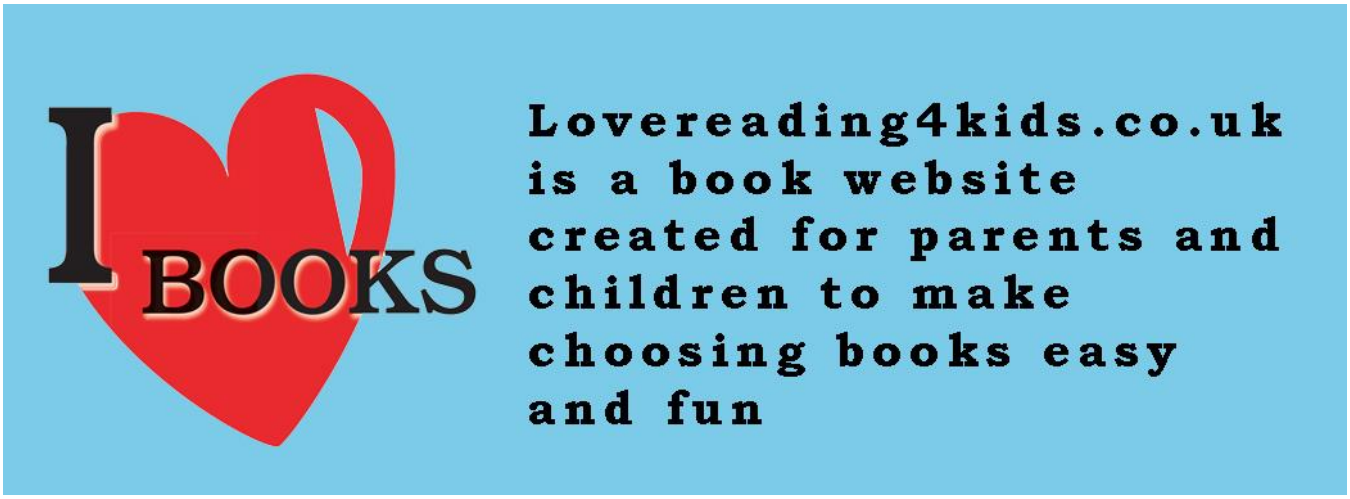


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50 Fantastic Facts

Written by

Malcolm Croft

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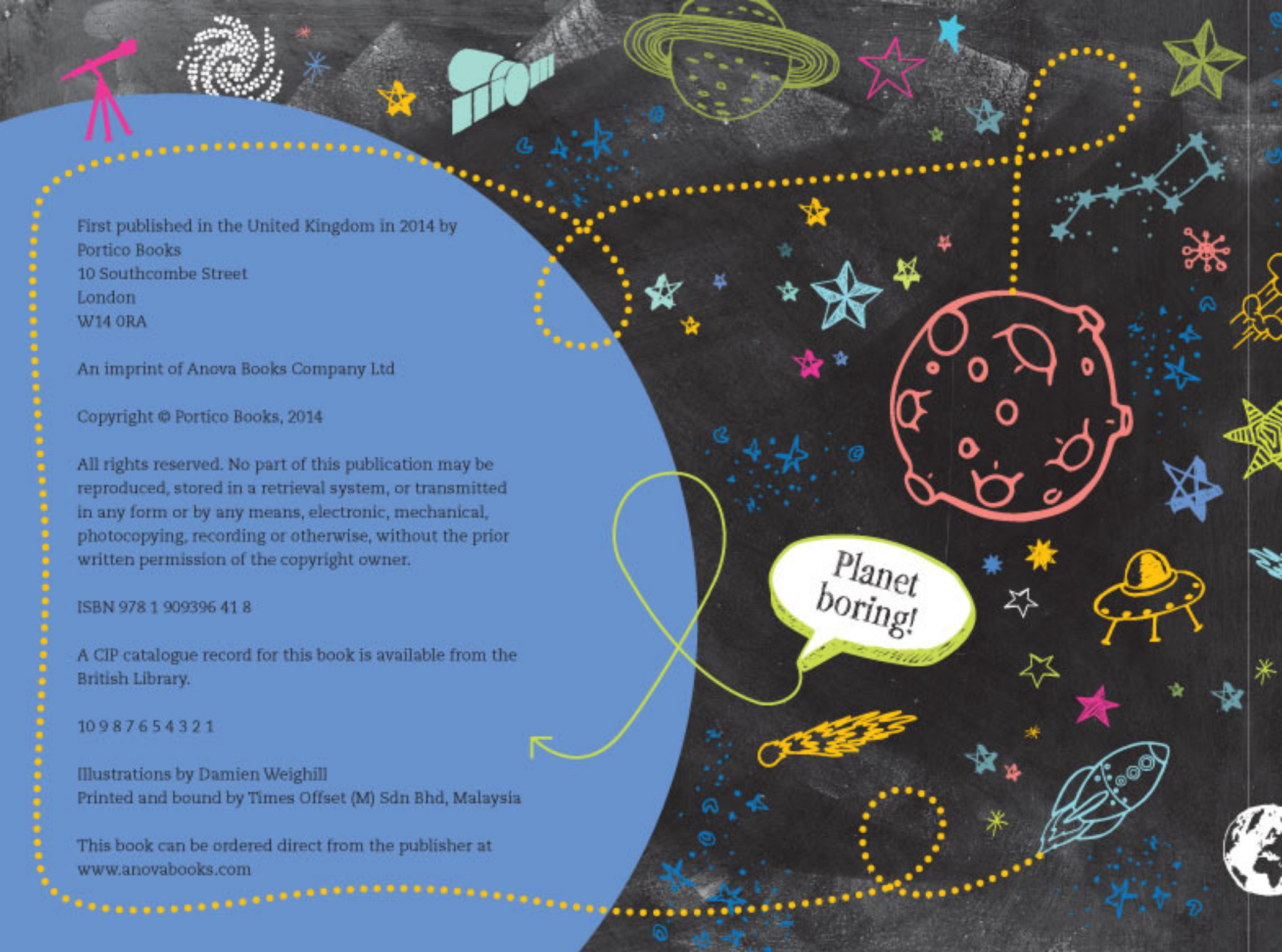
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The Solar System

With our Sun accounting for 99.9 per cent of all the mass in the Solar System (90 per cent of the remaining 0.1 per cent is taken up by Jupiter and Saturn), and with its size approximately 1,392,045km (865,000 miles) across, it's no wonder that the group of planets that Earth belongs to in our Milky Way is called the Solar System.

