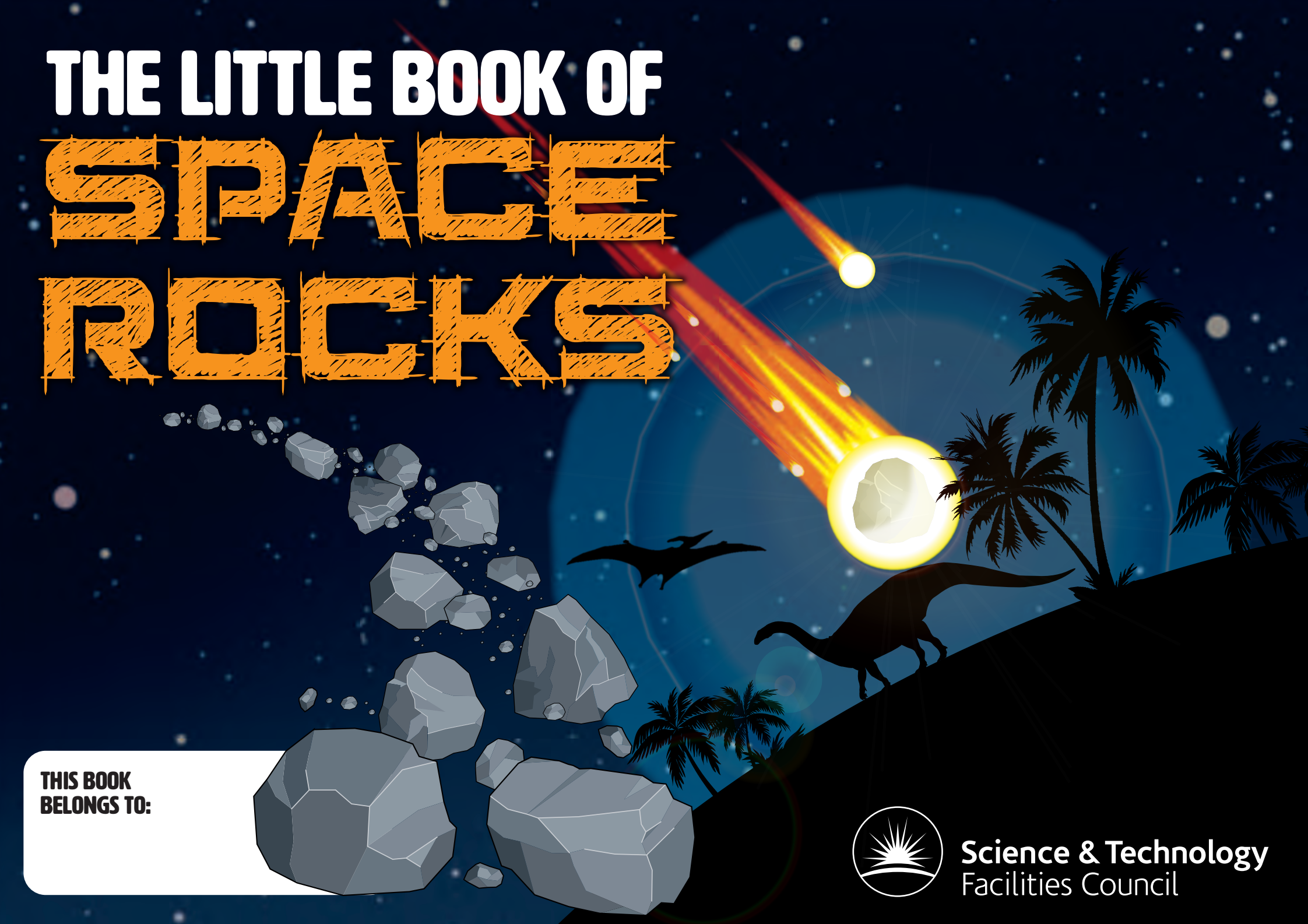
THE LITTLE BOOK OF SPACE ROCKS



THIS BOOK BELONGS TO:

Science & Technology Facilities Council

What's the difference between an asteroid, a comet and a meteoroid?

When is a meteoroid a meteor or a meteorite?

Where do they come from and what can they teach us?

You'll find all this out (and lots more) in...

THE LITTLE BOOK OF SPACE ROCKS

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OTHER IMAGES: NASA, ESA

Science & Technology Facilities Council

1 DIFFERENT TYPES OF SPACE ROCKS

When you think of the Solar System, the first things that come to mind will likely be the Sun and the planets and their moons. But, while they steal the limelight, they are accompanied by millions of smaller rocky companions. In fact, the Solar System is full of lumps of rock and ice – some are as small as grains of sand, others are the size of mountains and, unlike their more glamorous neighbours, sometimes these space rocks come to visit us here on Earth.

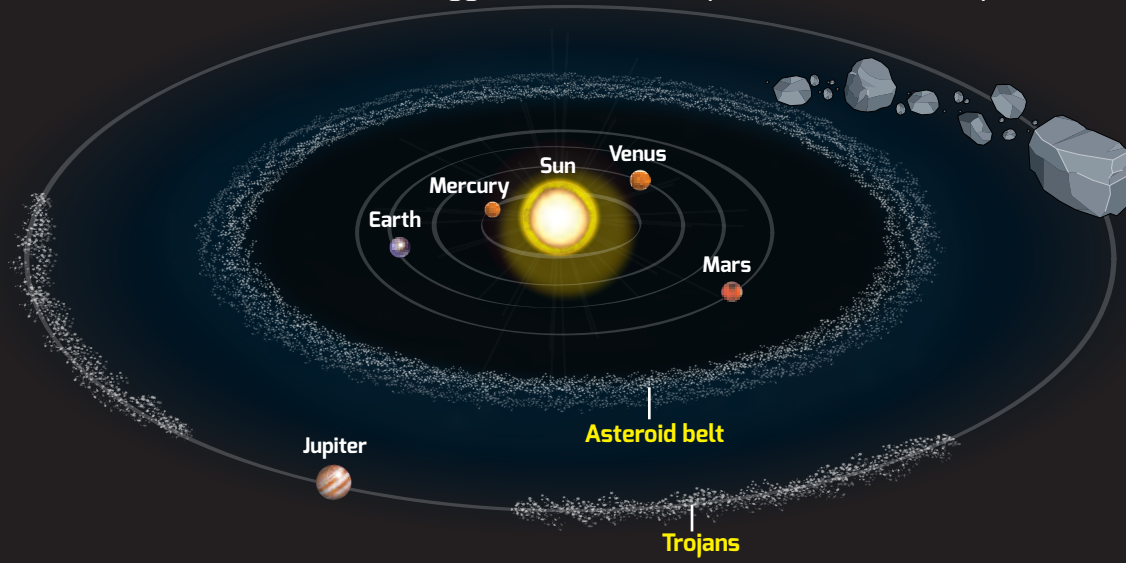
DID YOU KNOW?

The very biggest space rocks are known as dwarf planets. Dwarf planets are massive enough to be shaped by their own gravity, but do not have enough gravity to have cleared the space around them.They are usually found beyond the orbit of Neptune. Pluto is a dwarf planet.

TYPES OF SPACE ROCK

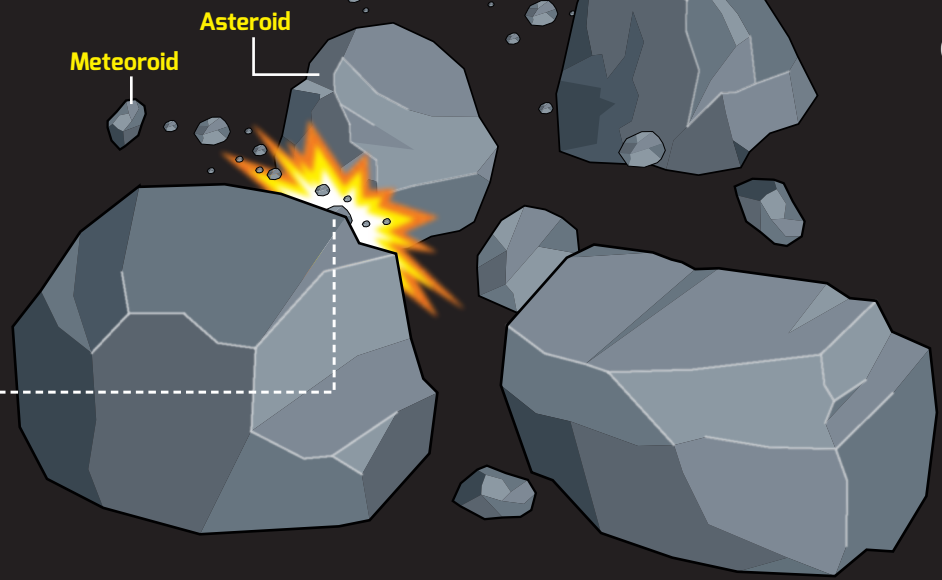
ASTEROIDS

Asteroids are large chunks of rock, or metallic rock, left over from the formation of the Solar System. Asteroids range in size from as little as a metre to thousands of metres – the biggest are known as planetoids, or dwarf planets.



Most asteroids are located in the **Asteroid Belt** between Mars and Jupiter. It is thought that Jupiter's gravity prevented them from coming together to form a planet. There are also two groups of asteroids, called the **Trojans**, that live in the orbit of Jupiter. Asteroids can also be found way out beyond the orbit of Neptune in the Kuiper Belt.

The largest asteroid in the Solar System is Ceres, which is 952 km wide and looks like a small moon. Ceres is classed as a dwarf planet.



