April 2019

REDDIFORD

AD MAJOREM DEI GLORIAM

SCIENCE DIGEST

Welcome to the second edition of Reddiford Science Digest. Learn more about inspirational scientists, the human body, electricity, planet Earth's fight for survival, space and robotics!

Contents

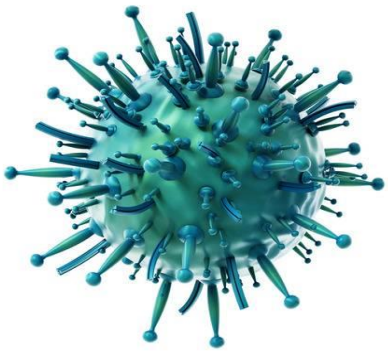
A COMPLEX SYSTEM...

Every second of your life you are under attack. Billions of bacteria, viruses and fungi are trying to make you their home. So, our bodies have developed a really complex little army with guards, soldiers, intelligence, weapons factories and communicators to protect you from…well… dying.

UNKNOWN INTRUDERS!

In this case, you have cut yourself on a sharp knife whilst cooking, nearby bacteria instantly enter the wound, they start to use up your body's resources and double their numbers almost every twenty minutes. Firstly, they are not noticed by the Immune System, but as they start to multiply rapidly, your body starts to detect them, as well as this the bacteria start to damage the environment around them. The Immune System has to stop them…

First of all, the macrophages (guard cells) arrive at the battle, they are massive cells, ranging up to 21 micrometres long. They can defeat one-hundred bacteria at a time. They kill them by swallowing them whole and trapping them inside a membrane (a thin sheet of tissue or layer of cells acting as a boundary, lining, or partition in an organism) to confuse the bacteria and get broken down by enzymes (protein molecules in cells which work as catalysts) and are killed.



When the macrophages fight for too long, they call in heavy backup, releasing messenger proteins. Neutrophils leave their patrol routes in the blood stream and travel to the battle.

The neutrophils fight so furiously that they kill healthy body cells in the process, releasing toxins and generating barriers which trap and kill the bacteria, they even evolve to commit suicide after five days so that they don't cause too much damage! If this is not enough to stop the invasion, the dendritic cell (brain of the Immune System) kicks in. The dendritic cell starts to collect samples of the enemy (the bacteria) and makes a crucial decision…

TO…

~~Call in anti-virus forces that eradicate infected body cells.~~
Or an army of bacteria killers.

POP QUIZ…

What is a macrophage?
Bacteria?
A guard cell?
Or an illness?

In about a day, the dendritic cell travels to the nearest lymph node, here, billions of helper and killer T-cells are waiting to be activated. When T-cells are born they go through a difficult and complicated training process and only a quarter make it through. The surviving cells are equipped with a specific set-up, and the dendritic cell is looking for a helper T-cell with a set-up which is just right.

When the Dendritic cell finds one, a chain reaction takes place, the helper T-cell is activated, quickly duplicating thousands of times. Some of these clones become memory T-cells that stay in the lymph node and will make you practically immune against this enemy, some travel to the field of battle to help out and the third group travels to the centre of the lymph node to activate a very powerful weapons factory. Like the T-cells, B-cells are born with a specific set-up, and when a B-cell and a T-cell meet, things go crazy. The B-cell duplicates rapidly

and starts to produce tiny weapons, antibodies, little proteins that are engineered to bind to the body of the intruders.

VICTORIOUS!

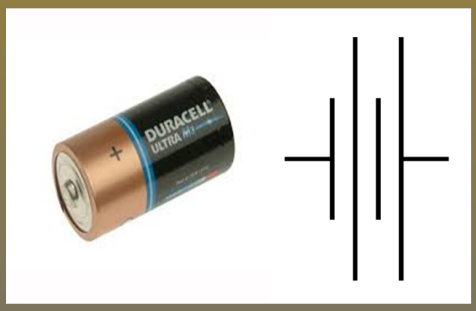
Meanwhile at the battle, the situation is getting dire, the bacteria have multiplied. The guard and attack cells fight harder, but without help they can't overwhelm the enemy, soon after millions of bacteria flood the battlefield and disable the bacteria, rendering them helpless or killing them in the process. Their back is built to connect to killer cells, so they can connect and kill the enemy more easily. Macrophages are especially good at breaking up the bacteria that the antibodies have attached to. Now the tables turn, in a team effort the infection is wiped out. If the Immune System ever encounter these bacteria again, the memory cells will kill the infection before you even notice.

By Ernest Gresty 5B

CIRCUITS!

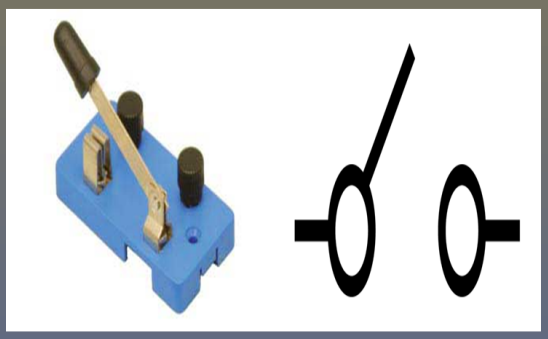
Circuits are paths for electrical current to flow. A circuit must have a power source [most commonly a battery] and wires connected to the positive + and negative – ends of each component. Electricity will only flow through a circuit that is complete [has no gaps]. Adding more batteries to a simple circuit will increase the electrical energy. Here are some components:

BATTERIES



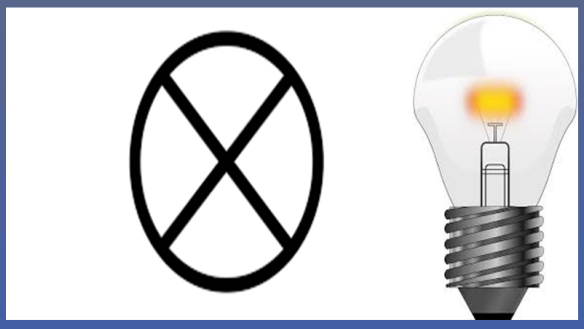
A battery is a source of energy which provides a voltage [a push] of energy to get electricity flowing through a circuit. Chemicals inside the battery store the energy. When the battery is used, the chemical energy changes into electric energy.

SWITCHES



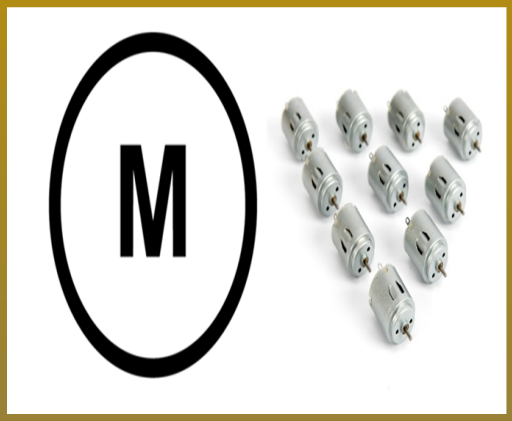
A switch can create a gap in a circuit, and can be used to switch it on and off. When a switch is open [off], there is a gap in the circuit, therefore electricity cannot flow through it. When a switch is closed [on], there are no gaps, so the circuit is complete. Electricity can now flow through it.

BULBS



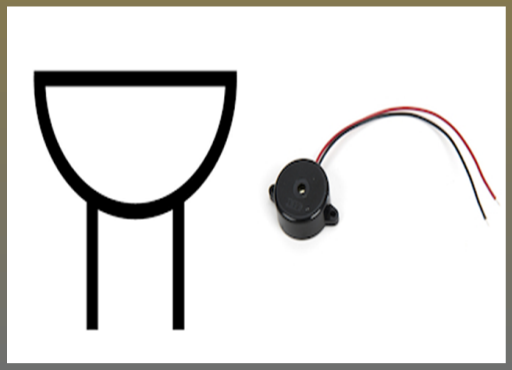
Light bulbs are used to turn electricity into light. They do this by sending an electric current through a thin metal wire called a filament, usually made of tungsten. The filament gets hotter and hotter until it starts to glow. The filament needs to be protected from oxygen, so the inside of the bulb has no air – it is a vacuum.

MOTORS



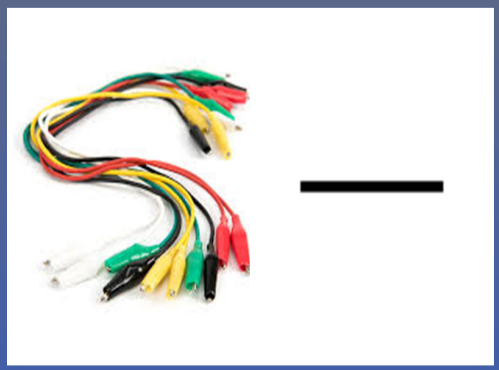
Motors use electrical current to make an axle (metal rod) rotate extremely fast. They do this by powering magnets called electromagnets. Electromagnets have two poles; north and south. When two of the same poles come near each other, they will repel. In a motor, this motion makes a magnet spin and as the magnet is attached to the axle, it too spins.

BUZZER



The buzzer consists of an outside case with two pins to attach it to power and receive current. Inside is a piezo element, which consists of a ceramic disc surrounded by a metal vibration disc. When current is applied to the buzzer it causes the ceramic disc to contract or expand. This then causes the surrounding disc to vibrate. That's the sound that you hear.