Look Out!

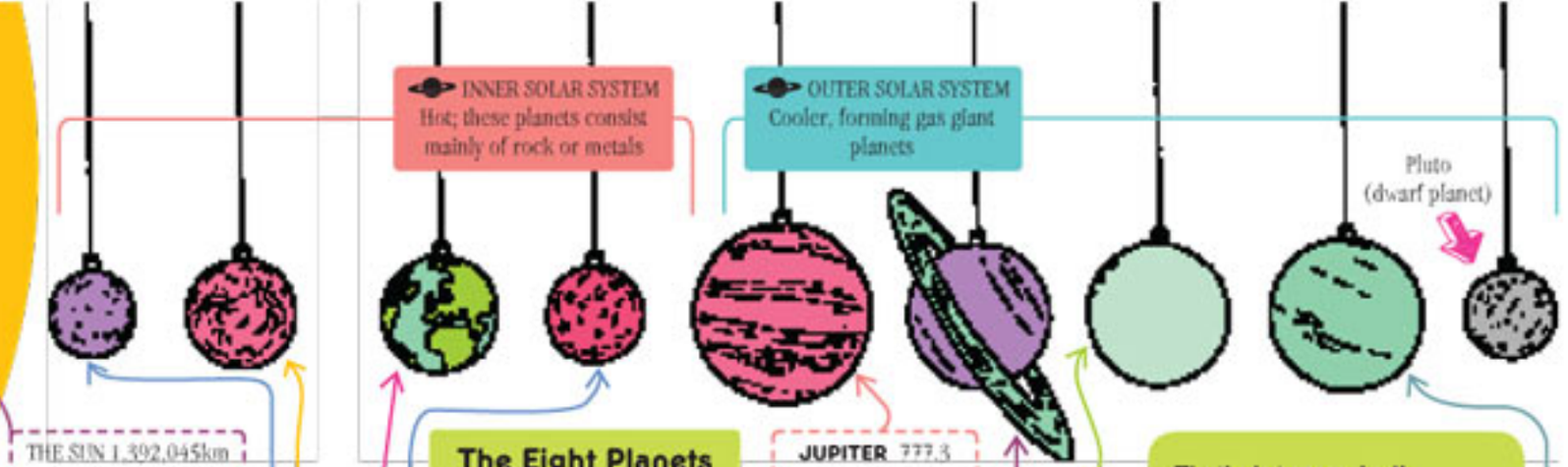
Our Solar System was born 4.5 billion years ago, when a dark, cold cloud of hydrogen mixed with other gases and 8 billion-year-old space dust. This cloud – many light years in size – collapsed under its own gravitational force and began to spin, and in doing so became a massive, rotating disc. While spinning, the space dust began to collide and clump together, creating denser clumps that grew into large chunks of rock and metal.