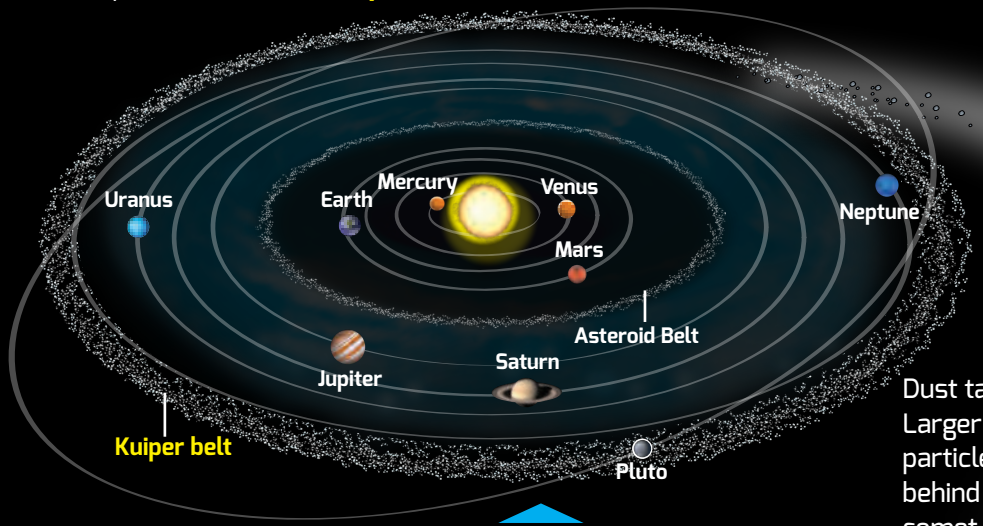
Sometimes asteroids can be knocked free from the Asteroid Belt by collisions or from being disturbed by the gravity of larger objects, such as planets. In these collisions, small pieces of rock are also thrown out into space – this is where most meteoroids come from.

TYPES OF SPACE ROCK

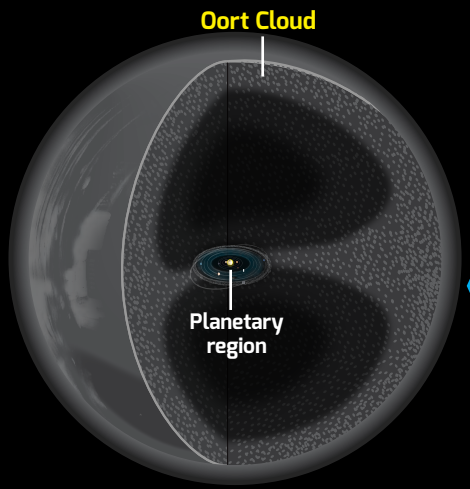
COMETS

Comets differ from asteroids because they are made up of mostly ice. Sometimes called 'dirty snowballs', most comets come from an icy region beyond Neptune called the **Kuiper Belt**, but some come from the distant **Oort Cloud**.

Comets spend most of their lives as unspectacular balls of ice and rock, but when their orbit brings them close to the Sun, comets heat up and vent gases and water vapour that form a huge glowing cloud called the 'coma'. The dust and gas form tails that stretch away for millions of kilometres.



The Kuiper Belt is a disc-shaped region of icy debris. It is located outside of Neptune's orbit – about 12-15 billion km from the Sun.



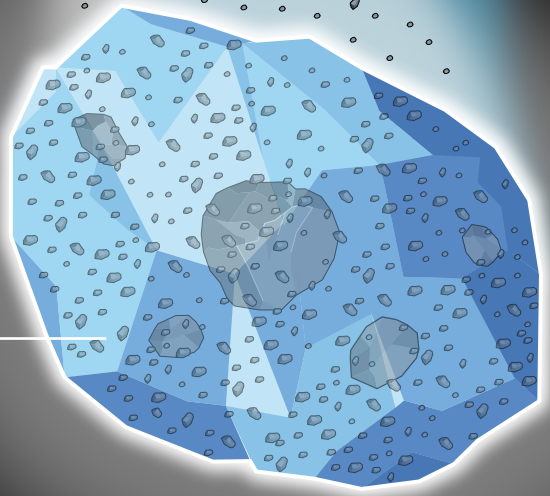
The Oort cloud is a huge spherical cloud of rocky debris left over from the formation of the Solar System. It surrounds the planetary region and extends about 30 trillion km from the Sun.

Gas tail: Charged gas particles pushed from the comet by the solar wind

Dust tail: Larger dust particles trail behind the comet

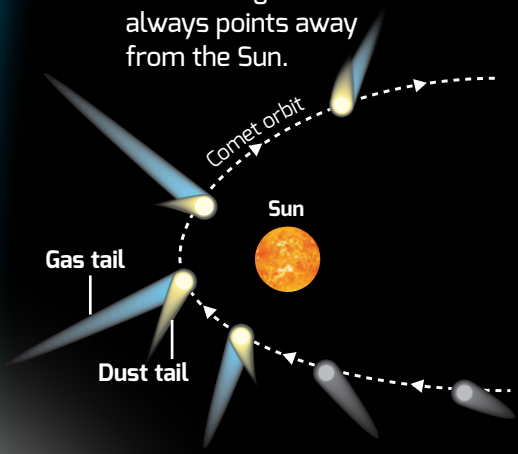
Coma: A hazy cloud of dust and vapour that surrounds the nucleus

Nucleus: 'Dirty snowball', or 'icy dirtball' made up of rock, dust, water ice and frozen gases*



The nucleus in this diagram is not to scale. The coma is many times larger than the nucleus.

A comet's gas tail always points away from the Sun.



The longest comet tail ever recorded belonged to Comet Hyakutake and measured more than 570million km (four times the distance between the Earth and the Sun).

A BRIEF HISTORY OF FAMOUS COMETS

In ancient times, the sudden arrival of (seemingly) unpredictable comets was viewed with awe, suspicion and alarm. Thought to resemble flaming swords, they were seen as omens of doom by many ancient civilisations.

In ancient Rome, the appearance of a comet in AD60 (believed to signal a change of kings) prompted Emperor Nero to slaughter members of the aristocracy he thought might be a threat to his throne.

When Halley's Comet visited in 1910, the residents of Chicago sealed their windows to protect themselves from the comet's 'poisonous' tail and all-night prayer services were held in New York churches.

HALLEY'S COMET

Perhaps the most famous comet in the world, Halley's Comet appears in our skies every 76 years. It was first recorded in 240 BCE by Chinese astronomers and it famously appears in the Bayeux Tapestry (pictured) following its appearance in 1066 during the Norman conquest of England.

COMET HALE-BOPP

Comet Hale-Bopp's appearance in 1997 made it one of the most studied comets in history. Along with the usual gas and dust tails, it was discovered that the comet had a third (very faint) sodium tail. The comet was visible to the naked eye for a record 18 months.

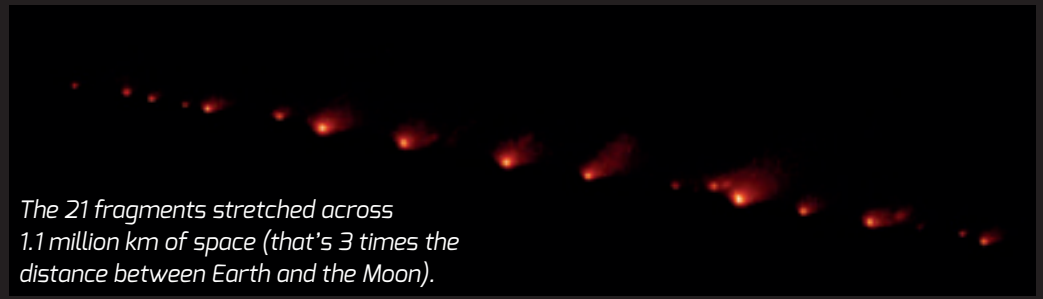
THE GREAT COMET OF 1577

This comet allowed the Danish astronomer, Tycho Brahe, to calculate that comets actually travel above the Earth's atmosphere and not within in it (as was previously believed). Brahe's observations were later used by his assistant, Johannes Kepler, to calculate his laws of planetary motion, which ultimately helped overturn the belief that the Sun and planets orbited the Earth.

SHOEMAKER-LEVY 9

This comet put on a spectacular show when it smashed into Jupiter in 1994. The gas giant's gravity tore the comet apart before it struck – creating 21 impacts.

The largest collision (estimated to have exploded with the energy of 6,000 billion tonnes of TNT) created a 3,000km-high fireball and left a mark the size of Earth.

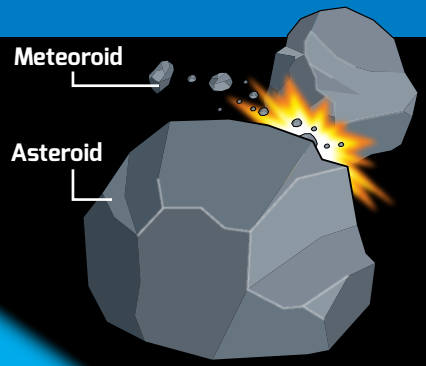


The 21 fragments stretched across 1.1 million km of space (that's 3 times the distance between Earth and the Moon).

TYPES OF SPACE ROCK

METEOROIDS

Any chunk of rocky or metallic material that travels through space could be called a meteoroid, but the name is usually reserved for rocks that are much smaller than asteroids. Meteoroids can range in size from that of small pebble to a huge boulder weighing several tonnes.



Most meteoroids come from the asteroid belt – either knocked clear by asteroid collisions or disturbed by the gravity of larger objects, such as planets.

METEOR, METEOROID, OR METEORITE?

Whether a space rock is called a meteoroid, meteor, or meteorite, depends on where it is at any given time.

Meteoroid

While it is floating around in space, a space rock is called a meteoroid. Really small space rocks (space dust) are called micrometeoroids.

Meteor

When a meteoroid enters the Earth's atmosphere, friction heats it up and it begins to burn. The trail of light left behind by a burning meteoroid is called a meteor, or 'shooting star'.

Millions of meteoroids travel through the Earth's atmosphere each day.

Fireball

Some meteoroids create more light when they burn up. These extra-bright meteors are called fireballs and they can even be seen during the day.

Meteorite

Sometimes a meteoroid doesn't completely burn up as it travels through the Earth's atmosphere. If it makes it to the ground, it is called a meteorite.

Some meteoroids come from the debris left behind by comets.

24% of meteoroids survive the journey through the Earth's atmosphere to become meteorites.

IT'S ALL GREEK TO ME!

Meteors get their name from the Greek word **meteōros**, which means 'high in the air'.

Asteroids get their name from the Greek word **asteroeidēs,** which means 'star-like'.