WIRES

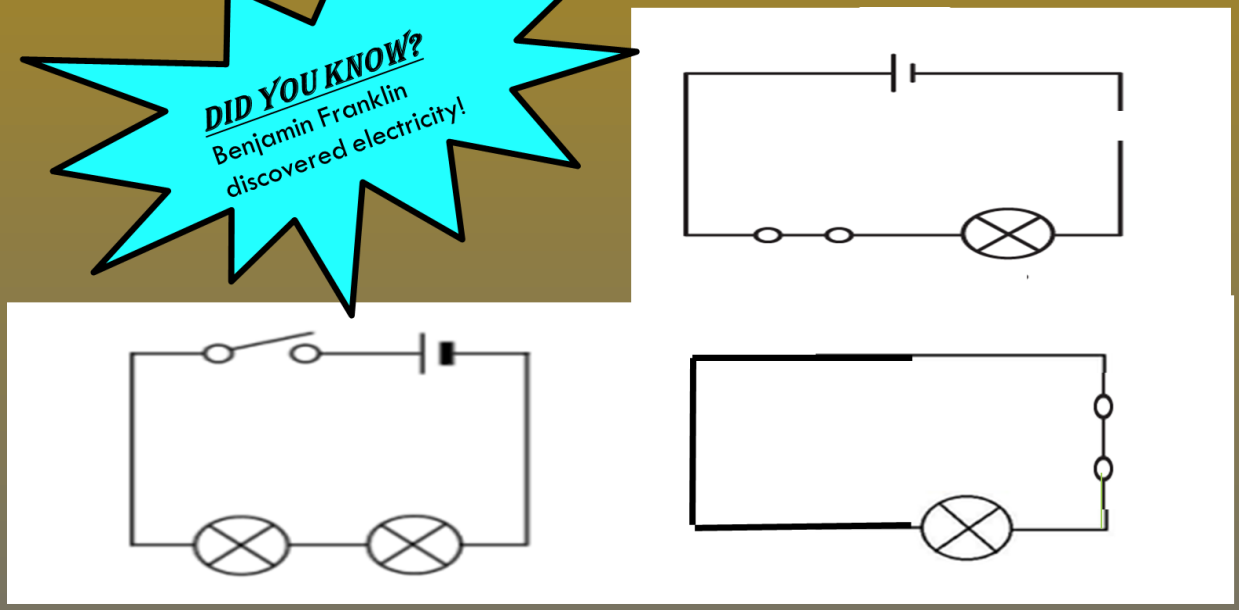


Wires are the long, thin tubes used to transport current from one component in a circuit to the next. They consist of a metal strip which conducts electricity (lets it flow through). This is surrounded by a plastic casing which is an insulator (does not let electricity pass). This is there to make the wire safe to hold and stop you from getting an electric shock.

QUIZ

Can you figure out why the circuits below won't work?

DID YOU KNOW?
Benjamin Franklin discovered electricity!



WORD SEARCH!

S	G	R	J	T	V	N	K	F	D	C	J	G	E	T	V	K
E	S	A	Q	K	P	L	H	F	H	I	E	W	D	R	Y	D
M	O	T	O	R	A	Z	S	Q	E	R	N	G	U	I	I	R
T	F	L	T	D	S	R	H	D	D	C	F	K	H	R	E	T
S	E	T	J	R	N	T	U	D	Y	U	S	G	D	U	R	U
K	Y	S	F	K	F	G	R	Y	E	I	T	H	Y	D	Y	S
S	F	B	A	T	D	W	F	F	U	T	W	D	R	G	Y	I
E	S	A	Y	S	H	A	I	Y	D	W	L	K	F	J	G	N
W	D	T	F	S	U	O	H	R	O	K	E	T	O	Y	D	K
R	G	T	J	L	J	D	T	M	E	L	U	S	R	H	B	G
U	R	E	G	L	R	N	G	I	O	H	D	I	B	U	L	B
J	B	R	J	C	E	C	J	U	W	R	U	D	Z	H	S	F
Z	S	Y	J	R	F	J	B	J	C	H	C	I	H	D	Y	E
G	U	E	R	F	J	U	U	R	R	U	E	E	I	E	Y	F
Z	V	U	B	C	G	B	Y	C	T	R	B	R	E	U	C	M
X	C	R	T	E	Y	Y	H	C	T	I	W	S	G	N	M	N
B	C	K	E	Y	E	N	M	F	N	U	E	F	U	R	I	Y

MOTOR
CIRCUIT
WIRE
BATTERY
CURRENT
BUZZER
BULB
SWITCH

By Shay Nagda 5B

Inspirational Women

Marie Curie

1867-1934

Marie Curie was born on November 7, 1867 in Warsaw, Poland. She was born as Maria Sklodowska but changed her name to Marie when she moved to Paris. She had four siblings – all older than her.

Marie's parents were Wladyslaw Sklodowski and Bronislawa Sklodowska. Marie Curie moved to Paris to study there in 1891 where she met her husband, Pierre Curie.

Did You Know?

Marie Curie was the first female to have won the Nobel Prize.

"One never notices what has been done, one can only see what remains to be done."

- Marie Curie

"Have no fear of perfection;

you'll never reach it."

- Marie Curie

- Marie Curie is best known for her discovery of 2 elements – radium (named after the Latin word for ray) and polonium (named after Marie's home country, Poland).
- She is the only woman who has shared the Nobel prize with her husband, Pierre Curie and with physicist Henry Becquerel in 1903.
- Marie and Pierre Curie discovered radium and polonium in 1898 and they are a part of the Periodic Table of Elements.

"Be less curious about people and more curious about ideas."

- Marie Curie

"Nothing in life is to be feared, it is only to be understood.

Now it is the time to understand more, so that we may fear less."

- Marie Curie

Marie Curie died of aplastic anemia on 4th July, 1934.

Did You Know?

Marie Curie's daughter also won the Nobel Prize for Chemistry.

Rosalind Franklin

1920 -1958

Who was Rosalind Franklin?

Rosalind Franklin was an English chemist and X-ray crystallographer who was born on 25th July 1920 in Notting Hill, London, England. Her father was Ellis Arthur Franklin and her mother was Muriel Frances Waley. Franklin studied at a private day school at Norland Place in West London, Lindores School for Young Ladies in Sussex and St Paul's Girls' School in London. She then studied Natural Sciences Tripos at Newnham College in Cambridge, where she graduated in 1941.

Rosalind Franklin studied the holes in coal before DNA. She loved travelling and backpacking. She loved her work and continued to work until her final breath.

Rosalind Franklin had three brothers and one sister and was the second of the five children.

"Science and everyday life cannot and should not be separated."

-Rosalind Franklin

⇒ Rosalind Franklin studied and made contributions to the formation of DNA (deoxyribonucleic acid), RNA (ribonucleic acid), viruses, coal and graphite.

⇒ She is best known for her work on X-ray diffraction studies.

⇒ She is also known as the Dark Lady of DNA.

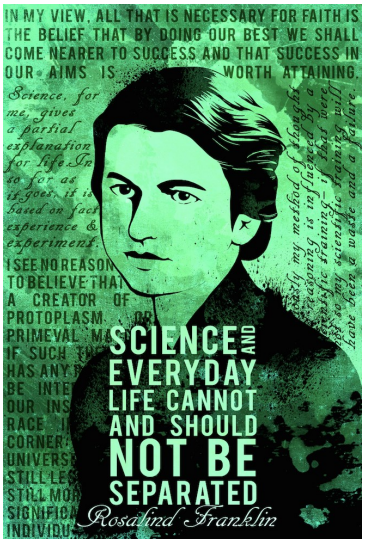
⇒ She discovered the double helix structure of DNA.

⇒ She died on 16th April 1958 from ovarian cancer.

Rosalind Franklin never got married or had children.

"In my view, all that is necessary for faith is the belief that by doing our best we shall succeed in our aims: the improvement of mankind."

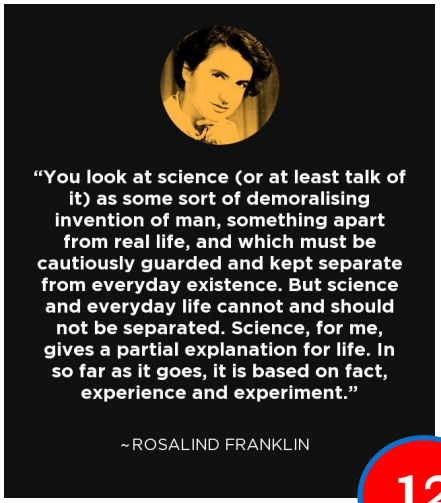
-Rosalind Franklin



By

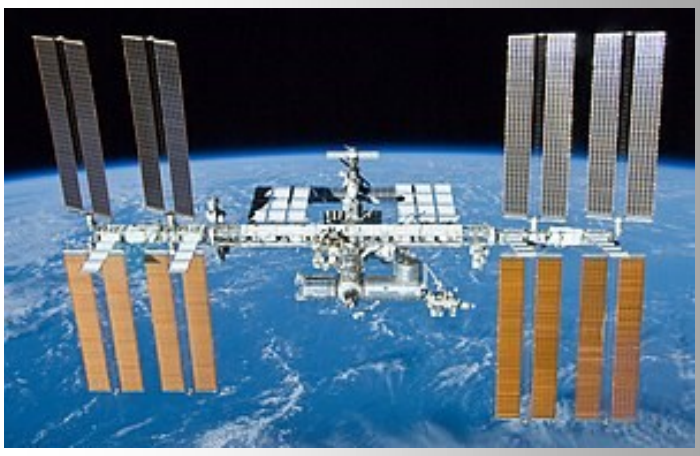
Siya Nanavati

5G



International Space Station (ISS)

By Joshua Griffith 6F



WHAT IS THE ISS?

