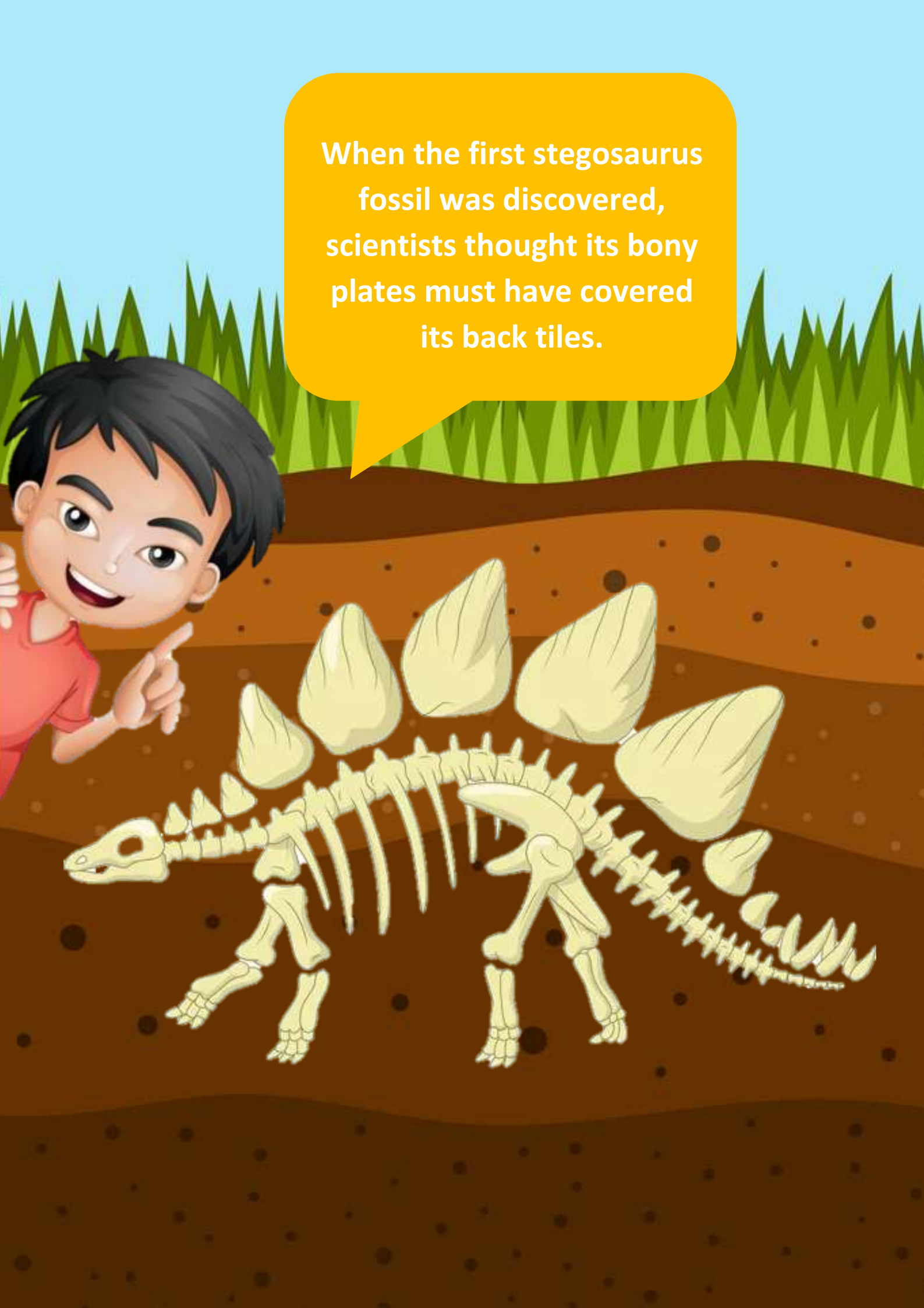



Fossils aren’t the actual bones, teeth or claws of a dinosaur, but they show us the shape of these body parts.