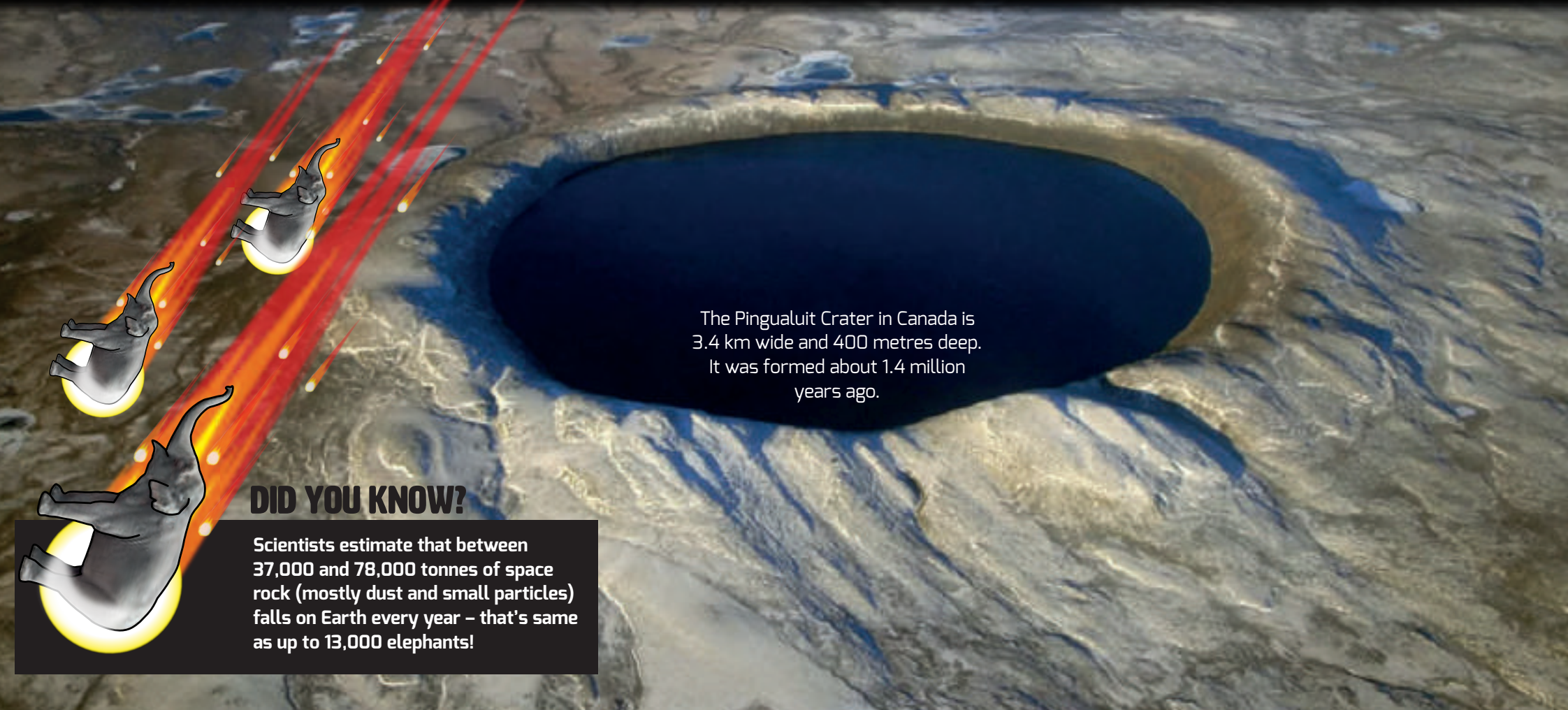
Comets get their name from the Greek word **aster kometes**, which means 'long-haired star' (they thought that a comet's tail looked like long, flowing hair).

2 WHEN SPACE ROCKS VISIT EARTH

The Earth is under constant attack from space rocks. Most burn up in the Earth's atmosphere, but some do get through and hit the surface and some are big enough to form craters. The Moon, and planets like Mars and Mercury are famous for their craters, but the Earth is hit by space rocks just as often.

The Earth isn't covered in craters because we are protected by our thick atmosphere, which makes most space rocks burn up before they hit the ground. Also, the craters of those that do make it to the surface are erased by weathering or geological processes.

Space rocks that are big enough to make craters like the one below are (luckily) quite rare. But many much smaller space rocks do still survive the journey to the Earth's surface.



The Pingualuit Crater in Canada is 3.4 km wide and 400 metres deep. It was formed about 1.4 million years ago.

DID YOU KNOW?

Scientists estimate that between 37,000 and 78,000 tonnes of space rock (mostly dust and small particles) falls on Earth every year – that's same as up to 13,000 elephants!

THE JOURNEY TO EARTH'S SURFACE

Thousands of tonnes of meteoroids, micrometeoroids and space dust enter the Earth's atmosphere ever year, but not all of it makes it to the surface.

1 When a meteoroid enters the Earth's atmosphere it can be travelling at many thousands of miles per hour. Compression of the air molecules in the atmosphere causes the meteoroid to heat up.

2 The surface of the meteoroid melts, vapourises and small particles break away and burn up. Most meteors are very small and so burn up completely long before they reach the ground.

3 In larger meteors, the surface layers are melted and burned away, but some material survives. As it melts and shrinks, a meteor can be sculpted into all sorts of interesting shapes.

4 As it slows down, the meteor cools down, the melted surface solidifies and, usually, turns black. This layer is called the fusion crust.

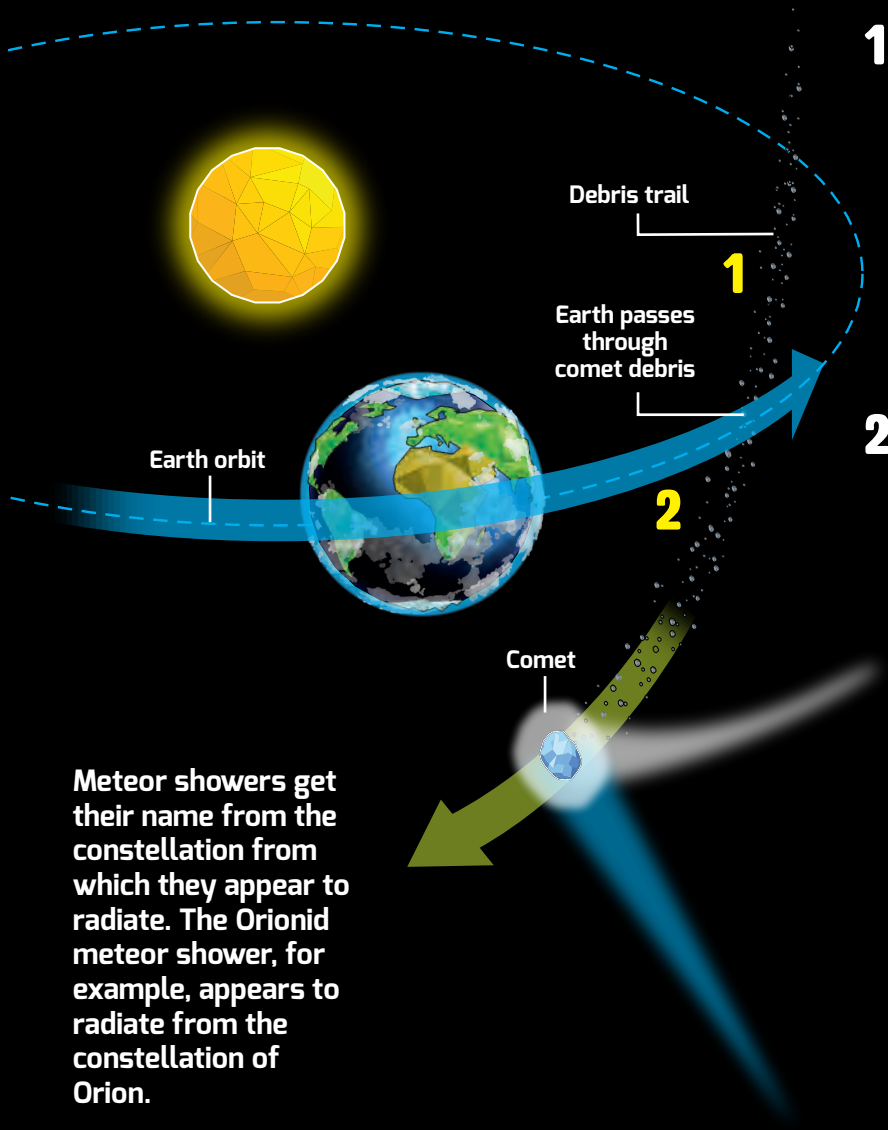
5 Most meteorites are lost at sea, but some do strike land and can be found if you know what to look for and are very lucky.

This meteorite tumbled as it fell and has melted with thumbprint-like indentations called regmaglypts.

This meteorite didn't tumble and has developed a conical nose a bit like a spacecraft's heat shield.

SHOWERS OF SPACE ROCKS

If you are very lucky you might spot a meteor on any night of the year, but it during meteor showers that you have the best chance. During a meteor shower, hundreds or thousands of meteors appear in the same part of the sky over the course of a just a few nights. Most meteor showers are associated with comets.



1 As a comet passes through the Solar System, it leaves behind a trail of dusty debris.

2 When the Earth's orbit carries us through the comet's debris, these micrometeoroids burn up in the atmosphere.

Meteor showers get their name from the constellation from which they appear to radiate. The Orionid meteor shower, for example, appears to radiate from the constellation of Orion.

Not all meteor showers are caused by comets. There are two showers every year that are created by debris shed by asteroids.

During a meteor shower, the meteors appear to radiate from the same point in the night sky – astronomers call this the 'radiant'.

Meteors burn with different colours depending on the chemicals they are made up of.

WHERE TO FIND SPACE ROCKS

The Earth is being constantly bombarded by meteorites – so you'd think they'd be quite easy to find, but you'd be wrong! Many will fall into the oceans and be lost forever, but some do fall over land.
If you want to stand a good change of finding a meteorite, you're best off looking in large, barren area where there are very few terrestrial rocks.