The **ISS** is an international **SPACE STATION.** It's a **LABORATORY** and home, in space, for **ASTRONAUTS** who live there months at a time. The ISS is also the most expensive man made object by far, costing $110 billion.

WHERE IS THE ISS?

The **ISS** is 250 miles above the Earth's surface, this is known as low **ORBIT.** If it was on **EARTH** the **ISS** would weigh 1 million pounds! But being in space makes it weightless.

Did you know?

The **ISS** has no gravity, this means water turns into bubbles and floats around inside the station.

WHEN WAS THE ISS BUILT?

Construction for the **ISS** began in 1998 and finished in 2011, although there has always been at least one **ASTRONAUT** in it since 2000.

HOW WAS THE ISS BUILT?

Pieces of the **ISS** were built on land and then launched into space on **ROCKETS** then put together over thirteen years. The **ESA** (European Space Agency), NASA and many other groups worked together to make the **ISS.** After Brexit, the UK will still participate in the **ISS** project because the ESA is separate from the EU. But the UK will not participate in any future EU driven projects.

HOW DOES THE ISS WORK?

The **ISS** is powered by sixteen solar rays, which charge the batteries that provide the energy for the **ISS**.

INTERNATIONAL SPACE STATION WORDSEARCH

E	J	N	B	R	B	T	J	W	A	P	L	D	F	S
S	A	Q	P	D	O	L	W	N	E	A	S	F	O	N
A	R	R	T	E	N	C	R	N	S	G	W	W	R	B
T	T	Q	T	W	W	T	K	E	A	F	D	G	B	E
E	Y	C	G	H	T	S	F	E	C	D	H	J	I	C
L	X	F	G	F	S	F	T	J	T	D	F	F	T	A
L	C	F	Y	I	T	K	U	D	Y	S	I	T	X	S
I	C	H	D	D	E	D	T	V	T	C	G	S	T	T
T	S	O	L	A	R	P	A	N	E	L	S	P	X	R
E	U	D	F	C	G	G	U	F	U	C	H	A	J	O
L	A	B	O	R	A	T	O	R	Y	J	C	C	X	N
Y	D	U	G	V	G	W	I	H	V	H	X	E	C	A
G	R	A	V	I	T	Y	G	M	G	N	N	J	J	U
U	H	T	L	I	J	T	H	H	U	J	J	N	T	T
J	S	P	A	C	E	S	T	A	T	I	O	N	J	S

ISS **EARTH** **LABORATORY**

ESA **ASTRONAUTS** **ROCKETS**

SPACE STATION **SPACE** **SATELLITE**

ORBIT **GRAVITY** **SOLAR PANELS**

(In the word search there are no spaces in between ‘space’ and ‘station’ or ‘solar’ and ‘panels’).

The World of Cells and Microbes

by Harshita Sinha 6O

Did you know that there are three main types of Microbes:

FUNGI

VIRUSES

BACTERIA

Fungi grows on nutrients and sugar. They are microorganisms and an example is yeast. Though fungi can be harmful, many foods we eat include it. Many people eat them every day as they are in bread. You shouldn't eat raw yeast as it will grow inside of you. Neither should you put raw yeast in your eyes, ears or nose. Did you know , that fungi are classified as a Kingdom.

Fungi

Three diseases Fungi can cause are:

- Athlete's foot
- Verruca
- A fungal nail

Viruses

Three diseases viruses can cause are:

- The common cold
- Flu (influenza)
- Chickenpox

A virus like fungi is a microorganism, it needs a host cell to survive. Unlike fungi and bacteria, a virus cannot reproduce but can copy itself exactly by feeding on the protein and nutrients of its host cell. Did you know viruses can infect anything from plants and animals to bacteria and microorganisms?

Bacteria are single-celled organisms. They are usually a few micrometres and can multiply rapidly. Did you know, they usually live in groups of millions. Bacteria inhabit deeper portions of the Earth's crust. During the period of their growth, some of the bacteria produce toxins which are vastly harmful to living organisms and can cause different diseases.

Bacteria

Three diseases Bacteria can cause are:

- Pneumonia
- Cholera
- Typhoid

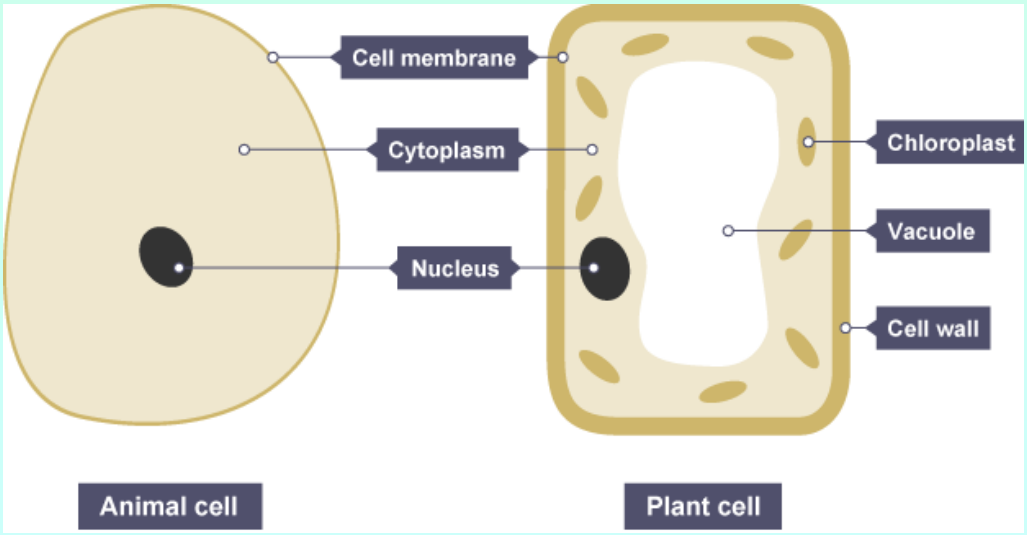
Cells

Cells are usually called 'the building blocks of life'.

Plants and Animal cells

DIFFERENCES !!!

ONLY plant cells	BOTH plant & animal cell
Vacuole	Cell Membrane
Chloroplast	Cytoplasm
Cell wall	Nucleus
Cell sap	



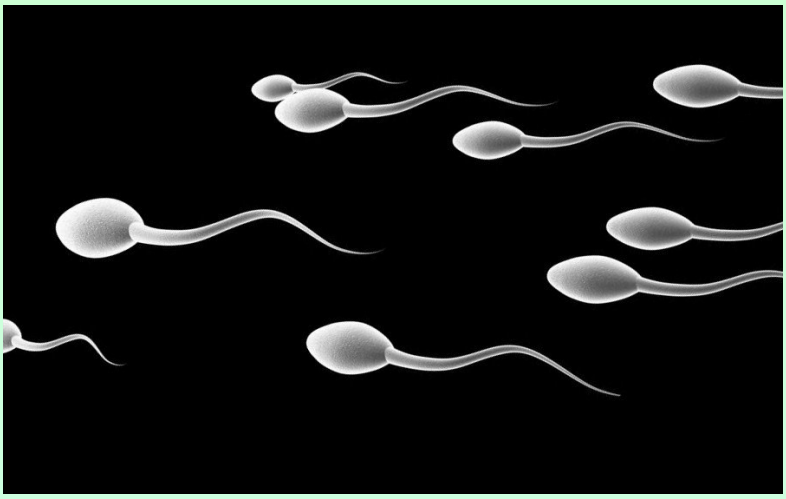
The Nucleus controls what happens in a cell.

The cell wall supports plant cells and is very strong.

Every cell is full of cytoplasm.

The cell membrane surrounds cells like a border.

Different types of Cells

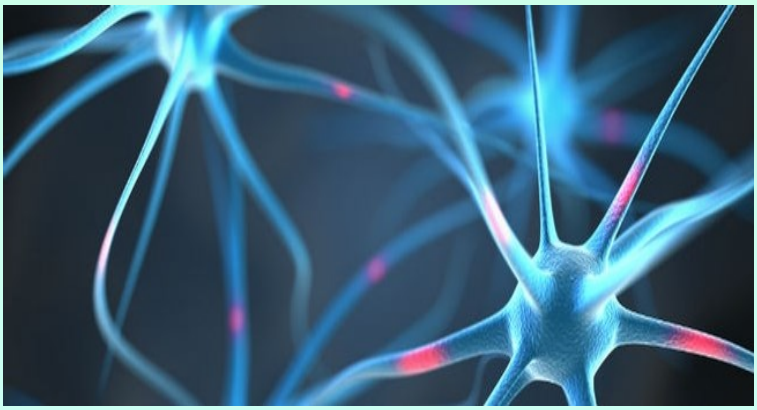


Sperm Cell

This is the male reproductive cell and its job is to find the egg cell, which is the female reproductive cell.

Red Blood Cells

These cells carry oxygen around your body and remove carbon dioxide. They take oxygen up to your lungs. The typical life span is 120 days.