Watch This Space

The planets in our Solar System are divided into two types – gas giants and terrestrial, rocky planets.

After 50 million years the Sun turned into a star, ignited by a thermonuclear reaction of immense proportions. As the solid clumps of rock and metal continued to collide, they eventually formed rocky planets – Mercury, Venus, Earth and Mars – in the inner region of the Solar System.

The four giant gas planets within our Solar System (Jupiter, Saturn, Uranus and Neptune) were formed in the cooler outer regions of the Solar System, when chunks of rock and ice gathered around supermassive volumes of gas.



The Eight Planets

MERCURY 57.9 million km (36 million miles) from the Sun

VENUS 107.8 million km (67 million miles) from the Sun

EARTH 149.7 million km (93 million miles) from the Sun

MARS 227.9 million km (142 million miles) from the Sun

JUPITER 777.3 million km (483 million miles) from the Sun

SATURN 1,429 million km (888 million miles) from the Sun

URANUS 2,871 million km (1,784 million miles) from the Sun

NEPTUNE 4,496 million km (2,794 million miles) from the Sun

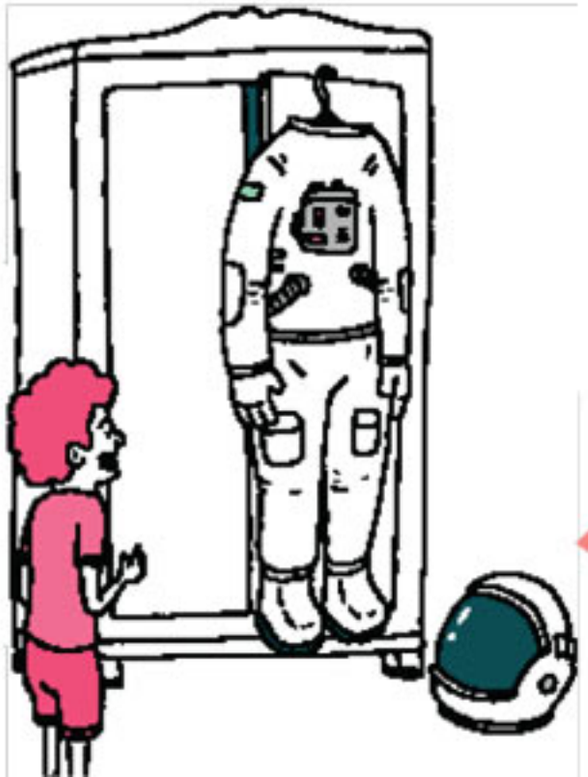
That's Astronomical!

Think you've discovered a planet? According to the 2006 Ruling on Planets, there are three rules a celestial body must comply with to be classified as a planet.

★ **1** It has to orbit the Sun.
★ **2** It has to have enough gravity to pull itself into a sphere.
★ **3** It needs to have cleared out its orbit of other objects.