If you can't make it to the desert or Antarctica to search for meteorites, you could always get your school to borrow some. The STFC runs the only 'Lunar Loans' scheme that allows schools and scientific organisations to borrow meteorites and samples of Lunar material.

Deserts are a good place to look because a dark meteorite will stand out from the sandy background and, because they are very dry, a metallic meteorite will take longer to rust, so it stays black (and easier to find) for longer.

Meteorites that are spotted as they fall through the Earth's atmosphere and then recovered are called 'falls', all others are called 'finds'.

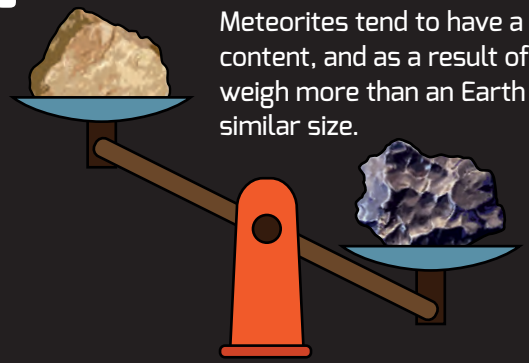
Antarctica is also a great place to look (although you might want to wear a scarf). Many meteorite gathering expeditions take place in Antarctica because meteorites easily stand out against the white background and they often get carried along with glaciers.

HOW TO IDENTIFY A SPACE ROCK

LITTLE BOOK OF SPACE ROCKS

So, let's say you are meteorite hunting in the desert and you find a rock. How will you determine whether it is worth picking up or not?

1 IT'S VERY DENSE



Meteorites tend to have a high iron content, and as a result often weigh more than an Earth rock of similar size.

2 IT'S MAGNETIC

As a result of this high iron content, meteorites will usually attract a magnet. Just be careful – several Earth rocks are also magnetic, so attracting a magnet is not a guarantee that you have found a meteorite.

3 IT'S QUITE SMOOTH

Since meteorites get very hot as they tear through the atmosphere, the outside of the meteorites will melt. As a result, most jagged edges will be smoothed out.

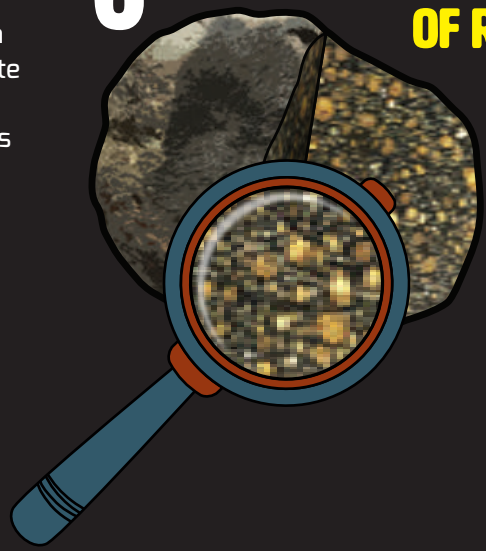
4 IT HAS A FUSION CRUST

This same heating process causes the outside of the meteorite to become dark, forming a crust of melted material around the outside of the meteorite. Often you can even see small lines a bit like mini rivers where the melted material flowed over the surface, or small bubble-like features where gasses in the rock expanded.

5 IT HAS 'THUMBPRINTS'

These are indentations in the surface of a meteorite that look as if someone has pressed their thumbs into the once squishy surface of the rock. The proper name for these marks is regmaglypts.

6 IT LOOKS LIKE IT'S FULL OF RICE CRISPIES



When you crack it open you can see coloured spherical formations. These are chondrules and they are unique to meteorites. Sometimes these can even be visible in the cracks of a fusion crust.

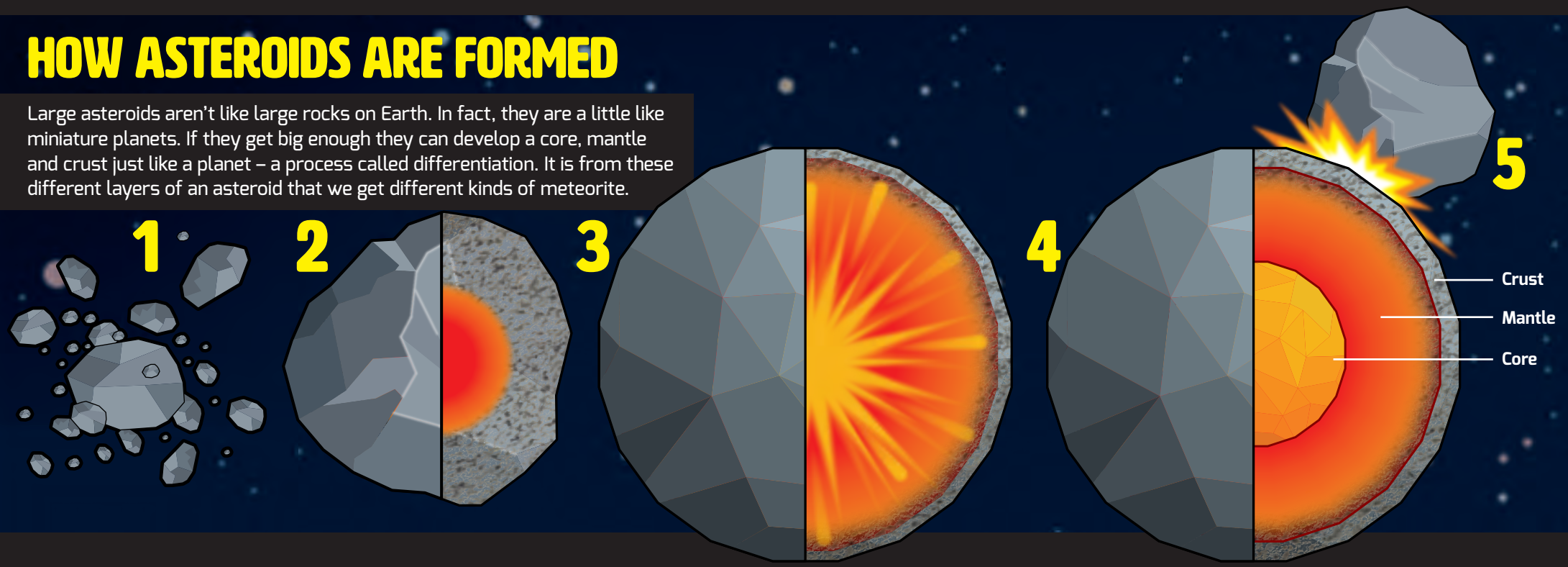
3 DIFFERENT TYPES OF METEORITE

As we've seen, meteorites can come from many different parts of the Solar System and form in many different ways, but most start their lives as part of a much larger asteroid.

Scientists classify meteorites by splitting them into three main groups: stony, iron and stony-iron. To understand why there are different types and what they can tell us, it helps to understand how the asteroids they came from formed.

HOW ASTEROIDS ARE FORMED

Large asteroids aren't like large rocks on Earth. In fact, they are a little like miniature planets. If they get big enough they can develop a core, mantle and crust just like a planet – a process called differentiation. It is from these different layers of an asteroid that we get different kinds of meteorite.



1 When the Solar System was young, there was lots of gas, dust and rock floating around the young Sun. Over time, gravity brought the dust and rocks together and made asteroids (and, of course, planets).

2 All those rocks smashing together created a lot of heat – if the asteroid was big enough, it could trap that heat.

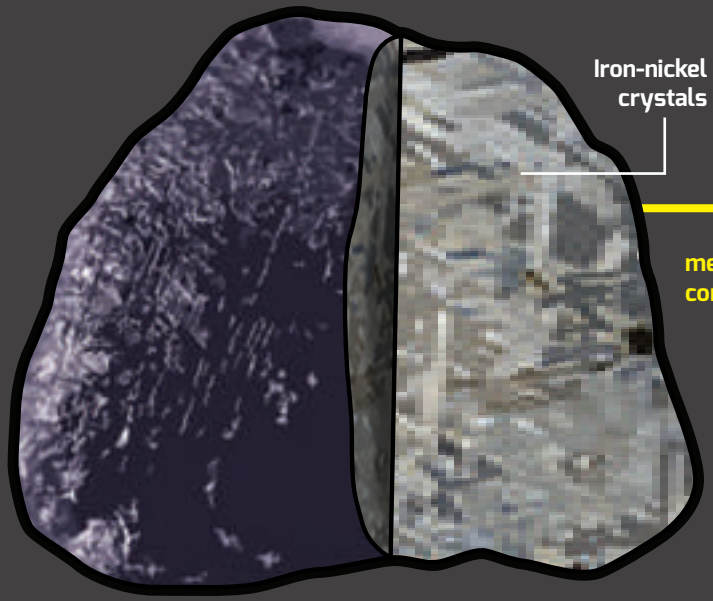
3 As it got bigger, the asteroid created more heat from the decay of radioactive atoms. This made the asteroid melt and all the metal mixed up inside it (being heavier than the rock) started to fall to the centre.

4 Eventually the metal all settled at the centre and the asteroid had a hot metallic core, a warm rocky mantle and a cold hard crust – just like a mini-planet!

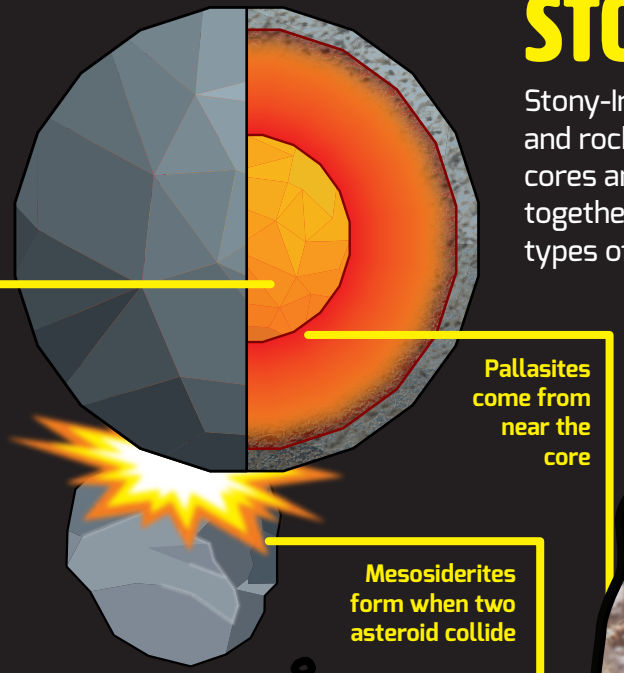
5 One day, another asteroid smashed into it and broke it into lots of pieces – making lots of meteorites. Stony meteorites come from the crust and mantle, stony-iron meteorites come from near the core, and iron meteorites come from the core.