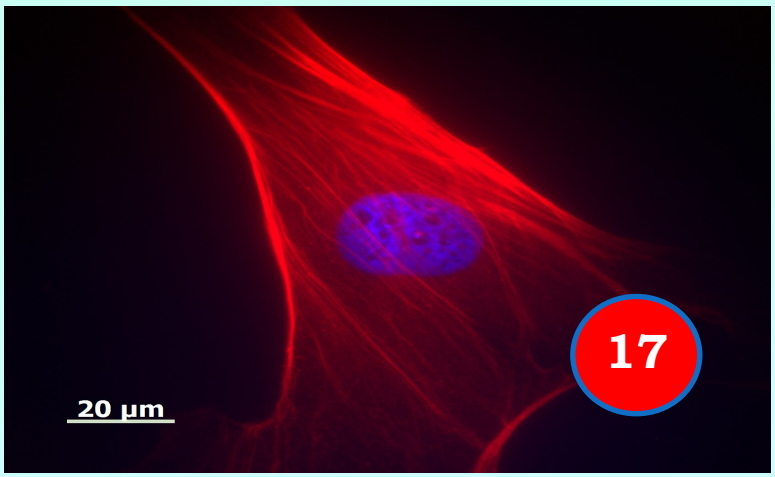


Nerve Cell

This cell is found in your nervous system. There job is to move and send messages from one part of your body to another

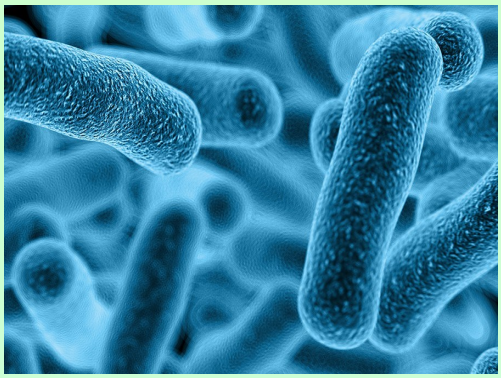
Muscle Cells

A muscle cell is a cell which can be found in muscle tissue. These cells are long and tubular and form out of myoblasts to make the muscles in our body.

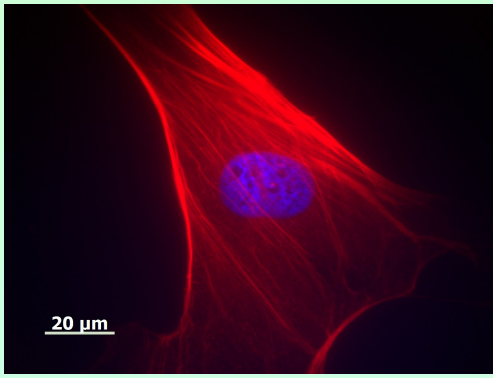


Can you match these up?

NERVE CELL



RED BLOOD CELL

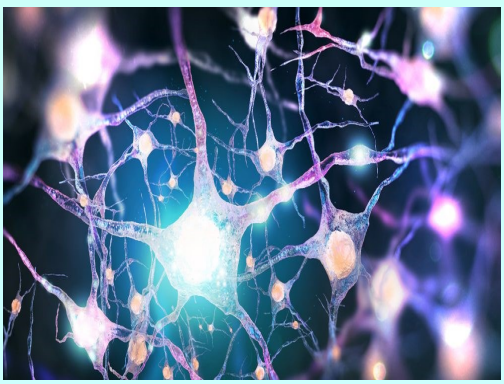


FUNGI

SPERM CELL

VIRUS

MUSCLE CELL



BACTERIA

Solve these Anagrams

IFGUN = _____

LECLS = _____

PSERM = _____

LESMU = _____

ISVUR = _____

VNEER= _____

ABATIERC = _____

Climate Change

by Shayan Dalia-Patel 5G

The Earth's climate has seen many changes in its 4.55 billion years. For example, 18,000 years ago most of Britain was covered in ice and glaciers. Although changes to the Earth's climate are natural, current changes are a result of increasing human populations and activities.

When talking about climate change in relation to human activities climate change can be said to mean –

'The build-up of man-made gases in the atmosphere that trap the sun's heat, causing changes in weather patterns around the world.'.

These climate change effects are due to an increase in *greenhouse gases* in the atmosphere. The main gases are carbon dioxide, methane and nitrous oxide. Water vapour in the atmosphere also plays a role.

Greenhouse gases in the atmosphere prevent the Earth from getting too hot or too cold. However, as the greenhouse gases in the atmosphere increase, global warming occurs.

Have you heard of the Ice Age?

Not the film, but the condition that planet Earth was in many thousands of years ago? Earth has been in and out of ice ages all through its billions of years of existence. Much of the planet was regularly covered in huge ice sheets and glaciers as the air temperatures plummeted then rose again, causing the ice to melt. This is one reason why the woolly mammoth is thought to have

become extinct. Its habitat melted and it couldn't survive in the warmer climate.

Why is climate change happening?

Ten thousand years ago: There was no fuelled transport, machinery or electricity. Not even mobile phones!! Things stayed like this for thousands of years. Humans used horses and oxen for farming and transport.

In the 1700s: Humans invented more complicated machines, which needed some sort of energy to power them. Coal, oil and natural gas (fossil fuels) were discovered underground.

1800s to Present Day: We started burning fossil fuels and discovered electricity. Over the years, industry and technology has improved rapidly, increasing the amount of power used in transport, manufacturing (making things in factories) and electricity. The population (number of people) of the world has also increased dramatically, which means even more people use transport, manufactured goods and electricity.

So why does it matter that climate change is happening?

Well, it is happening more quickly now than ever. Humans are believed to be speeding up the rate at which the climate is getting warmer.

Volcanic eruptions, the burning of fossil fuels, deforestation mainly from forest fires, pollution and agriculture (paddy fields where rice is grown) all release greenhouse gases into the atmosphere causing global warming.

As sea levels rise, some places such as Maldives and Venice risk disappearing altogether one day. Many plants and animals cannot adapt quickly enough to the changes in order to survive, like the poor old woolly mammoth. Warmer temperatures are affecting

seals and polar bears too, as they need cold temperatures to survive.

How can we help? We can do simple things like:

- Walk or cycle to school if possible, to reduce pollution
- Re-cycle to reduce waste
- We already have electric/hybrid cars that don't burn fuels like petrol and diesel.
- Grow our own fruits and vegetables.

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O	E	Q	S	B	N	P	I	Y	T	E	W	C	H	U
W	N	J	S	D	A	E	M	R	A	U	P	O	R	T
A	H	T	I	A	C	L	U	P	T	F	L	A	R	A
F	O	I	L	E	L	R	W	H	S	C	Q	L	G	R
X	U	G	F	N	O	B	J	A	E	L	E	S	O	E
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E	S	Y	O	G	Z	R	N	C	D	E	H	X	G	F
N	E	D	E	R	E	H	P	S	O	M	T	A	W	S
W	S	Q	M	I	K	E	A	G	W	P	E	Y	O	R