If palaeontologists find enough fossilised bones from a dinosaur, they can fit them together like a 3D jigsaw to work out what the animal's entire skeleton looked like.


Softer parts like muscles, skin and feather don’t usually form fossils, so palaeontologists use some extra clues to make a best guess. They compare fossils to today’s animals.

By doing this, they can even make a best guess about a dinosaur's colours, sounds and behaviour. However, even the most careful scientists sometimes get it REALLY WRONG!


When the first stegosaurus fossil was discovered, scientists thought its bony plates must have covered its back tiles.

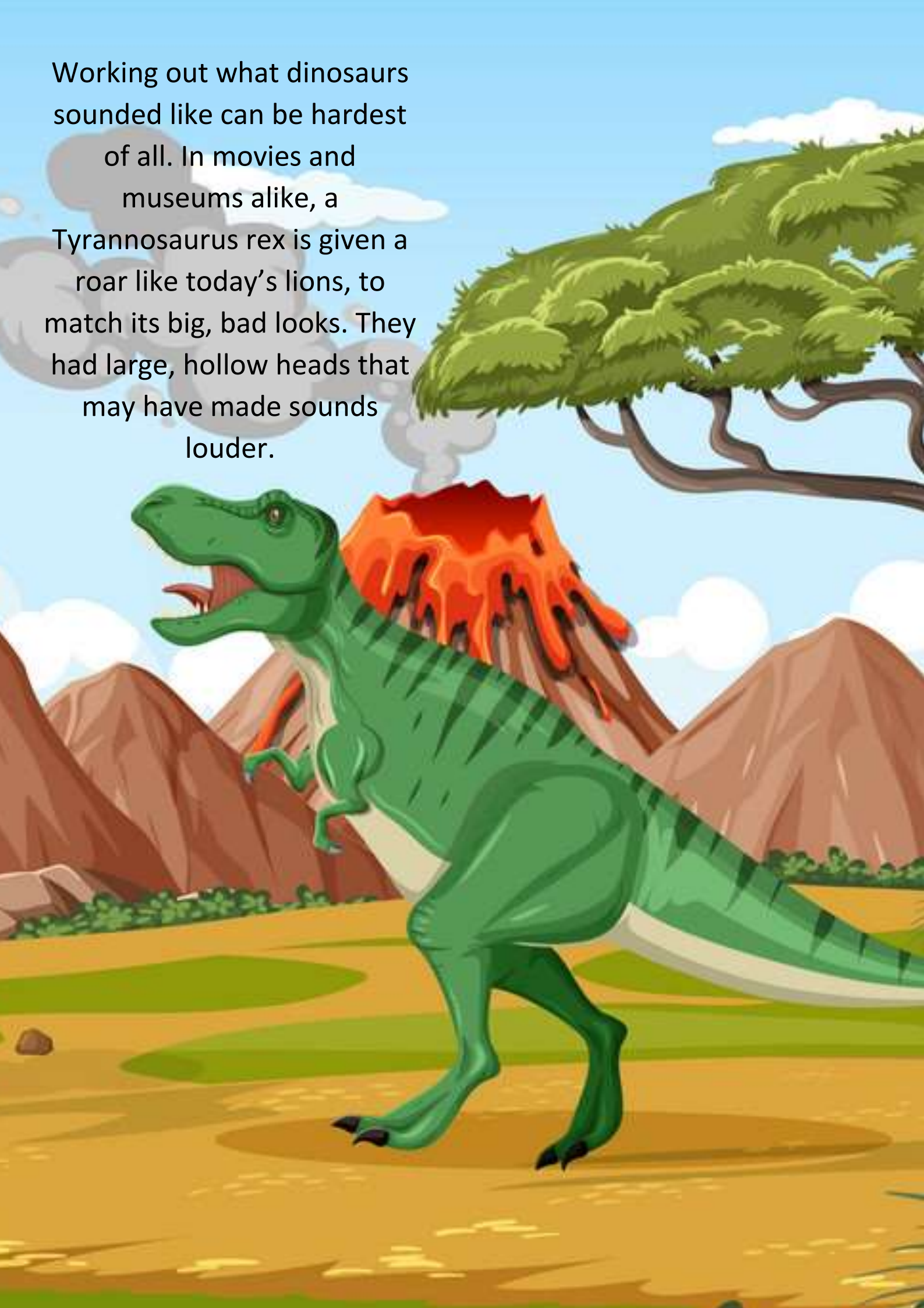

It took ten years to work out that the plates stood straight up.


Working out how dinosaurs
behaved is even harder.