DIFFERENT TYPES OF METEORITE

IRON METEORITES

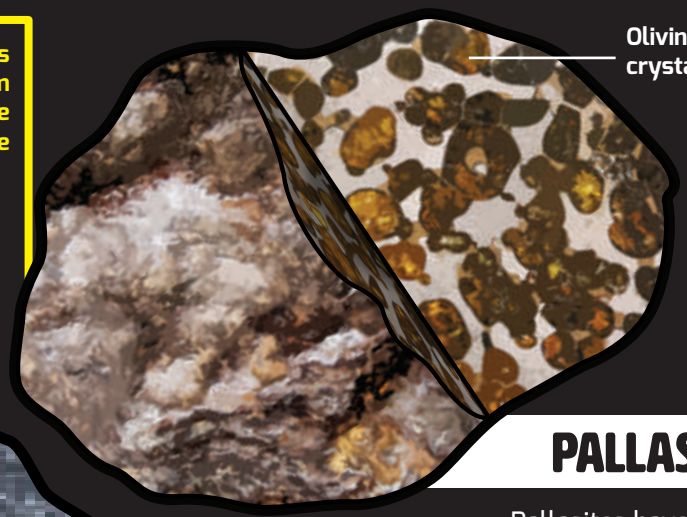


Iron meteorites are made of about 90-95% iron with the rest made up of mostly nickel and some trace elements. It is thought that they come from the metallic cores of asteroids. Iron meteorites are rarer than stony meteorites but are easier to find because of their magnetism.



STONY-IRON METEORITES

Stony-Iron meteorites are made of a mix of both metallic and rocky material. They probably formed when the metal cores and the rocky magmas inside asteroids mixed together, which makes them extremely rare. There are two types of stony-iron meteorites: pallasites and mesosiderites.

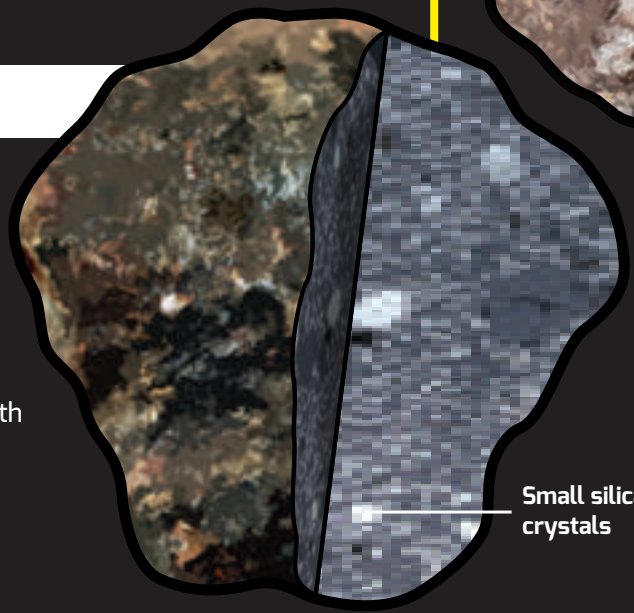


PALLASITE

Pallasites have solid bodies of nickel and iron but also contain large translucent crystals of olivine. Pallasites come from the area between the metallic core of an asteroid and the surrounding rocky magma.

MESOSIDERITE

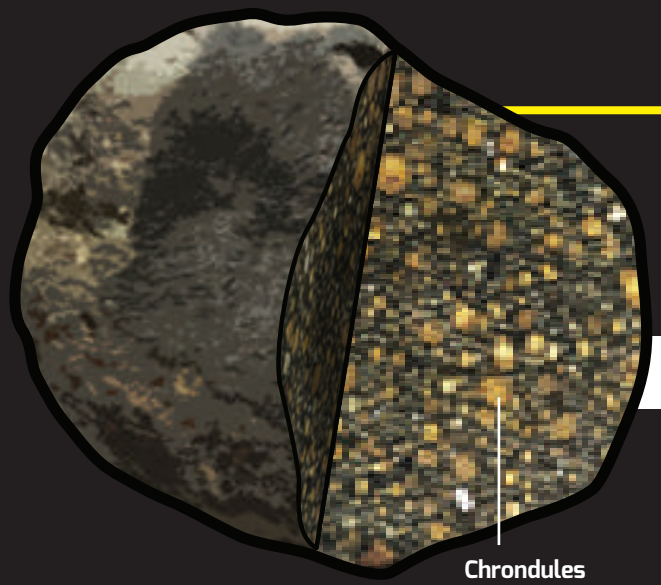
Mesosiderites differ from pallasites in that their crystals are smaller and made of silicate minerals. It is thought that mesosiderites form when magma mixes with the core during a collision between two asteroids.



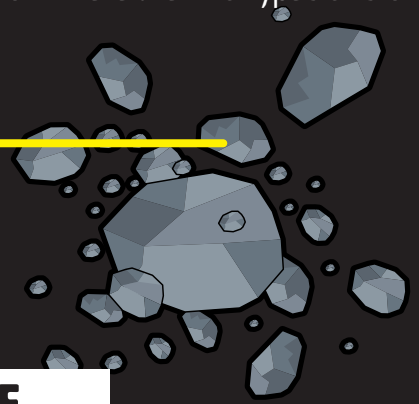
DIFFERENT TYPES OF METEORITE

STONY METEORITES

Stony meteorites are the most common type of meteorite. They are made of rock, but can also contain small amounts of iron. There are two types of stony meteorites: chondrites and achondrites.

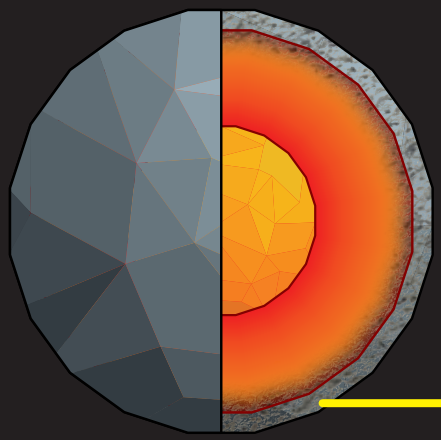


Chondrites come from undifferentiated asteroids



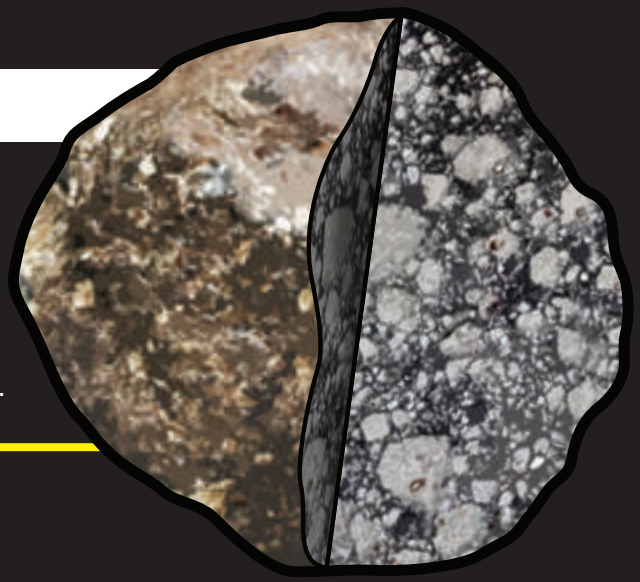
CHONDRITE

Chondrites contain rock that has changed little since the formation of the Solar System. They are made up of small mineral blobs called chondrules that formed in space billions of years ago and became clumped together.



ACHONDRITE

Achondrites are much younger than chrondrites. They contain minerals which have been melted, changed and altered since they were formed.



Achondrites come from the crust of asteroids or planets

NON-ASTEROID BELT

Not all meteorites come from the Asteroid Belt. Sometimes, very large collisions between an asteroid and a planet or moon can allow material from the surface to be ejected into space and sent on a trajectory that will overlap with the Earth's. This is, thus far, the only way we are able to get our hands on material from Mars.

4 KILLER SPACE ROCKS!

Not all meteorites are harmless. Sometimes a space rock falls that is so large it has the potential to destroy a city or even wipe out most of the life on Earth.

DID YOU KNOW?

65 million years ago a **10 kilometre-wide** asteroid smashed into the Earth in modern-day Mexico. It formed a crater 180 kilometres wide and caused a global climate shift that helped to kill off 75% of the life on Earth – including the dinosaurs.

Big rocks don't hit the Earth very often, but when they do they can do a huge amount of damage.

50 METRES

Most will disintegrate in the upper atmosphere.