GLOBAL WARMING DEFORESTATION VOLCANO

FOSSIL FUELS GREENHOUSE GASES ELECTRICITY

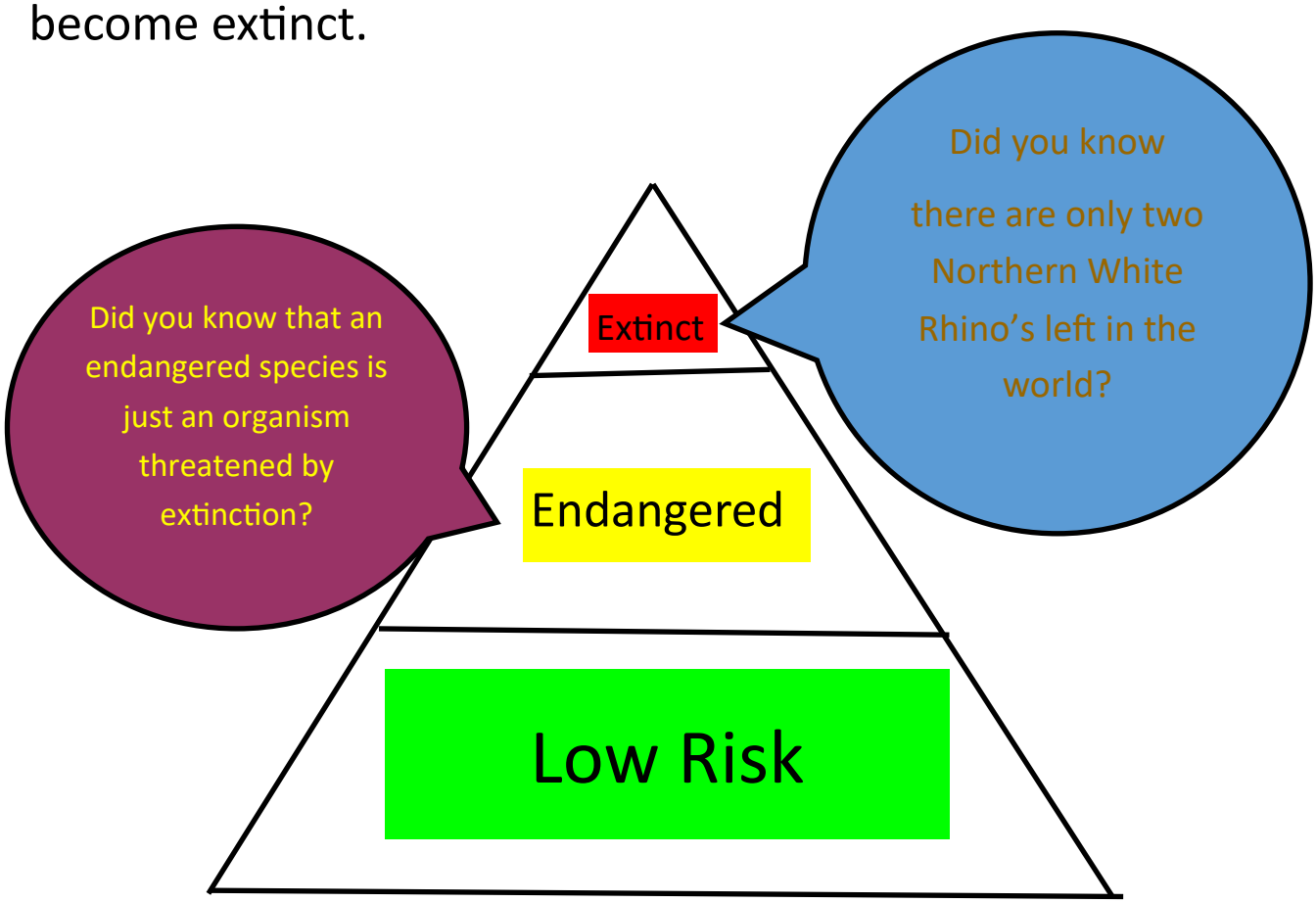
ICE AGE HYBRID CARS POLLUTION

CLIMATE TEMPERATURE FLOODS

ATMOSPHERE OIL COAL

Endangered Animals

Endangered animals are species that are in danger of becoming extinct but we humans can help them to move into the Low Risk part of the Danger Pyramid, rather than letting them become extinct.



In the animal kingdom there are different species of mammals, birds, amphibians, reptiles and fish which are endangered.

Here are some examples of Endangered Animals

Asian Elephants

Current population: 40,000—50,000

Where do you find them: deciduous and evergreen forests of Asia.

Why is it endangered: poaching for tusk and habitat loss.

Snow Leopard

Current population: 4,000—6,500

Where do you find them: Himalaya mountains.

Why is it Endangered: climate change and poaching for skin.

Black Rhino

Current Population: 5,000—5,400

Where do you find them: Namibia, East Coastal Africa.

Why is it Endangered: habitat loss and poaching for horn.

Blue Whale

Current Population: 10,000—25,000

Where do you find them: Southern Chile, Gulf of California and Coral Triangle.

Why is it Endangered: poaching for oil and meat.

Why are many species of animals becoming endangered?

There are many reasons for animals to become endangered.

Here are some of those reasons:

Poaching animals leave them at risk because their body or body part is more important than the parts we use for medicine, food and luxury artifacts.

If an animal's **habitat** is destroyed then it will not have a home, and so without any shelter or habitat it will eventually become an endangered species.

Pollution can be another reason for animals to become endangered because of water spills, plastic pollution, acid rain and oil spills. These have been shocking for birds and fish species.

Fishing and hunting animals can be a disaster because that decreases the number of living animals. Animals are hunted for their fur, meat and other parts because those parts are valuable for humans and care should be taken to use such resources sparingly.

How can we help?

1. Don't destroy an animal's habitat.
2. Join and support animal charities such as WWF and Wildlife Trust.
3. Adopt an animal.
4. Buy sustainable products.
5. Tell lobby governments to change laws locally and internationally.
6. Help charities to research alternative medicines.

Here is a short story about a Snow Leopard.

"A farmer came in the morning to look at his goats but he saw that all of them were killed. The farmer found out that it was a Snow Leopard that had killed the goats and said if he found that Snow Leopard he would kill it."

Please be nice to the animals who share the planet with us humans!!

Quiz Time!

Let's see what you remember from this article!

1. What are endangered animals?
2. How many Northern White Rhinos are there left in the world?
3. What is the current population of Asian elephants?
4. Why are snow leopards endangered?
5. Where do you find Blue Whales?
6. Why are Black Rhinos endangered?
7. What are the four main reasons given in this article for animals becoming endangered?
8. Give three examples of how we can help animals from becoming endangered?
9. What is the current population of the Blue Whale?
10. 'Please be nice to the animals who share the planet with us humans'. What do you think that means?

By Kaushalyah Jeyakumar 5B

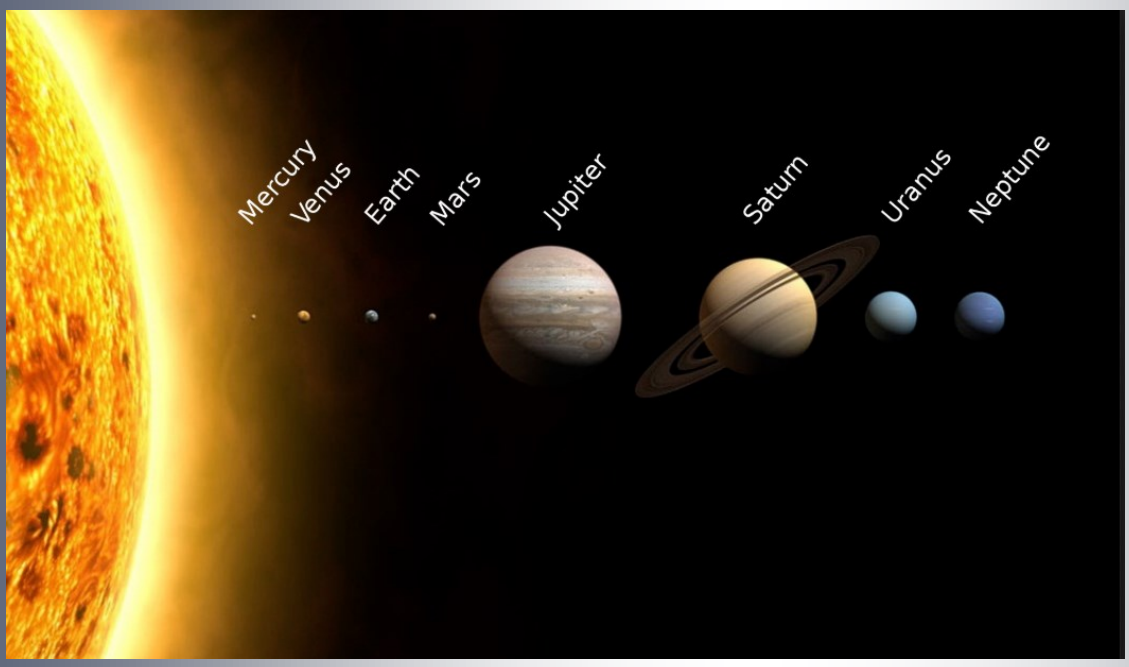
Mars and Beyond

By Shivam Trivedi 6O

Mars

Humans have a strange fascination about one red dot in the sky and our next-door relative, which we all identify as planet Mars. In this article, I would like to take you on a short journey and talk about Mars. Recent discoveries and events have made our attraction towards this red planet even more interesting.

I hope you enjoy my article!



In our solar system, Mars is the fourth planet from the Sun and the second largest planet. Mars is named after the Roman god of war. One may wonder why Mars appears red; it's the presence of iron oxide in the dust on its surface which gives Mars its' reddish appearance and hence it is also known as the "Red Planet".

Mars Profile

First Record	2nd millennium BC
Recorded By	Egyptian Astronomers
Orbit Period	687 days
Moons	2 (Phobos & Deimos)
Surface Temperature	-153 to 20 °C
Equatorial Diameter	6,792 km

Mars' volume is 163,000,000km^3 and it and it has two moons, Phobos and Deimos, Phobos being the bigger one.

Did you know that Mars also has the largest volcano in the world? Olympus Mons, a large shield volcano, is over 25km high. That's over three times as high as Mount Everest! Despite having formed over billions of years ago, evidence of volcanic lava flows could mean it is still active, as believed by many scientists.

Martian surface gravity is only 37% of the Earth's. This could mean you could leap three times higher on Mars. Isn't that amusing?

Did you know that Mars has the largest dust storms in the solar systems? They can last for months and can cover the entire planet. I guess it is not a good place for someone with dust allergies!

For years Mars has been known to have water in the form of ice at both the north and south poles, and it is the only other planet in addition to Earth that has polar ice caps. The Northern cap is called Planum Boreum and the Southern cap is called Planum Australe.

Scientists have found tiny traces of Martian atmosphere which has been ejected from Mars and orbits the solar system, before crash landing on Earth. This has helped scientists to study Mars, prior to launching space missions.

Mars Missions

Since the first spacecraft was sent to Mars in 1960, there have been at least sixty missions launched to or flown by Mars. More than half of these missions have failed, however there have been success along the way.

The Viking landers were the first spacecraft to land on Mars in the 1970s. Viking 1 and Viking 2 each had both an orbiter and a lander. These two landers took images of the Martian surface, studied soil samples and studies the atmosphere on Mars.

Some of the fascinating images of Mars have been taken by the Hubble Space Telescope which was launched by NASA in 1990.

Mars Rovers

Since 1970s, scientists have been sending spacecrafts to Mars. Some of them were orbiters, taking pictures as they zoom around the planet and others were landers, which provided information from their landing spots on the surface of Mars.

Rovers however possess a significant importance. They have wheels and specialize in moving on rough terrain. They land on the surface Mars and drive around to different spots.

Rovers help scientists in their quest to understand what different parts of the planet are made of. Mars is made up of lots of different types of rocks, and each rock is made up of a mixture of chemicals. A rover can drive around to different areas, studying the different chemicals in each rock. These chemicals can tell scientists something about the environments that changed that rock over time.