How to Become a NASA Astronaut

At some stage everybody wants to be an astronaut when they grow up. But have you got what it takes? If you want to get a close look at the stars then you may need to put your games console away and get cracking – it takes a lot of hard work. NASA only accepts the best of the best!



Look Up!

The NASA Astronaut Program in the USA is one of the toughest job interview processes in the world, but it's not impossible. With the Space Shuttle out of commission since 2012, the only means of travelling in space is in rockets, but with the burgeoning space tourism program initiated by Virgin Galactic, and the forthcoming Mars One project, the need for space pilots in 2014 (and beyond!) is at an all time high.

Watch This Space

NASA selects astronauts from a diverse pool of applicants with a wide variety of backgrounds. From the thousands of applications NASA receives each year, only a few are chosen for the intensive Astronaut Candidate training program, at the Johnson Space Center, in Houston, Texas. Only 330 astronauts have been selected to date.

The basic requirements for an Astronaut Pilot, include the following:

1. A bachelor's degree from an accredited institution in engineering, biological science, physical science or mathematics. An advanced degree is desirable.

2. At least 1,000 hours pilot-in-command time in jet aircraft. Test-flight experience is a necessity.

3. Ability to pass a NASA space physical which is similar to a military or civilian flight physical and includes the following specific standards:
   - ★ **Distant visual acuity** 20/100 or better uncorrected, correctable to 20/20 each eye.
   - ★ **Blood pressure** 140/90 measured in a sitting position.
   - ★ **Height** between 157.5cm (5ft 2in) and 190.5cm (6ft 3in).

Stellar Facts

★ All food eaten in space is precooked or processed so it requires no refrigeration.

★ You can't boil pasta in space – the bubbles in the pan don't rise!

★ Space Shuttle astronaut Bill Thornton once opened a packet of M&Ms for a bedtime snack. When some of the candy floated away, they later returned – while he was asleep – and smacked him in the face!

That's Astronomical!

The word 'astronaut' derives from the Greek words meaning 'space sailor', a wonderfully illustrative word that conjures up images of heroic men sailing through an ocean of stars in wonderful space boats!

The Goldilocks Zone

On Earth it was just the right amount of heat, light, water and air that caused life blissfully to burst forth. The same rule applies in space – welcome to the Goldilocks Zone.

Look Up!

Earth is what is known as a Goldilocks Planet – it falls into a star's circumstellar habitable zone (CHZ) – a region around a star where planets such as Earth can support liquid water on their surface; a place far enough away from danger to be able to support life with a non-threatening and stable atmospheric climate, but not so far away to be removed from a light and heat source – ingredients vital to life. It is neither too hot, nor too cold.

'This porridge is too hot,' Goldilocks exclaimed.

So she tasted the porridge from the second bowl.

'This porridge is too cold.'

So she tasted the last bowl of porridge.

'This porridge is just right!' she said happily.

