
Isabel Thomas
HOW HEAVY IS EARTH?
THE BEDTIME BOOK OF IMPOSSIBLE QUESTIONS
illustrated by Aaron Cushley
CAN I SWIM IN ICE CREAM?
WHY DON'T WE LIVE FOREVER?
Real life adventures in curiosity
BLOOMSBURY

THE BEDTIME BOOK OF IMPOSSIBLE QUESTIONS





For everyone who doesn't take
'I don't know' for an answer – I.T.

To Fionn, if ever I don't know an
answer, please refer to this. – A.C.

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Shall I tell you a secret?

Science isn't about knowing lots of facts or getting the right answer all the time. It's not even about wearing a lab coat.

Science is about **asking questions**.

They can be sensible questions.

They can be silly questions.

Best of all, they can be

IMPOSSIBLE QUESTIONS!



The history of science is paved with **impossible questions**.

Each one is a stepping stone on the path to understanding the universe and everything in it.

But this path is not yet finished …

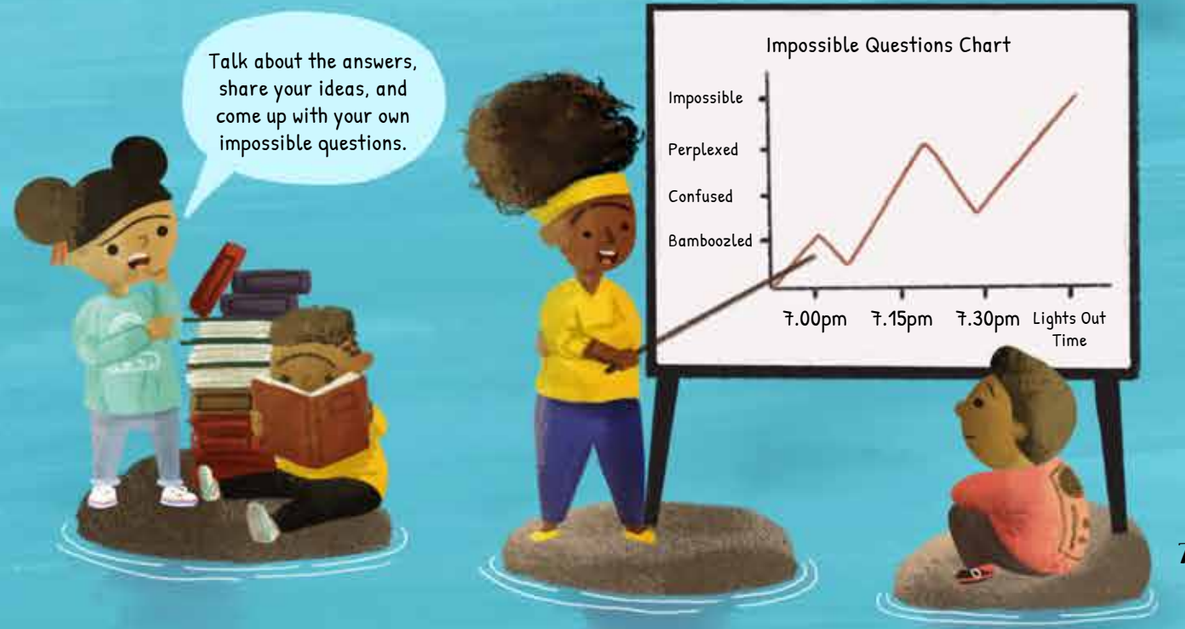
Every answer leads to **new** impossible questions … and new stepping stones!

This book explores some of the impossible questions that are still **bamboozling** biologists, confusing chemists and making physicists feel **perplexed**.

None of the answers are 100 per cent correct – as any scientist will tell you, there is **no such thing as a perfect answer**!

They are just our best answers based on the **evidence** available right now. As scientists continue to **experiment**, **explore**, **collect** and **discover** more information, the answers will probably change.

The impossible questions in this book will help you explore life, the universe and everything in it – and the best time to do this (as every scientist knows) is at bedtime.



Why does rain smell rainy?

Next time it rains, go outside and take a **big sniff**. After dry days, a rain shower can make the air smell clean, sweet, fresh and earthy – rather like a walk in the woods. Lots of people like this smell and it even has a name – petrichor (say peh-truh-kaw). It's not the smell of raindrops themselves, because pure water doesn't have a smell. It actually comes from microbes that live in the soil. Every teaspoon of soil contains **up to a billion** of these tiny living things. They do a very important job – feeding on dead leaves and other things that were once alive, recycling the minerals that new life needs to grow. As they go about their lives, microbes make an oil called geosmin. When **raindrops splatter** on dusty, dry soil, tiny particles of geosmin are thrown up into the air and get carried away on the wind … **eventually reaching our noses**! Nobody knows exactly why the microbes make geosmin. One idea is that they might be trying to hitch a lift to new homes on the animals and insects that come to snuffle the lovely smell. If you like the smell, you don't have to wait for a rainy day – beetroot plants make geosmin too!