Sojourner

Sojourner landed on Mars in July 1997 and was the first wheeled robot to rove the Red Planet. However, it travelled just over 100 meters by the time communication was lost.

Spirit & Opportunity

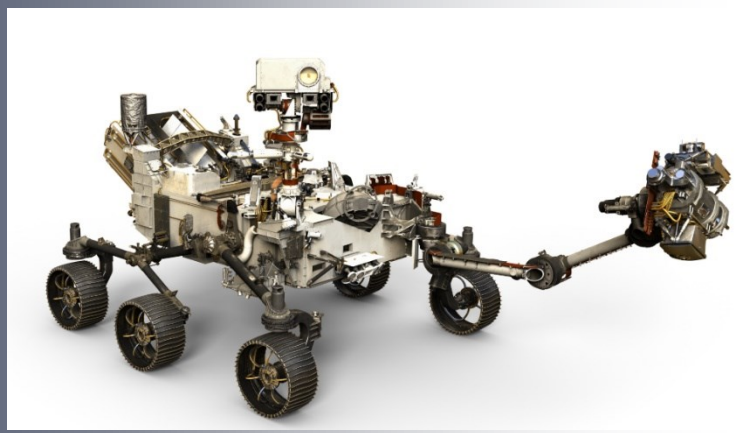
Two rovers named Spirit and Opportunity landed on the opposite side of Mars in January 2004. They had far greater mobility than any other rovers and were able to collect and send significant information for scientist to analyse. Scientist found evidence of water on Mars with the help of data sent by these rovers.

Curiosity

Curiosity rover is a car-sized rover designed to explore crater Gale. The rover's goals include investigation on climate, assess whether crater Gale ever offered conditions favourable for microbial life, investigation of the role of water and possibility of human exploration.

Mars 2020

Mars 2020 is a future mission on Mars to assess possibility of past life on Mars. It will be Mars sample-return mission for NASA.



Volcanoes

Introduction

What is a volcano? - A volcano is an opening in Earth's crust.

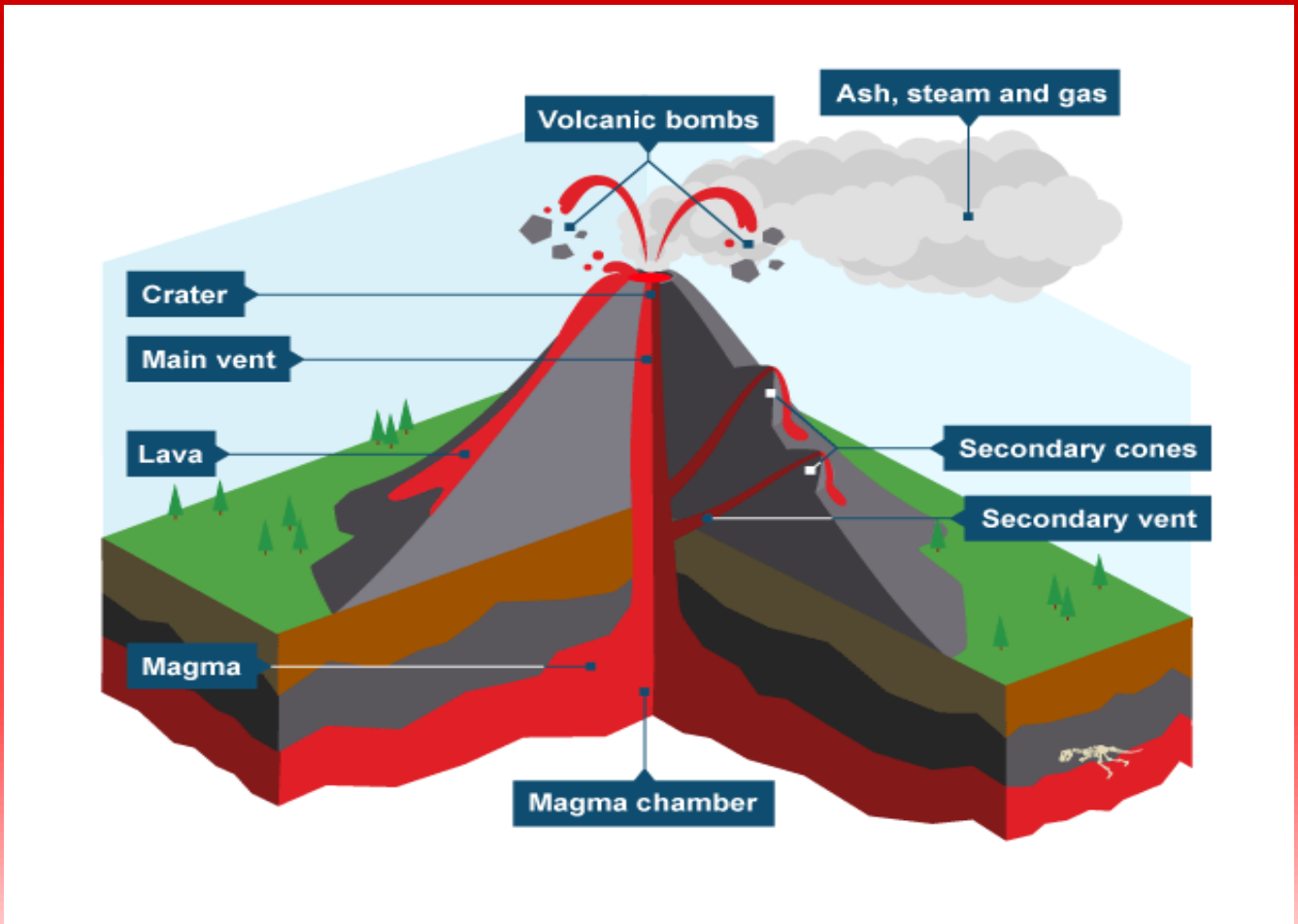
What happens when a volcano errupts? - When a volcano erupts, hot gases and melted rock from deep within Earth and find their way up to the surface. This material may flow slowly out of a fissure, or crack, in the ground, or it may explode suddenly into the air.

What damage can a volcano do? - Volcanic eruptions may be very destructive, but they also create new landforms. Did you know that there are more than 1,500 potentially active volcanoes in the world today? Three quarters of the worlds active volcanoes are underwater.

Where are Earth's Volcanoes?

Volcanoes are found in just a few areas of the world. Most lie close to the boundaries of the tectonic plates. These are great slabs of rock that fit together like a jigsaw to make up the Earth's surface.

Many volcanoes form part of a chain called the Ring of Fire, making a huge arc around the Pacific Ocean. Other volcanoes sit over hot spots in the middle of tectonic plates. Many of these form islands out in the ocean.



Features of a volcano

Magma chamber - a large underground pool where magma is stored.

Lava - the magma once it has reached the surface.

Crater - the bowl-shaped basin in the top of a volcano that has been blown off from an eruption.

Vent - central tube which magma travels through.

Secondary cones - eruptions from other vents may build up secondary cones on the flanks.

Ash, steam and gas - material thrown out by the volcano.

Volcanic bombs - larger material thrown out by the force of eruption.

How Does a Volcano Erupt?

An eruption occurs when pressure in the magma chamber forces magma up the main vent, towards the crater at the top of the volcano.

Some magma will also be forced out of the secondary vent at the side of the volcano.

Volcanic Activity

Volcanoes can be can be:

- Active and erupt frequently.
- Dormant (temporarily inactive but not fully extinct).
- Extinct (never likely to erupt again).

Volcanoes can also be described by their shape or type - shield or composite.

Composite volcanoes are steep-sided and cone-shaped, made up of layers of ash and lava, containing sticky lava which doesn't flow very far.

10 Explosive Volcano Facts!

1. Put simply, a volcano is an opening (usually in a mountain) in the Earth's surface from which gas, hot magma and ash can escape.

2. The word "volcano" comes from the Roman name "Vulcan" – the Roman god of fire.

3. Volcanoes are often found at meeting points of what are called "tectonic plates". These plates are pieces of the Earth's surface that fit together just like a jigsaw puzzle.

4. Volcanoes aren't only found on the boundaries of tectonic plates, though. They can also occur over "mantle plumes" – super hot areas of rock inside the Earth.

5. 350 million, or one in 20 people in the world live within "danger range" of an active volcano.

6. Volcanoes are classified as active, dormant or extinct depending on the amount of volcanic activity happening. "Active" means there's regular activity, "dormant" means there's been recent activity but that it's currently quiet and "extinct", means it's been so long since the last eruption that it's unlikely to ever erupt again.

7. When you imagine a volcano, you might picture it as a large, slope-sided mountain, but volcanoes can actually be a variety of shapes. Shield (flat), composite (tall and thin), cinder cones (circular or oval cones), and lava domes (where dome-shaped deposits of hardened lava have built up around the vent, as the lava is too thick to flow very far).

8. Magma is the name given to hot liquid rock inside a volcano. Once it leaves the volcano, it's known as lava.

9. Volcanoes don't just occur on land, they can be found on the ocean floor and under ice caps, too!

10. Lava can reach 1,250°C and has the potential to burn everything in its path! If you used a glass thermometer to take the temperature it would melt.

Recent Events

On Saturday 22nd December 2018, an explosion on Anak Krakatau volcano island caused a tsunami that hit Sumatra and Java where more than 420 people died and 40,000 were displaced.

There was no warning of the giant waves which struck at night, destroying hundreds of buildings, sweeping away cars and uprooting trees.