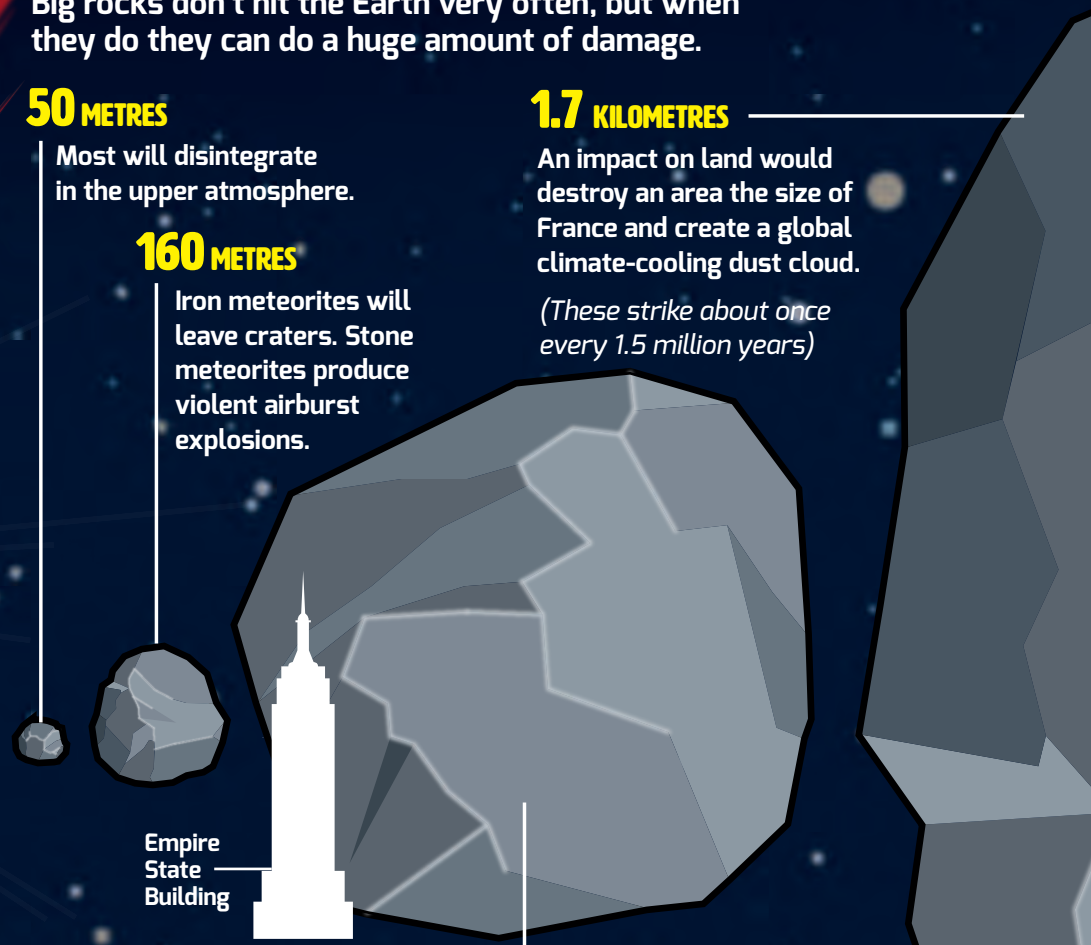
160 METRES

Iron meteorites will leave craters. Stone meteorites produce violent airburst explosions.

1.7 KILOMETRES

An impact on land would destroy an area the size of France and create a global climate-cooling dust cloud.

(These strike about once every 1.5 million years)



700 METRES

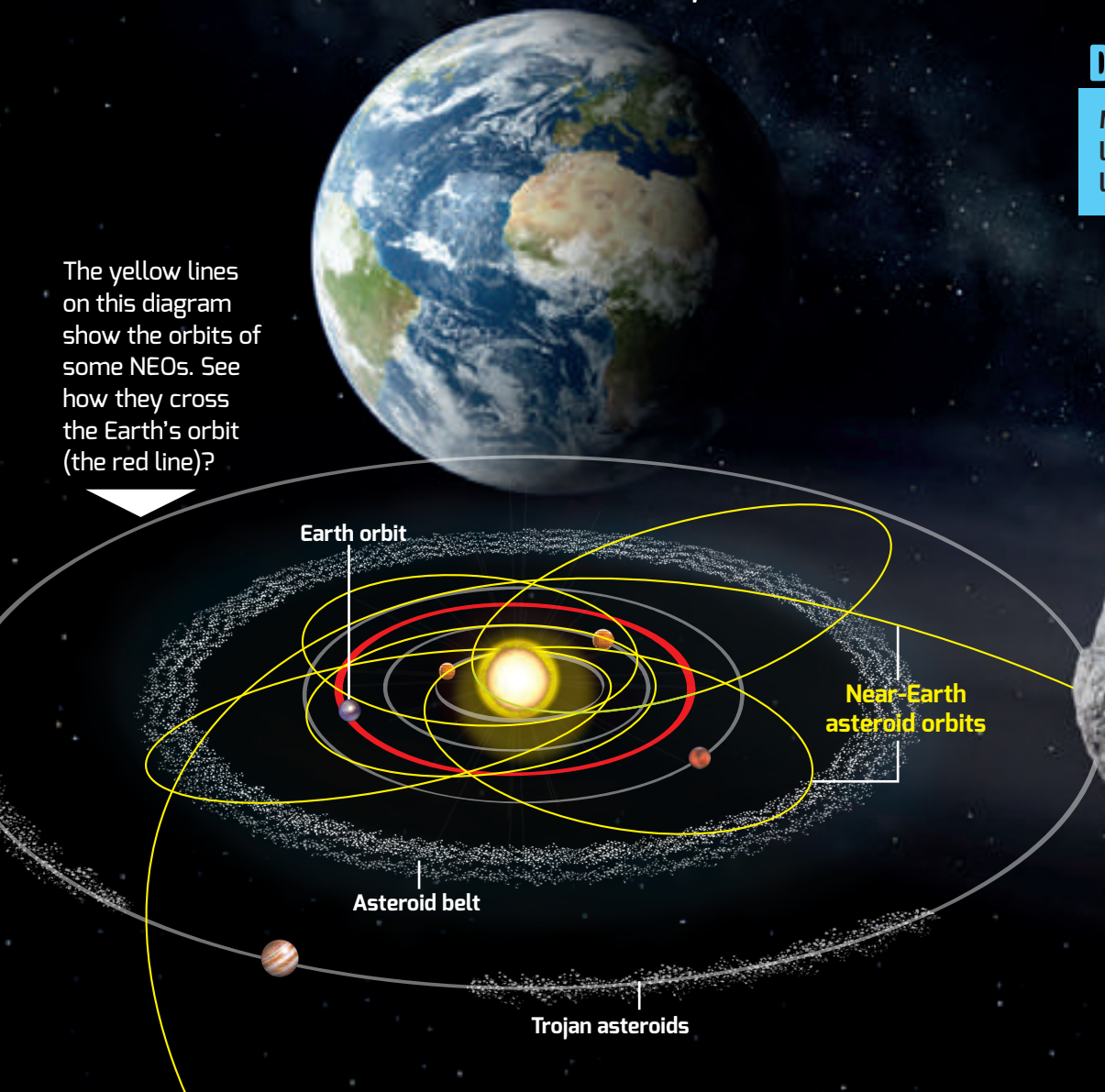
An impact on land would destroy an area the size of Yorkshire. An impact in the ocean would create huge tsunamis.

(A 700m meteorite strikes the Earth about once in every 190,000 years)

NEAR-EARTH OBJECTS

Most asteroids stay out of the Earth's way by orbiting the Sun in the Asteroid Belt between Mars and Jupiter. These asteroids have nice stable circular orbits. But some have eliptical orbits that cross the orbit of the Earth. These asteroids are called Near-Earth Objects, or NEOs.

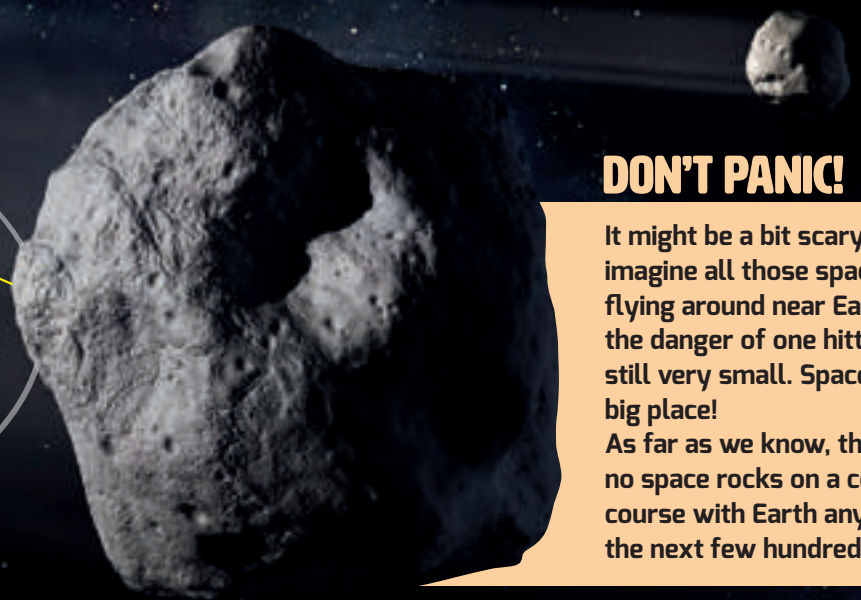
If a NEO crosses the orbit of the Earth, there is a small chance that it could it hit the Earth. Scientists use telescopes to identify NEOs and map their orbits to see which might pose a threat to Earth in the future.



The yellow lines on this diagram show the orbits of some NEOs. See how they cross the Earth's orbit (the red line)?

DID YOU KNOW?

Many NEOs are less than a metre long, but some are much bigger. The largest known NEO is called 1036 Ganymed, which is about 33 kilometres long – that's three times bigger than the asteroid that killed the dinosaurs!



DON'T PANIC!

It might be a bit scary to imagine all those space rocks flying around near Earth, but the danger of one hitting us is still very small. Space is a very big place!

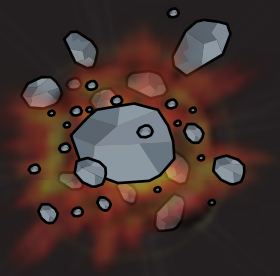
As far as we know, there are no space rocks on a collision course with Earth any time in the next few hundred years.

HOW TO DEFEND THE EARTH

Although the chances of a large asteroid hitting the Earth are very small, what if the worst were to happen and we discovered a space rock on a collision course? Is there anything we could do? If we detected a killer space rock in time, there are several things we might do to protect the Earth.

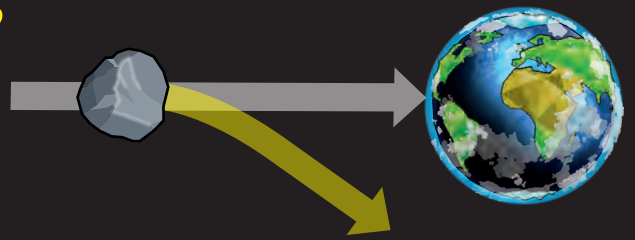
SHOULD WE BLOW IT UP?