Could I touch a rainbow?

Sadly, a rainbow is not a solid object that we can touch. It's more like millions of moving mirrors made of water. You see a rainbow when **sunlight bounces off raindrops** towards your eyes. For this to happen, you have to be standing with your back to the sun, looking towards a rainy part of the sky (or even water being sprayed by a hose!). Sunlight is a mixture of different colours. As sunlight travels into a raindrop, it slows down a little and changes direction. This splits the sunlight up into its different colours. The coloured light then **bounces off** the back of the raindrop, as if it were a mirror. If you happen to be looking that way, the light reaches your eyes. Each raindrop reflects a single colour towards your eyes, but when you look towards a rainy sky you are seeing **millions of drops at once**. Together, they reflect red, orange, yellow, green, blue, indigo and violet light towards your eyes. Your brain tries to make sense of this trick of the light. It tells you that you're looking at a flat, colourful circle somewhere in the distance. Up close, we can't see the colours reflected by raindrops. So you can't touch a rainbow that you can see. But you could go and stand in the rain that's making a rainbow for somebody else.



What is the world's worst smell?

Your nose can sniff out at least a trillion different smells, but it's your brain's job to tell you if they're nasty or nice. Everyone's brain is different, but there are some odours that most people agree are DISGUSTING. One of these is skatole, the substance that gives **poo** its smell. Although it's revolting in big doses, a little skatole can smell lovely and sweet – it gives flowers such as jasmine their scent and is even used to flavour vanilla ice cream! Another well-known pong is skunk spray, a smelly substance containing sulphur. Predators squirted by skunks **stink for up to three weeks**!

Chemicals that contain sulphur are to blame for lots of other awful smells too, including rotten **eggs, stinky socks and farts**. But believe it or not, there are even worse smells! When a metal called selenium combines with hydrogen, it makes a famously foul gas called hydrogen selenide. This is not something you would **ever** want to sniff – one whiff can wipe out a person's sense of smell for hours, and a big dose can be deadly. Scientists who have sniffed hydrogen selenide and survived have compared it to rotting radishes, or the smell of six skunks and a burning tyre! What's the worst whiff you have ever sniffed? How would you describe it to somebody else?





Why do we need two ears?

Have you ever listened to a bedtime story while lying on a pillow? Perhaps you're doing it right now. Even with one ear blocked or covered, we can still hear pretty well. So why do our bodies go to the trouble of growing two? Well, imagine you are Little Red Riding Hood, strolling through a **dark, dark forest**. Suddenly you hear a rustle and a growl. You can't see the wolf, but thanks to your two ears you can hear **exactly** where the sound is coming from – and **run in the other direction**! Because your ears are on opposite sides of your head, each one collects slightly different sounds. So if a twig snaps to your left, your left ear will hear the sound just before your right ear does, and a little more loudly. Your brain quickly compares the information from both ears to work out where the sound is coming from. Try it for yourself, by sitting with your eyes closed and pointing to the sounds you hear around you. But if you hear a wolf don't point – RUN!