Scientists say Indonesia's Anak Krakatau volcano island, which erupted and collapsed triggering a deadly tsunami, is now only about a quarter of its pre-eruption size.

Word Search

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Active Hazard Ash Lava

Magma Cone Extinct Dust

Crater Ring of fire Crust Vent

Dormant Volcanic bombs Earthquake Volcano

Plate boundary

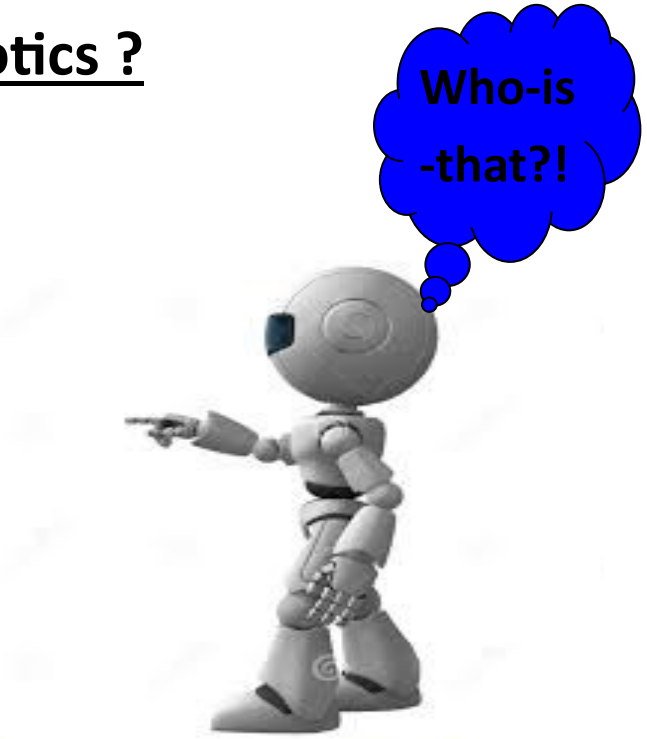
By Mili Shah 6O

ROBOTICS

By Ishaan Bhandari 6O

What, how, why, where, when, who?

What is robotics ?



Robotics is the use of machines that can function like a real person. They are often pictured as humans talking in a mechanical voice whilst moving their arms sharply. Robots are programmed to do certain functions when commanded to, and you will find that they are very similar to puppets. But there is whole lot more to it than just that. In this article, get ready to ride through a series of robotic developments and learn how robots work!

How do robots work?

Some very practical robots uses specific gadgets to behave almost like humans. This is called artificial intelligence or AI.

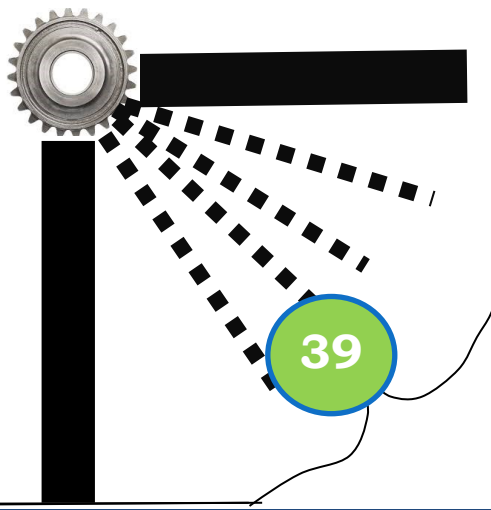
They use light and colour sensors as cameras to differentiate various colours and light. Touch sensors on their hands to feel and grip, and temperature and rain sensors to know when to fold up different parts of their body and of course the brain which stores the information for later use. This is how they can react with their environment and surroundings.

The remote control sends wireless messages to the brain of the robot when the button is tapped and therefore it is given a command.

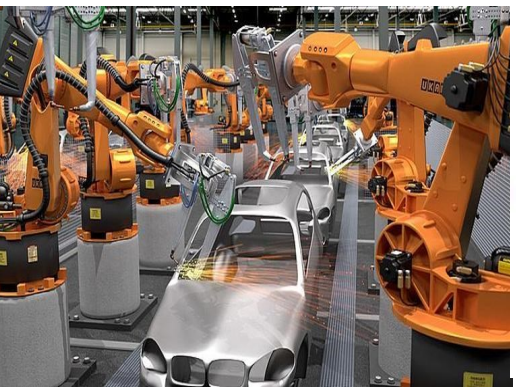
The brain or Central Processing Unit in the motherboard understands the message sent by the remote and converts it to a computer language.

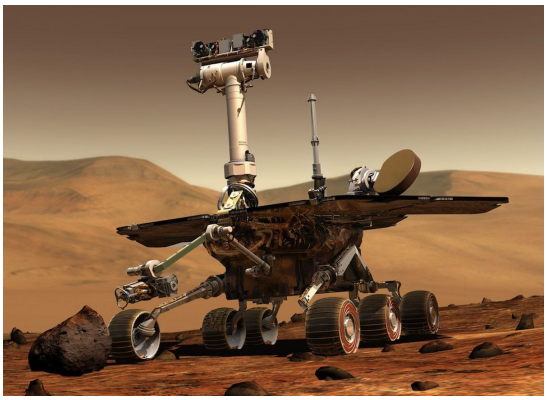
Before going to the motors of the hand, the memory records it, just in case it is needed for further usage in the future.

Finally, the robot arm understands the message given by the brain and follows the command by telling motor A for example to move 45^0 clockwise.



Why did we even bother about robotics ?

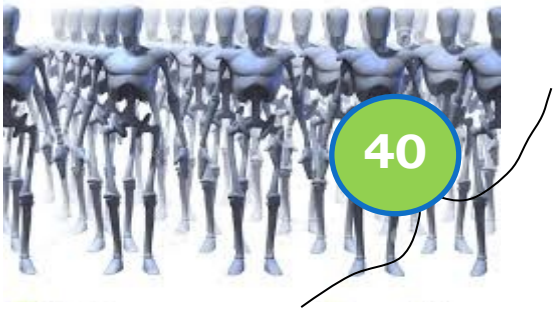




Well, who would build cars, candy bars, electronic circuits? Who would explore houses with unexploded bombs, clear gas tanks or travel to Mars? Robots can easily do this! They can come as hoovers or programmable pets in your house. They don't fall sick, never take a day off work, don't need food or water, don't make mistakes and never complain!

Where are the most robots in the world ?

Tokyo, JAPAN, is where the most robots can be found. It is sometimes called the 'city of robots'!



When did robotics start developing, and who first invented them?

There are many early legends about robots – these include thoughts about talking inhuman servants, like the legend that originated from ancient Greece about talking mechanical attendants.

Then the first attempt at robots was made in 1000 BCE, when a Japanese artist, Yan Shi, made humanoid puppets that could sing and dance. Another Japanese artist made one that could play a musical instrument.

Electricity had not yet been invented—they were hand controlled. 600 years later, a mechanical steam bird, the Pigeon, was constructed by Archyatus of Tarentum. Around 1200 AD, Al Jazari made complex machines that floated on water and played instruments. Leonardo da Vinci created an armour kit which could walk, sit and even shake your hand. Here is a timeline of 1930 to 2019.

1930s

Elektro was a robot made in Ohio 1937—1938 that could move its head and limbs by voice command, speak and differentiate colours. It weighed 120kg and was 2m tall.

1940s

From 1948-1949 , W.G. Walter made Elmer and Elsie out of old war supplies and human body parts. They had touch and light sensors on their eyes and hands to react with objects.

1950s

Unimate was created by George Devol in 1954. It was an arm which could pick up hot metal and survive toxic fumes in an industrial car factory. Its info was stored in a magnetic drum.

1960s

The Tentacle and Stanford Arm were built in 1968 and 1969 by Marvin Minsky and Victor Scheinmann respectively. They were the first computer controlled ones.

1970s

WABOT-1 (1970-1973) was the first intelligent human scale robot. It could grip things measure distances, walk and even understand conversations! David Silver designed the Silver Arm in 1974 which could copy fine movements like us.

1980s

WABOT-2 was revealed in 1984. It had 2 feet and 10 fingers and in addition could play the organ. Genghis in 1989 was six wheeled and had 22 sensors and 12 motors.

1990s

AIBO was a robot dog introduced by Sony. ASIMO from Honda could recognise features and even run. Honda P2 and P3 were revealed, 1.8m tall and very human like in their in their actions. Cyberknife was a big hit because it could perform surgery and detect little things like heartbeat and uses laser radiation to get rid of tumour cells (cancer). Robonaut was a robot that could teach astronauts engineering in space and help

2000s

2010s

Just a bit of fun!

Did you know?

A robot called NAO can sense human emotions by facial features and react to them in a certain programmed way. He can also move around objects by using thermal imaging to see your body because humans give off heat. It has a number of other sensors too.

Alphadog , a robot dog can walk up tough, steep mountain terrains, carry 180kg and walk 20 miles in one day! Astonishing!

The skies will soon be full of creepy unmanned aerial vehicles, or UAVs for short. These planes don't have a pilot and are normally used as secretive spy planes. However, they will also start to be used in commercial flights but first need to be extremely safe.

Nanobots are the latest technology. They are the smallest robots and are invisible to the naked human eye and smaller than a speck of dust. Imagine how hard it must be to make them! They can be injected into someone's blood and then work on the blood cells in their body.