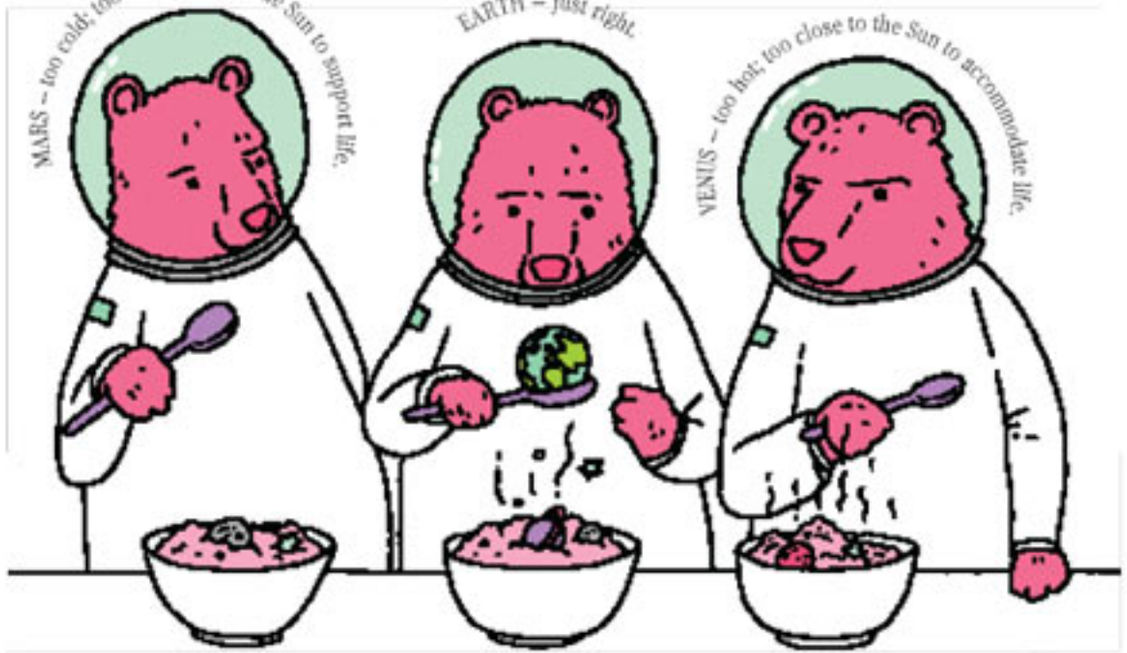
And she ate it all up.

Watch This Space

Astronomers looking for life on exoplanets in our own Milky Way (where there could be as many as 100 billion planets) first look for signs of habitable zones – or Goldilocks Zones – as this is potentially where life could thrive most successfully.



Life is highly improbable, except around Sun-like stars – a mere 5 per cent of all stars in the Universe.



Astronomers reported that there could be as many as 40 billion Earth-sized planets orbiting in the habitable zones of Sun-like stars and red dwarf stars just within the Milky Way.

The Universe Within Us All: Atoms

While we humans may feel alone in the Universe, let's take comfort in the knowledge that every single thing ever created is all made up of the same stuff – atoms.



In 1776, hydrogen was recognized as a unique substance by English scientist Henry Cavendish.

Hydrogen is the first element in the Periodic Table, which means it has an atomic number of 1, or 1 proton in each hydrogen atom.

It is the lightest element in the Universe as well as the most abundant. About 75 per cent of the element mass of the Universe is hydrogen.

Look Up!
Atoms are the basic chemical building blocks of all matter in the Universe – every star, planet and galaxy you can see through a telescope is made up of atoms. Even the telescope itself is made up of uniquely combined atoms, called molecules, and materials that are made out of many molecules, known as polymers. So, for example, when one atom of oxygen joins with two atoms of hydrogen, we get water (H_2O).

Watch This Space
Atoms are made up of protons (that carry a positive electric charge), neutrons (that carry no electric charge) and electrons (that carry a negative electric charge). Because electrons carry a negative electric charge, and protons carry a positive charge, the attraction between them holds the electrons together.



That's Astronomical!
A cube of sugar contains as many atoms as there are stars in the Universe.

Fireworks in Space

Astronomers get to see fireworks all year round, in the form of meteors and meteor showers. Meteors are small, icy bodies that can be seen orbiting around the Solar System at great speeds. Comets are balls of rock and ice surrounded by a cloud of gas and dust that becomes visible when the comet approaches the Sun and begins to warm up.

Look Up!

Comets illuminate and streak through the sky thousands of times every night. As an astronomer, your chance of seeing one is incredibly high – just keep looking! The centre, or nucleus, of a comet is usually no greater than 16km (10 miles), which is very small compared to its tail, which can be up to 161 million km (100 million miles) long; radiation from the Sun pushes dust particles away from the centre of the comet to form the tail.

Stellar Fact

During the Perseid meteor showers, astronomers may see up to 80 meteors an hour!

Watch This Space

Providing there is no light pollution, wherever you are on Earth, you will be able to see a few random meteors every night. Approximately 20 meteor showers occur each year that are visible to observers on Earth. Some of these showers have been around longer than 100 years. Here are some of the most spectacular.