Pachycephalosaurus skeletons have a bony dome on their heads that looks like a cycle helmet. At first scientists assumed these were used for head-butting competitions.


But as they learned more about his dinosaur's skeleton, they realised its neck would have been far too weak. The domes were probably just for showing off, like the tail of a peacock.

Working out what dinosaurs sounded like can be hardest of all. In movies and museums alike, a Tyrannosaurus rex is given a roar like today's lions, to match its big, bad looks. They had large, hollow heads that may have made sounds louder.



But some scientists think dinosaurs may have made much quieter sounds, more like today's reptiles.

As we find more fossils (and find new ways to study them) our ideas about dinosaurs are sure to change. We'll never be 100 percent sure of anything – except, perhaps, that we wouldn't want to bump into a Tyrannosaurus rex to test our theories in real life!


How Do We Know What Stars Are Made Of?

Twinkle, Twinkle Little Star

How I Wonder What You Are ...


When this famous song was written in 1806, most people had no idea what he twinkling pinpricks of light in the night sky were made of. After 200 years of wondering, at last we do have some answers.

No one has visited a star to check, but we don’t have to. Light from stars travels to us! Scientists began by looking more closely at light from out nearest star – the Sun.

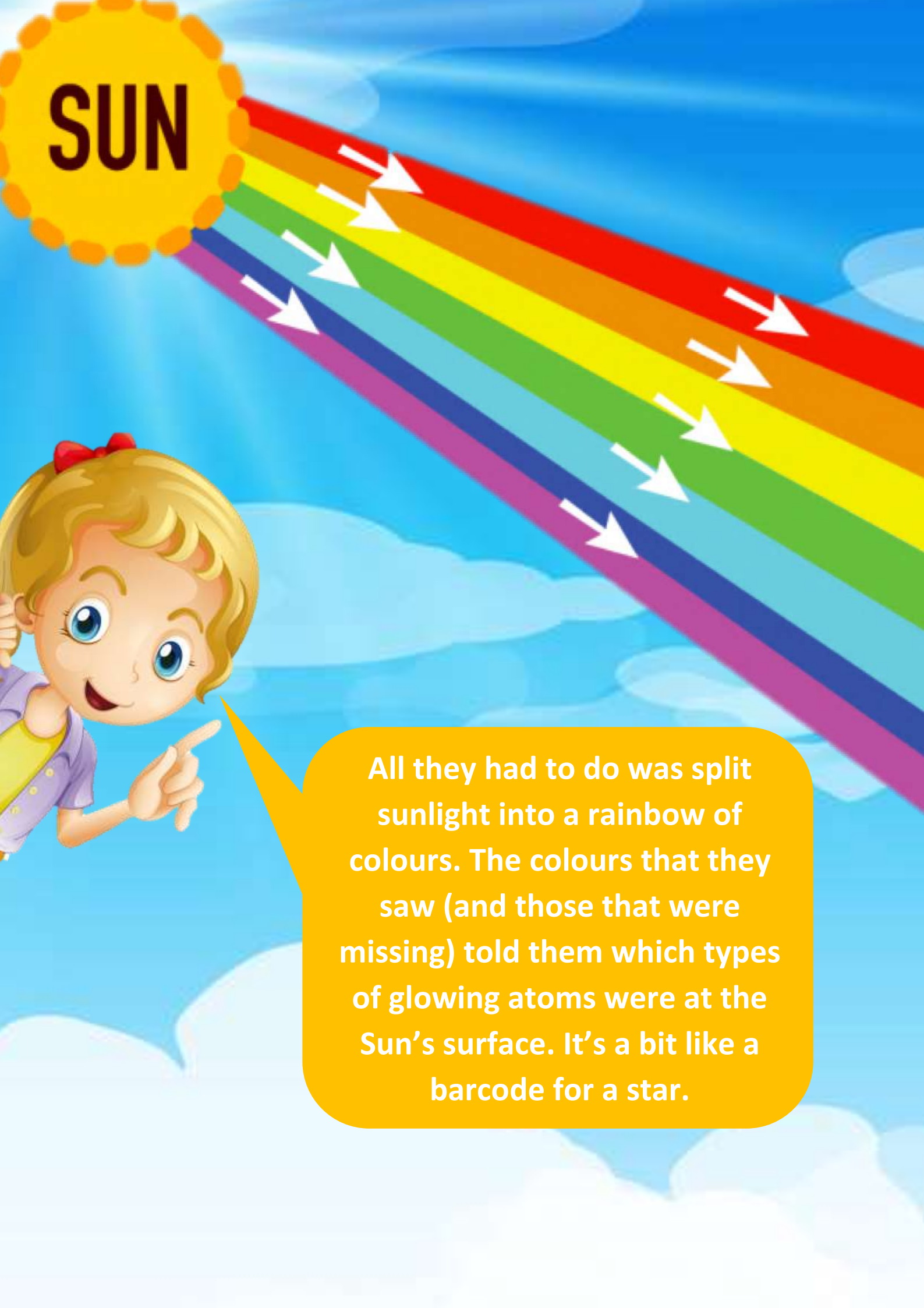
Sunlight appears to be colourless, or white, but it actually a mixture of many different colours of light.