It might seem like a good idea try to destroy a killer space rock, but it might actually make the situation worse! If you blow it up, you might turn one deadly asteroid into hundreds of smaller, but still deadly, fragments!

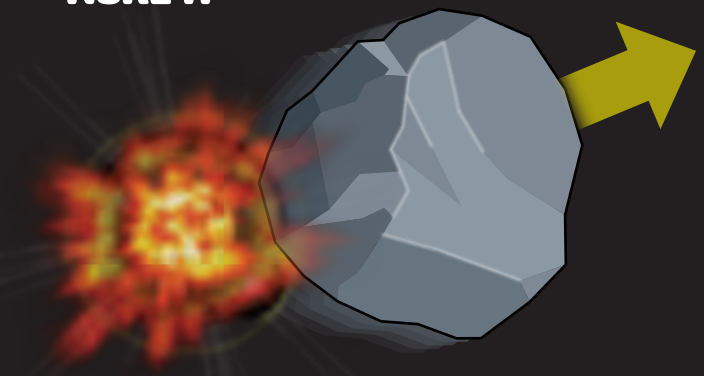


WHAT IF WE COULD DEFLECT IT?

A better idea would be to find a way to nudge the asteroid away from its collision course. If you can change the rock's orbit, even just a little bit, it be might enough to make it miss the Earth entirely!



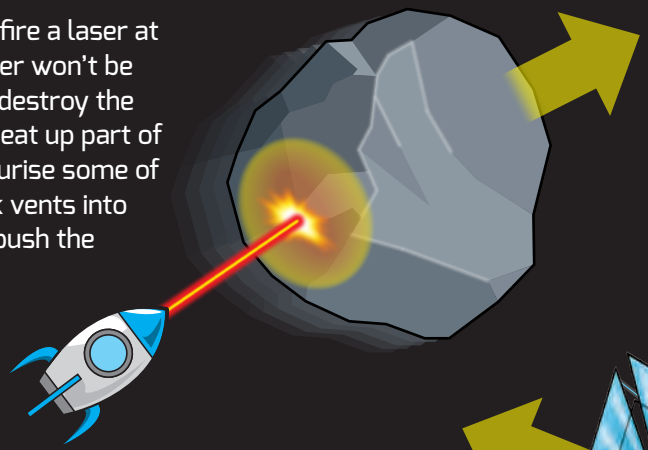
NUKE IT



Instead of trying to blow up the asteroid with a nuclear weapon, what if you were to explode the bomb nearby? The force of the explosion won't be enough to break the asteroid apart, but it might be enough to push it away from the Earth.

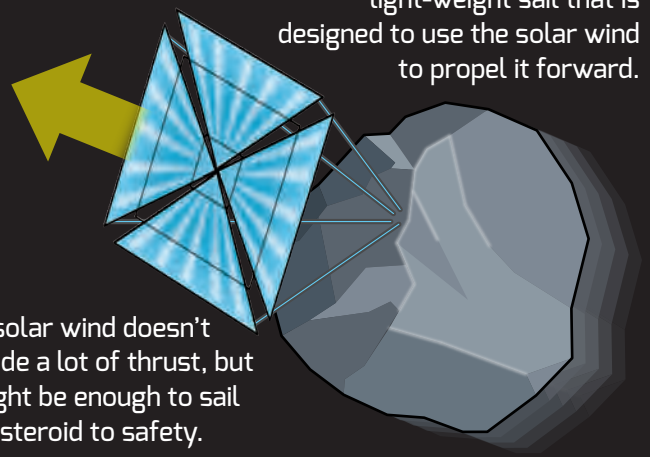
LASER IT

Another option is to fire a laser at the asteroid. The laser won't be powerful enough to destroy the asteroid, but it will heat up part of its surface and vapourise some of the rock. As the rock vents into space, it will gently push the asteroid off target.



SAIL IT

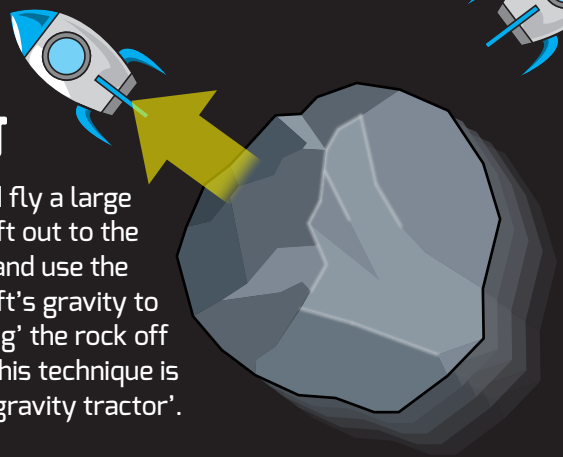
You might not think it, but there there is wind in space, although it's not like the wind on Earth. Every second, about a million tonnes of charged particles flow out from the Sun at a million miles per hour. This called the 'solar wind'. A solar sail is a special sort of light-weight sail that is designed to use the solar wind to propel it forward.



The solar wind doesn't provide a lot of thrust, but it might be enough to sail the asteroid to safety.

TUG IT

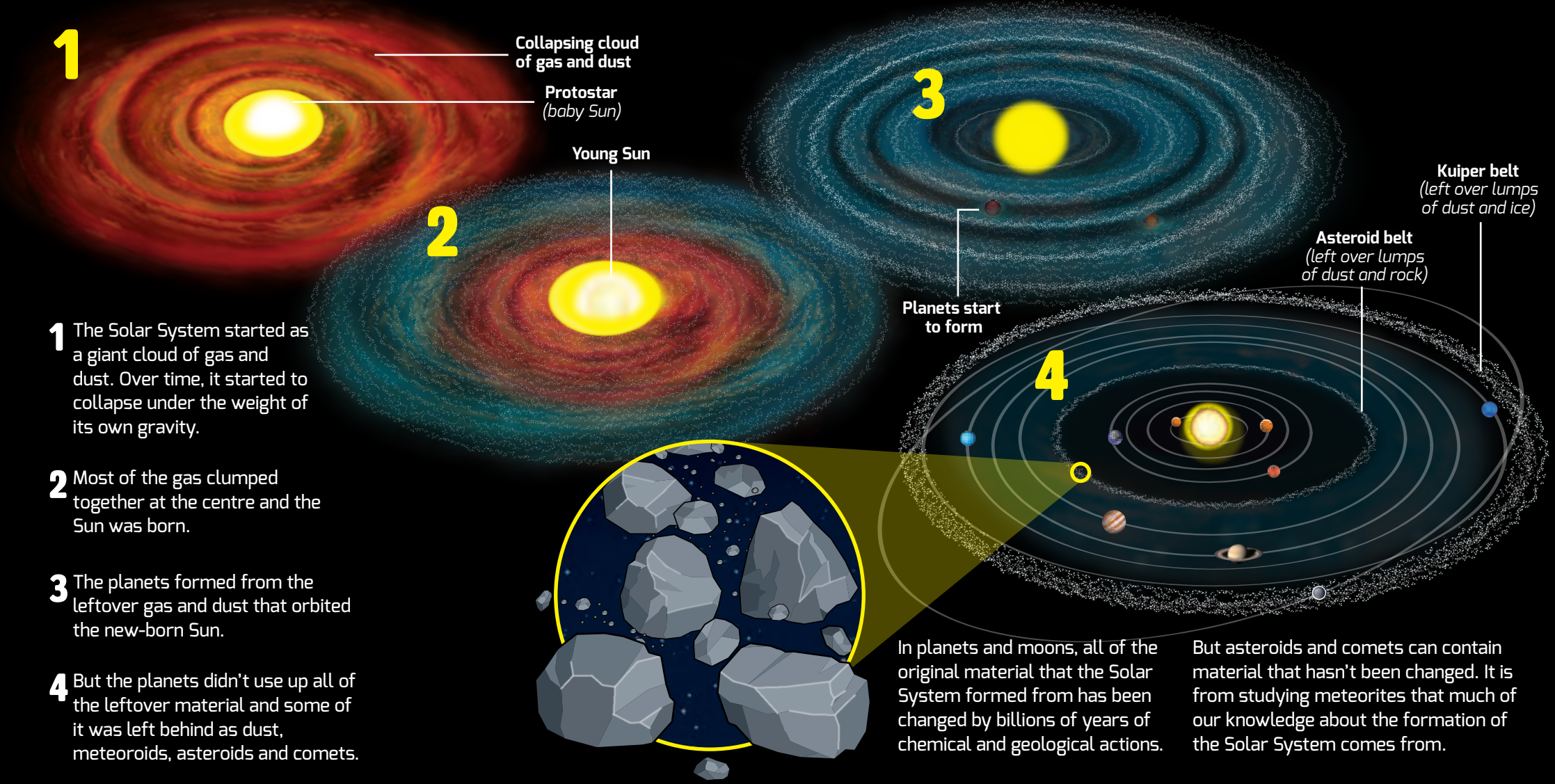
You could fly a large spacecraft out to the asteroid and use the spacecraft's gravity to gently 'tug' the rock off course. This technique is called a 'gravity tractor'.



5 WHAT SPACE ROCKS CAN TEACH US

When our Solar System first formed about 4.6 billion years ago, there was no one there to watch it. So how do we know how something that took place billions of years before life even evolved actually happened?

Until someone invents a timemachine so we can go back and have a look, we have to search for any clues that might have been left behind.



1 The Solar System started as a giant cloud of gas and dust. Over time, it started to collapse under the weight of its own gravity.

2 Most of the gas clumped together at the centre and the Sun was born.

3 The planets formed from the leftover gas and dust that orbited the new-born Sun.

4 But the planets didn't use up all of the leftover material and some of it was left behind as dust, meteoroids, asteroids and comets.

In planets and moons, all of the original material that the Solar System formed from has been changed by billions of years of chemical and geological actions.

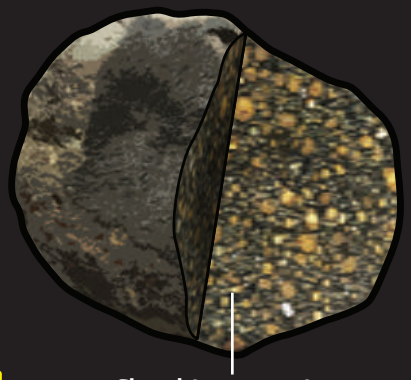
But asteroids and comets can contain material that hasn't been changed. It is from studying meteorites that much of our knowledge about the formation of the Solar System comes from.