- **Quadrantids** 2 January
- **Lyrids** 21 April
- **Eta Aquarids** 4–5 May
- **Delta Aquarids** 27–28 July
- **Perseids** 11–12 August
- **Orionids** 21 October
- **Leonids** 16 November
- **Geminids** 12–13 December
- **Ursids** 21–21 December

That's Astronomical!

Meteor showers get their names from the constellation in which they are seen. Perseids come from Perseus, hence the name Perseids. Comets continuously eject material with each passage around the Sun and this replenishes the shower with meteoroids. Meteors are sometimes seen with red, yellow or green trails. The colours are caused by the ionization of molecules, such oxygen that appears green.



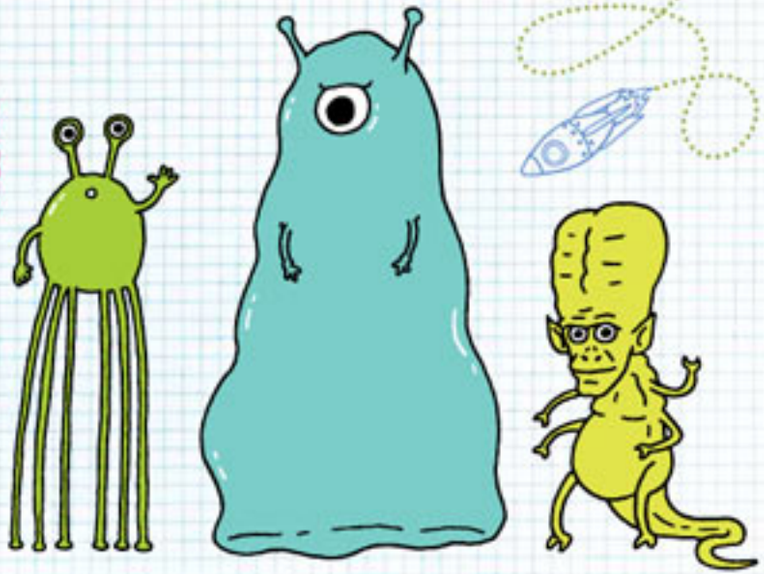
The impact theory is that a meteorite hitting Earth caused such devastation that the dinosaurs died out.

Are We Alone in the Universe?

It's a question that has been bugging every astronomer since Galileo first used his telescope to look up at the sky over 400 years ago. Back then it was hard to imagine life beyond Earth – we were the centre of the Universe – but with the discovery of new planets with the potential to support life, the answer to this vital question is surely within reach in the next few decades.

'I'm sure the universe is full of intelligent life. It's just been too intelligent to come here.'

Arthur C. Clarke



Look Up!

In 1961, astrophysicist Frank Drake devised the Drake Equation in an attempt to estimate N – the number of potentially advanced civilizations in our Milky Way. Let's look at the Drake Equation in more detail:

$$N = R^* \, fp \, ne \, fl \, fi \, fc \, L$$

Or, put another way,

$$N = R^* \times fp \times ne \times fl \times fi \times fc \times L$$

- N = number of civilizations in the Milky Way with which communication might be possible.
- R^* = average rate of star formation in the Milky Way.
- fp = fraction of those stars that have planets.
- ne = average number of planets with the potential to support life per star that has planets.
- fl = fraction of planets with the potential to support life that actually develop life.
- fi = fraction of planets with life that actually develop intelligent life (civilizations).
- fc = fraction of civilizations that develop a technology that produces detectable signs of their existence.
- L = the length of time these civilizations continue to emit detectable signals into space.

Stellar Fact

According to Drake's Equation, there are about 10,000 technically advanced civilizations spread across the Milky Way.

That's Astronomical!

Since 1961, the Search for Extra-Terrestrial Intelligence project (SETI) has been looking for intelligent life in the Universe by listening out for radio waves sent by alien civilizations. Based in the USA and run by many of the country's top universities, SETI is a series of projects designed to search for intelligent life forms. No longer funded by the US government, privately funded companies are now in charge of SETI and are scanning the skies for signals from alien life.