You can see them by allowing sunlight to shine through a glass bowl of water onto a white piece of paper.


As the sunlight travels through the water, the colours are split up, so each one hits the paper in a slightly different place creating a rainbow effect.

The Sun and other stars glow because they are HOT. Hot things on Earth glow too, from fires to lightbulbs. Amazingly, every chemical on Earth – including all the different elements – releases and soaks up a very specific mixture of coloured light.

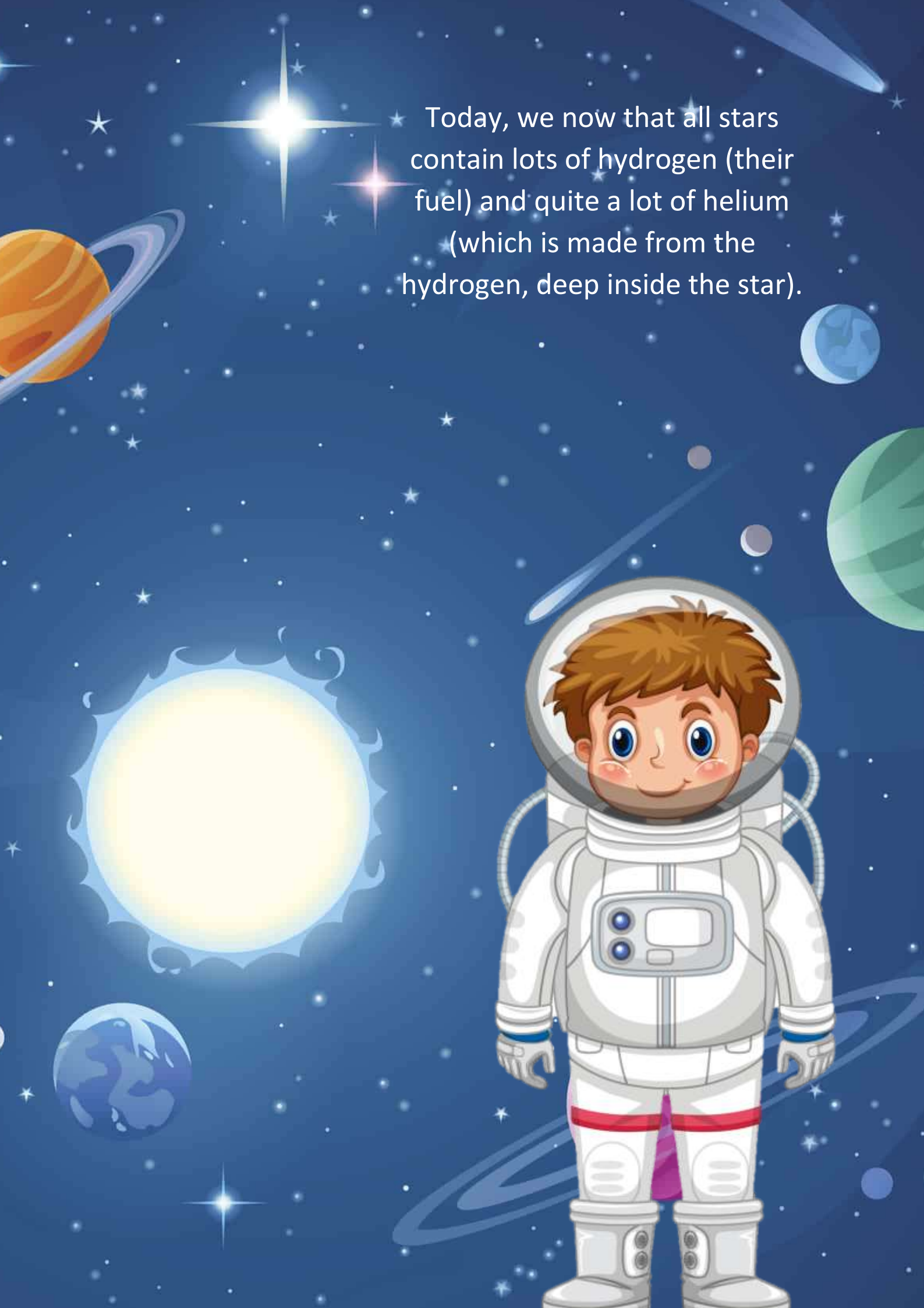
Discovering this gave scientists a way to find out what the Sun is made of. All they had to do was split sunlight into a rainbow of colours.


SUN
All they had to do was split sunlight into a rainbow of colours. The colours that they saw (and those that were missing) told them which types of glowing atoms were at the Sun's surface. It's a bit like a barcode for a star.

They showed that the Sun contains hydrogen, sodium and calcium – at least on it's surface, which is the part that gives out the light.

It took longer to find out what else was inside the Sun, and other stars. To test this, scientists first had to be able to detect other types of particles and rays.

Today, we now that all stars contain lots of hydrogen (their fuel) and quite a lot of helium (which is made from the hydrogen, deep inside the star).