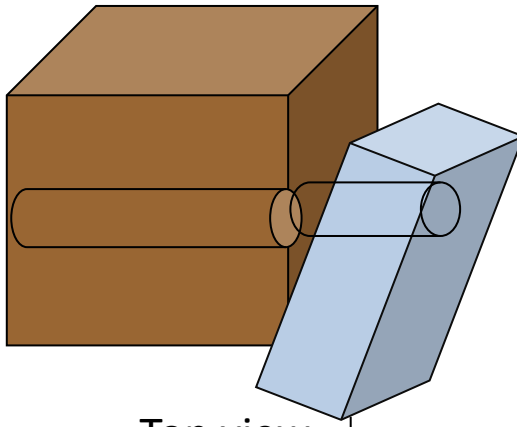
Autonomous underwater vehicles or AUVs are robotic submarines which explore the undersea by themselves without any pilot. They take lots of photographs and study the ocean floor. They have to be very robust to withstand the water pressure.

Make Your Own Robot!

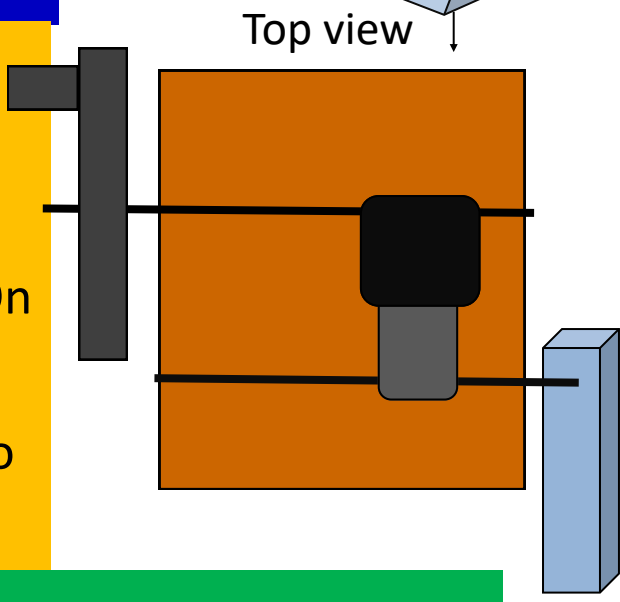
Of course, you don't have to use motors to make something move. You can try magnets or fluid systems and syringes, or just use a crank. These are some very simple steps on how to make one.

Steps:

1. Grab a cardboard box, fix a pencil through it so that is sticks out at the right end and tape a toothpaste container (no, not the toothpaste tube which the container holds) to the pencil end sticking out. This will be the arm.



2.Pinch another pencil above the first one. Open your box and tape a cardboard 'hitter' onto the second pencil inside the box. This will tap the other hitter and make it move. On the hand pencil, tape another cardboard hitter opposite to the hand. Attach a crank to the other end of the second pencil.



3. Now turn the crank and see what happens……

Results

The robotic arm should move up and then go down like it is falling. This creates the impression that it is shaking hands with you. This will only happen if you have placed the black hitter **over** the grey one. If anything goes wrong, alter it so that the thing that is stopping the movement can be replaced or something can be added to it.

Why don't you try and put a head on it, give it some rolling eyes and different face expression and make pop-up letters to spell different words? Remember, try using the same mechanism!

STARS

LIFE CYCLE - A BIG STAR

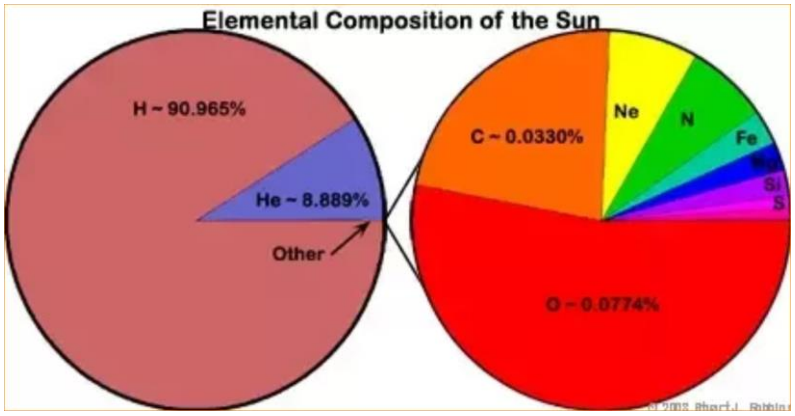
A star is born in a huge cluster of hydrogen atoms. The gravity pulls all the atoms together and is powered by fusing the hydrogen, which makes a helium core at 10 million degrees Celsius (18 million degrees Fahrenheit).

When almost all the hydrogen has been used, the star begins to cool. Its core then collapses in on itself from the immense gravity crushing down on the star. It starts to generate more heat and uses the remaining hydrogen quicker.

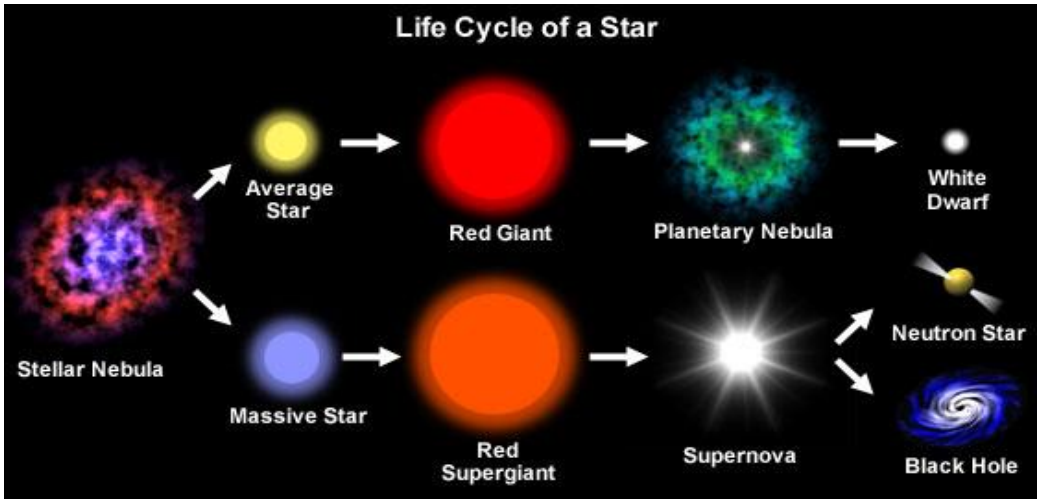
The star begins to expand and at 100 million degrees Celsius (180 million degrees Fahrenheit), the helium atoms start fusing, producing carbon, oxygen and neon atoms. This process then repeats itself and produces denser elements as the star gets hotter.

This process then continues until the star's core is at about 3 billion degrees Celsius (5 billion degrees Fahrenheit). At this point the elements fuse up to iron (the 26th element) and it can't produce any more heat. Heavier elements up to bismuth (the 83rd element) in the outer layers of the star.

Once no more fuel is left to use, the star's core completely collapses in on itself because there is not enough energy to overcome gravity, there is a gigantic supernova explosion. The temperature heats up to about 10,000 times hotter than the sun and the existing elements fuse to form all the much heavier elements up to uranium.



The size of most stars is quite small and these stars can live for billions of years. Our Sun is one of these. Big stars use elements quicker and are hotter, and only live for about 10 million years.



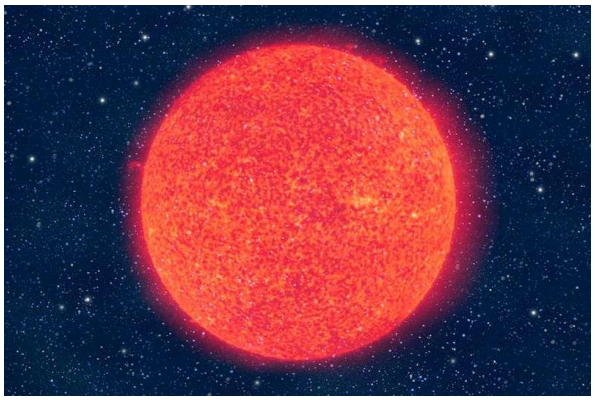
LIFE CYCLE - A Small Star

This star is made in a smaller cluster of hydrogen atoms. After about 10 billion years, a small star's core will run out of hydrogen. Nuclear reactions stop. The generation of radiation pressure ceases. Gravitational collapse happens again, increasing the density and heat of the core until temperatures are sufficient to trigger the fusion of helium into carbon.

The resulting radiation pressure will cause the star's outer layers to expand to a radius as large as that of the orbit of Mercury, Venus, or even Earth. As they expand, they cool, turning red. We call a star at this stage of its life a red giant.

The process repeats when the core's supply of helium runs out: nuclear reactions stop and gravitational collapse resumes. In a small star, there will be no further nuclear reactions. Instead, stability will resume when the carbon electrons come so close together that electron degeneracy pressure occurs with enough force to balance out gravity and halt the stars further collapse.

Meanwhile, the star's outer layers expand, forming a cloud of stellar components orbiting what's left of the star's core. This cloud is a planetary nebula. The star is now a white dwarf. It will continue dimming and cooling until all of its heat energy is gone.



STARS are cosmic energy engines that produce heat, light, ultraviolet rays, x-rays, and other forms of radiation. They are composed largely of gas and plasma, a superheated state of matter composed of subatomic particles.

Though the most familiar star, our own Sun, stands alone, about three of every four stars exist as part of a binary system containing two mutually orbiting stars.

By Zak Kupfer 6F