WHY DO WE STUDY SPACE ROCKS?

Space rocks are much more than just interesting lumps of rock floating around space. There is a lot we can learn from studying asteroids, comets and meteorites...

THEY ARE TIME CAPSULES

As we've mentioned, much of what we know about the formation of the Solar System comes from space rocks. Some space rocks contain material that hasn't changed since the birth of the Solar System – the metals and minerals inside them frozen in time for billions of years. Some meteorites contain grains of dust produced by stars before our Sun was born. Studying them can help us understand how stars form and evolved.

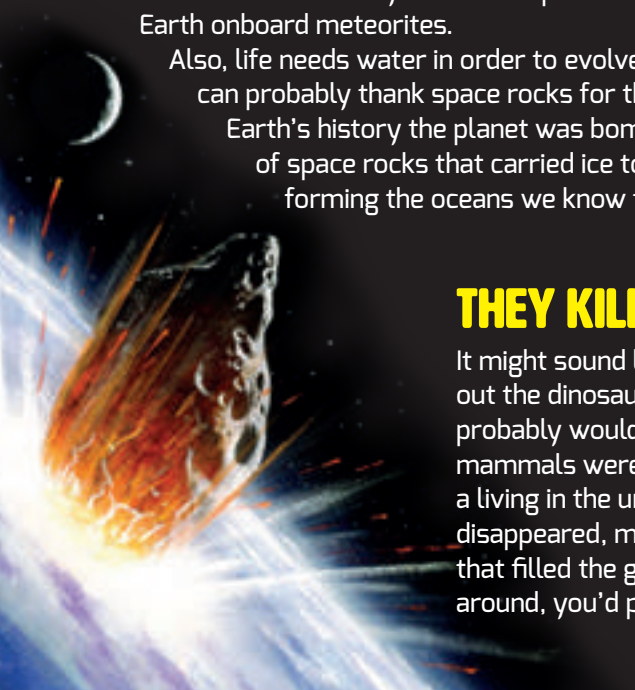


Chondrite meteorites haven't been melted and can contain material that hasn't changed since the Solar System first formed.

THEY MAY HAVE STARTED LIFE ON EARTH

We might owe our very existence to space rocks. It is thought that many of the building blocks of life – basic organic compounds and amino acids – were actually formed in space and then delivered to Earth onboard meteorites.

Also, life needs water in order to evolve and survive and we can probably thank space rocks for that too. Early in Earth's history the planet was bombarded by millions of space rocks that carried ice to the Earth surface – forming the oceans we know today.

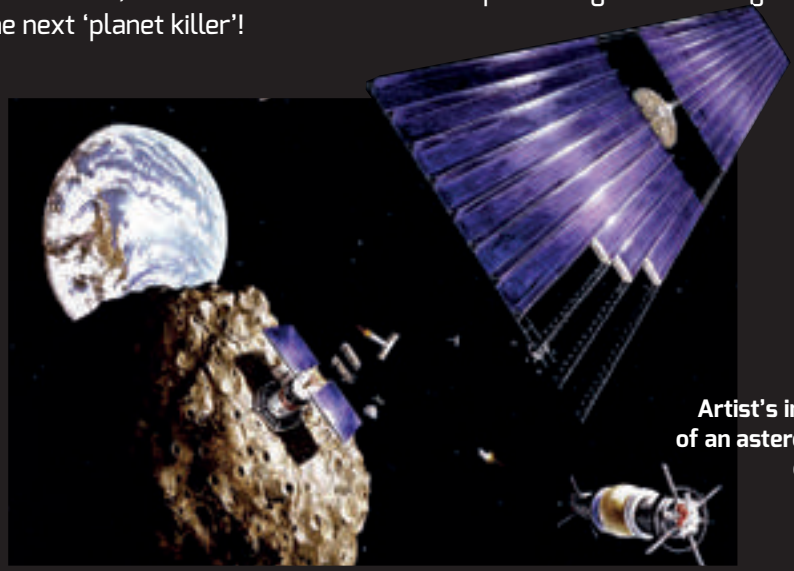


THEY KILLED OFF THE DINOSAURS

It might sound like a bad thing that a giant space rock wiped out the dinosaurs 65 million years ago, but without it humans probably wouldn't exist. When dinosaurs ruled the Earth, mammals were tiny little creatures that were stuck eking out a living in the undergrowth. When the big scary dinosaurs disappeared, mammals were able to evolve into larger species that filled the gaps left by the dinos. If the dinosaurs had stuck around, you'd probably still be a tiny little rodent!

THEY COULD KILL OFF HUMANS

Unfortunately, there are still giant space rocks flying around in space and, one day, a giant one could wipe us out just like the dinosaurs.
By studying space rocks we can understand what they are made of and identify any might pose a threat in the future. The better we understand space rocks, the better chance we have of protecting ourselves against the next 'planet killer'!



Artist's impression of an asteroid mining operation.

WE COULD USE THEIR RESOURCES

Space rocks are full of minerals and metals that could be mined. Rare metals extracted from asteroids, such as platinum and palladium, could be sent back to Earth – while other resources could be used to build spacecraft in space. Meanwhile, all that water ice locked away in comets could be turned into oxygen and hydrogen, which are used in rocket fuel – meaning comets could become space-based refuelling stations for interplanetary spacecraft.
If that all sounds like science fiction, it isn't – in fact, there are lots of private companies who plan on starting asteroid mining as early as 2025.

A BRIEF GLOSSARY OF TERMS

Achondrite: A stony meteorite that does not contain chondrules.

Asteroid: Large rocks that have accreted together over millennia but never became large enough to form into a planet.

Chondrite: A stony meteorite that was originally part of a small asteroid and contains chondrules. The most common type of meteorite to fall to the Earth.

Chondrules: Spherical grains that formed during the early accretion of the Solar System and are the building blocks of the solar system. These are the most prominent feature in a chondrite meteorite.

Crater: A depression or hole on the surface of the Earth caused by the impact of a comet or meteorite.

Fusion crust: Smooth, black surface of a meteorite formed by the exterior melting as it tears through the atmosphere which cools quickly after it has made it through the atmosphere.

Kuiper belt: A disc shaped region of icy objects beyond the orbit of Neptune. Comets which take less than 200 years to orbit the sun (short period comets) originate here.

Lunar: Anything pertaining to the Moon.

Little book of space rocks: An awesome book all about space rocks developed by the Science and Technology Facilities Council (STFC).

Meteor: The bright light given off by a meteoroid as it burns through the atmosphere.

Meteor showers: A regularly occurring rain of meteors that radiate from a point in the sky. These meteors are the remnants of the tail of a comet.

Meteoroid: A small rock that is travelling through space.

Meteorite: A rock from space that has survived re-entry and landed on the Earth's surface.

Mineral: A naturally occuring, crystalline solid with a fixed chemical composition.

Oort cloud: A disc shaped region of icy objects beyond the orbit of Neptune. Comets which take more than 200 years to orbit the sun originate here.

Orbit: The motion of an object around a gravity point in space, such as the motion of the Earth around the Sun.

Organic molecules: Molecules made of carbon chains and other organic elements such as oxygen or nitrogen.

Rock: A naturally occurring solid made up of minerals.

Solar System: A star and all the objects that orbit it.

NOTES

Need to make some notes or doodle some ideas? This is the place to do it!

The Science and Technology Facilities Council operates world-class, large-scale research facilities; supports scientists and engineers world-wide; funds researchers in universities and provides strategic scientific advice to government.

The Council's Public Engagement Team offers a wide range of support for teachers, scientists and communicators to facilitate greater engagement with STFC science which includes astronomy, space science, particle physics and nuclear physics:

FOR SCHOOLS

- **Free Publications and resource guides** suitable for teaching ages 10-18.
- **Funding** schemes for projects and school visits.
- **A Moon rock and meteorite loan scheme**.
- **Visits** to STFC's UK laboratories in Cheshire, Oxfordshire and Edinburgh plus CERN in Geneva.

www.stfc.ukri.org

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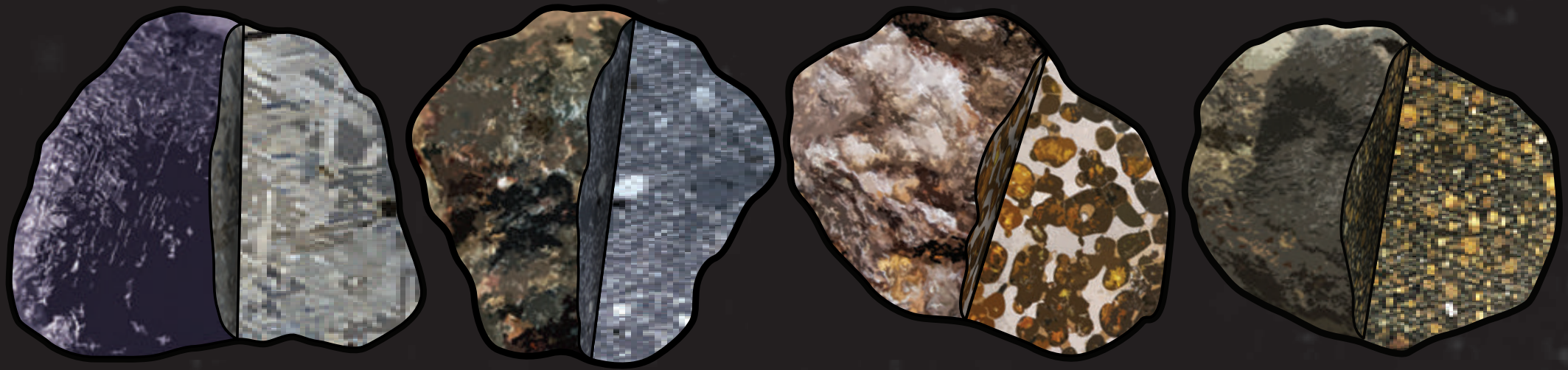
THE LITTLE BOOK OF SPACE ROCKS



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