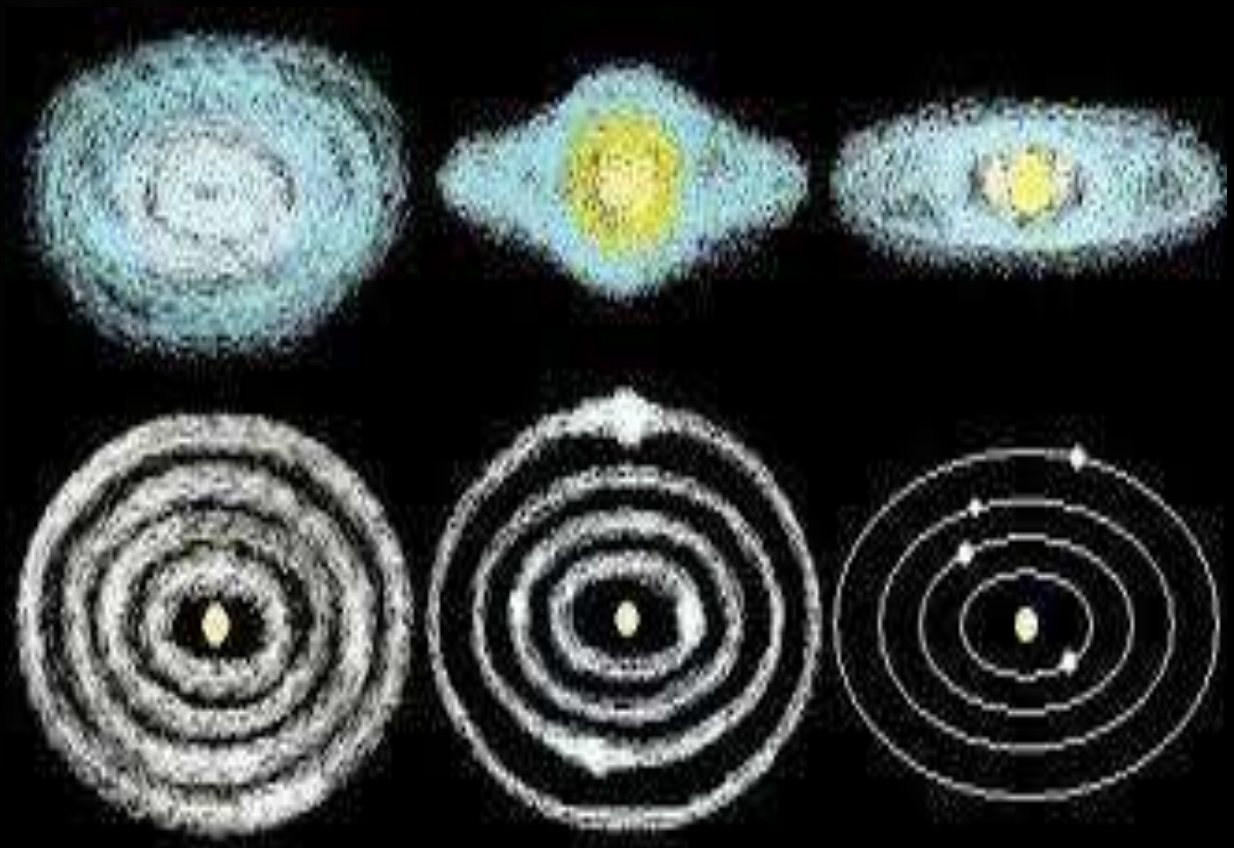
Analysing light and other types of radiation from stars has helped us work out that stars are the factories of the universe – the places where most elements we find on Earth are made of. This includes the elements that build your body – meaning that you are made of stardust!

If We Are Made of Stardust, How Did it Get to Earth?