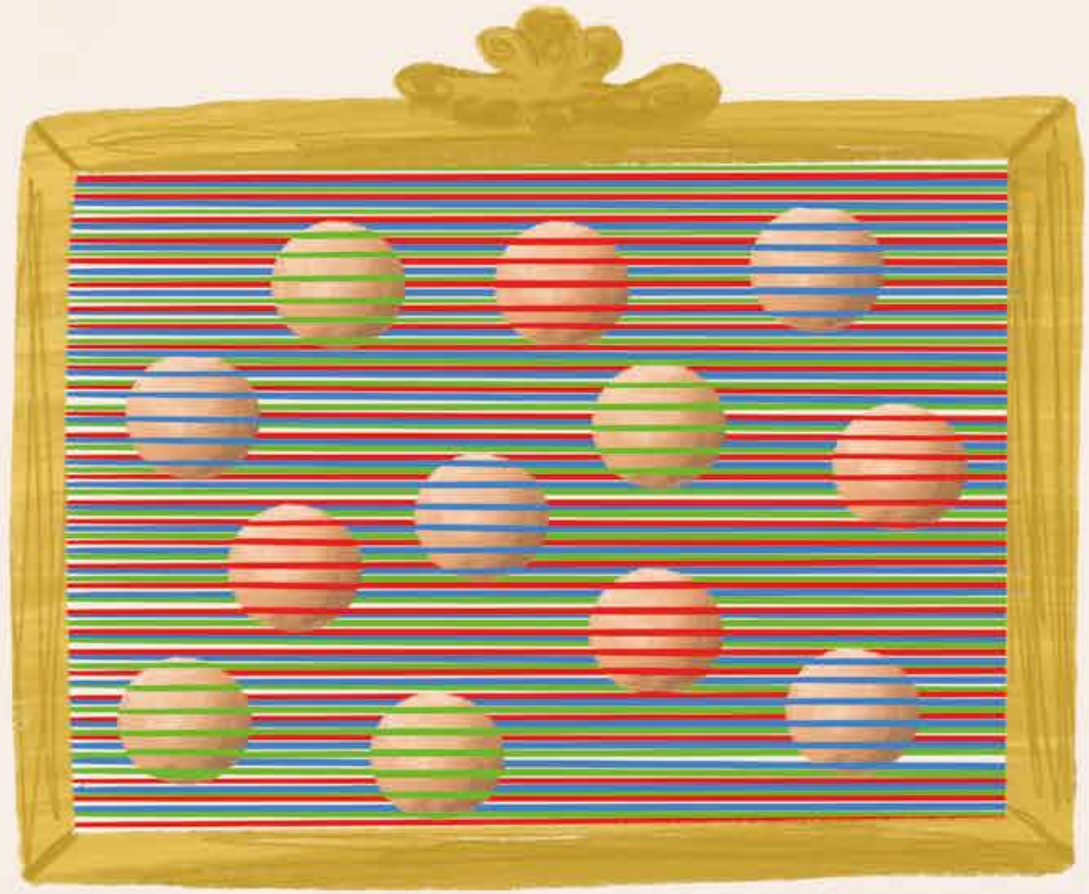


Does yellow look the same to me as it does to you?

We all agree that bananas are yellow, and oranges are orange. But what if the colour that I see when I look at a banana is actually the colour you see when you look at an orange, or a pear? **Are we really seeing the same thing**, or have we just learned to call different colours by the same name? It's impossible to know for certain, because we'll never be able to look through someone else's eyes. But we have found some clues that people do see colours differently.

The average person has eyes that can detect three different types of light – red, green and blue light. These colours can be combined in different ways to make millions of other colours. Most people's eyes can detect about a million different combinations, but it's our brains that make sense of this information to decide what colours we are seeing. And it turns out that it's pretty easy to trick your brain! One person can see the same colour very differently depending on which other colours are nearby, or even how he or she is feeling. This means that different people probably do see colours differently, but does it matter? No matter how we see a banana, **it still tastes just as good!**





These circles are all yellow. When they are criss-crossed by different coloured lines, our brains get confused and see them as different colours!



How long are millipedes?

It's easy to measure one millipede, but it's **impossible** to answer this question for millipedes in general. For starters, scientists think there may be **80,000** different kinds of millipedes! The tiniest are just over 3 mm long – a little shorter than a grain of rice, while the largest millipedes can grow longer than an adult's forearm! Even millipedes of the same species can be very different lengths, depending on how good they are at finding food, and how many birthdays they've had. Unlike humans, some millipedes **keep on growing** for their entire lives by **adding new segments** to their bodies. Each new segment has two pairs of legs – it's lucky they don't need school shoes. Long or short, millipedes are needed by forests around the world. They chomp away at dead leaves that gather on the forest floor, breaking them down so that all the nutrients trapped inside can be recycled and used by new living things. Although the word 'millipede' means 'thousand feet', no one has ever found a millipede with 1,000 legs. The record is around 750 legs, and strangely these belong to some of the shortest millipedes!

Why don't humans have tails?

Most animals with a backbone also have a tail that sticks out behind their body. Imagine what you could do if you had one too! You could **swish** it in water to help you swim, or **wag** it to say hello. It would help you **balance** as you run and jump, or **grasp** branches while you clamber up trees. You could use it by day to swat flies from your food and by night to keep your nose warm. Tails are very useful indeed – **so why don't we get one?** Humans do have tailbones at the very end of our spines. They are tiny and tucked away, but they tell us that our ancestors had tails. Great apes like chimpanzees, gorillas and gibbons have lost their tails too, so we can look at them to **find clues**. Being tailless seems to help these animals move around with straight backs, and their heads held high. Monkeys can't do this – **their tails get in the way!** It's impossible to know for sure why we lost our tails because we can't zoom back millions of years and watch it happen. Perhaps having smaller tails helped our ancestors to stand, walk and run more easily on two legs, saving energy which they could use for other things. Our tails became less useful, and eventually **disappeared**. Leaving our tails behind has been no problem. We can still swim, say hello, balance, climb, swat flies and keep warm – we just do it in different ways.

Could a tortoise really win a race with a hare?

The Tortoise and the Hare is one of the world's most famous stories. But could a slow, heavy tortoise really beat a speedy hare? Scientists love an impossible question, and one team took on this challenge. They discovered that slower, steadier animals really do move faster (and further) than speedy ones over the course of their lives! Animals that can move very quickly in short bursts, like hares, actually move less overall. They spend long periods of time resting and snoozing – just like the hare in the story. Meanwhile, slow tortoises plod around feeding all day, every day – racking up long-distance records. Which type of animal do you think we are?