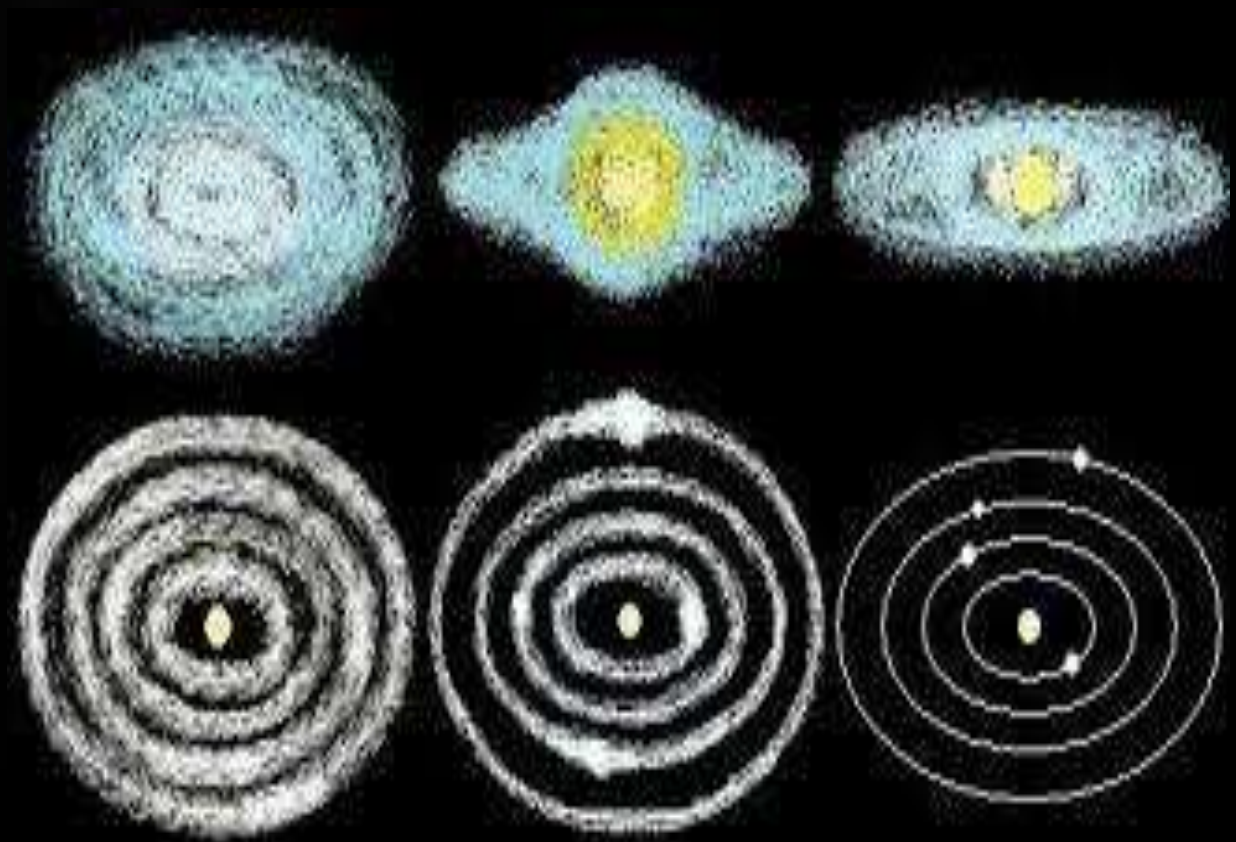

Most of the building blocks of our bodies were formed in stars. Not the stars you can see in the night sky, but in stars that burned out billions of years ago.

When a star uses up most of its hydrogen fuel, it begins to change. The atoms that formed in its fiery insides may be slowly swept out into space.

Or the star might explode and scatter its stardust across the galaxy. Many elements are ONLY formed as a star burns out. The universe is full of drifting stardust. It’s the raw material for new stars, planets, moons, comets and asteroids.



Our own universe and solar system were formed around 4.6 billion years ago, from the dust left behind by old stars. The elements in the dust gradually came together in different ways to make our planet, and the things on it.



At first, these were simple chemicals and minerals such as water, and rocks. Then more complicated chemicals began to form, and finally living things – including us. Some of the stardust that builds your body may be as ancient as the universe or the solay system itself.

Some landed on Earth more recently, in comets, asteroids and smaller meteorites.

Much of the stardust that formed Earth seems to have been made by medium-sized stars that expand and then shrink as they run out of fuel, instead of exploding. Elements formed inside this type of star include molybdenum – one of the important ingredients in our bodies.

Around 40,000 tonnes of stardust rain down on Earth every year, but most of it is far too small to see. On Earth, scientists have even found grains of stardust 3 billion years older than our own Sun that crashed to Earth inside a massive meteorite.

It’s impossible to say exactly when and where the building blocks of your body were made, but you can be sure that every atom has been on an epic adventure through space and time to get to you, reading this story, right now.

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