



science

sequence of Learning Document

'I am among those who think that science has great beauty.'

Marie Curie



Prior Learning

EYFS

In EYFS, children work towards reaching the Early Learning Goals by the end of Reception:

- Explore the natural world around them, making observations and drawing pictures of animals and plants
- Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read to them.
- Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.

The Big Ideas of Science

The big ideas of science are referred to in each unit of work enabling children to make links between their learning and gain a secure concept base.

Physics

P1: The universe follows unbreakable rules that are all about forces, matter and energy.

P2: Forces are different kinds of pushes and pulls that act on all the matter that is in the universe. Matter is all the stuff, or mass, in the universe.

P3: Energy, which cannot be created or destroyed, comes in many different forms and tends to move away from objects that have lots of it.

Chemistry

C1: All matter (stuff) in the universe is made up of tiny building blocks.

C2: The arrangement, movement and type of the building blocks of matter and the forces that hold them together or push them apart explain all the properties of matter (e.g. hot/cold, soft/hard, light/heavy, etc).

C3: Matter can change if the arrangement of these building blocks changes.

Biology

B1: Living things are special collections of matter that make copies of themselves, use energy and grow.

B2: Living things on Earth come in a huge variety of different forms that are all related because they all came from the same starting point 4.5 billion years ago.

B3: The different kinds of life, animals, plants and microorganisms, have evolved over millions of generations into different forms in order to survive in the environments in which they live.

Earth science

E1: The Earth is one of eight planets that orbit the sun.

E2: The Earth is tilted and spins on its axis leading to day and night, the seasons and the climate.

E3: The Earth is made up of several layers, including a relatively thin rocky surface which is divided into tectonic plates, and the movement of these plates leads to many geologic events (such as earthquakes and volcanoes) and geographical features (such as mountains.)



The 'Big Ideas' explored in this unit:

E2 - The Earth is tilted and spins on its axis leading today and night, the seasons, and the climate.



Year 1

Seasonal Changes

Year 1 – Seasonal Changes

Learning Point 1

Recap of Previous Learning:

- Know that the Earth orbits the Sun with one orbit constituting a year of 365/366 days.
- Know that the year is split into four seasons.
- Know that it is dangerous to look at the sun, even when wearing dark glasses.

Learning Point 2

Know what happens in Autumn

- Know that the leaves of **deciduous** trees begin to change colour.
- Know that the leaves will eventually fall off of deciduous trees.
- Know that **daylight hours** will gradually decrease
- Know that it will start to get colder.



Scientific Enquiry – Research using Secondary Sources – compare the number of daylight hours of the middle of each month.

What is the weather like in Autumn compared to the rest of the year?

Year 1 – Seasonal Changes

Learning Point 3

Know what happens in Winter

- Know that **deciduous** trees no longer have leaves.
- Know that **evergreen** trees are still green
- Know that it becomes cold and the ground and water can **freeze**
- Know that we can have **snow** in winter.
- Know that some animals will begin to **hibernate** or **migrate**.
- Know that we may need to wear clothes to keep us warm (e.g. woolly hat, gloves, scarf and coat)



Scientific Enquiry – Observing Over Time – count how many birds or animals we can see in the environment

How many birds and animals can I see in Winter?

Learning Point 4

Know what happens in Spring

- Know that the **daylight hours** will begin to increase
- Know that it will start to get warmer
- Know that there is a lot of **rainfall**.
- Know that new flowers begin to grow
- Know that new leaves grow on **deciduous** trees
- Know that new animals are born (e.g. lambs)



Scientific Enquiry - Comparative & Fair Testing – measure the amount of rain over a set period of time.

How much does it rain in Spring?

Year 1 – Seasonal Changes

Learning Point 5

Know what happens in Summer

- Know that the weather is warmer and drier
- Know that **daylight hours** are at their longest
- Know that you often need a **sun** protection (e.g. hat, sunglasses, suncream)
- Know that we may need to wear clothes to keep us cool (e.g. t-shirt and shorts/skirt/dress)



Scientific Enquiry – Observation Over Time – count how many birds or animals we can see in the environment

How many birds or animals can I see in Summer?

Learning Point 6

Know that the weather is different at different times of the year

Know that in Winter, the weather is often cold
Know that in Spring, the weather is often cool and wet
Know that in Summer, the weather is often dry and hot
Know that in Autumn, the weather is often warm and dry



Scientific Enquiry – Identifying, Classifying & Grouping – look at different weather types and match them to the seasons where they are most likely to be seen

How does the weather change throughout the year?

Year 1 – Seasonal Changes

Assessment

What do we know about the weather?

Create a seasons wheel, ordering the months & seasons and matching expected weather to each of the four seasons

Owain Wyn Evans (1984-Present)



Owain Wyn Evans is a Welsh journalist and broadcaster. He is the weather presenter for the nightly news programme North West Tonight, BBC Breakfast and is a reporter for the television magazine and chat show programme The One Show.

JB Gill (1986-Present)



Jonathan Benjamin Gill is an English actor, farmer, presenter and singer-songwriter. He is best known as a member of boy band JLS. He decided to move his family to a farm in Kent.

Monty Don (1955-Present)



Montagu Don OBE is a British horticulturist, broadcaster, and writer who is best known as the lead presenter of the BBC gardening television series Gardeners' World.

Famous Scientists

Please refer to the above scientists to expand children's scientific capital

Year 1 – Seasonal Changes

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

It always snows in winter
It is always sunny in summer
There are only flowers in spring and summer
It rains most in winter
Summer is caused by the earth being closer to the sun



The 'Big Ideas' explored in this unit:

C1: All matter (stuff) in the universe is made up of tiny building blocks

C2: The arrangement, movement and type of the building blocks of matter and the forces that hold them together or push them apart explain all the properties of matter (e.g. hot/cold, soft/hard, light/heavy etc).



Year 1

Everyday Materials

Year 1 – Everyday Materials (Autumn 2)

Learning Point 1

Recap of previous learning.

- Some things are man-made (buildings, cars, TVs & toys) and others are natural (plants, animals, mountains, rivers & oceans)
- Texture is how something feels to touch – we can use a range of adjectives to describe different textures e.g. bumpy – Lego; rough – sandpaper; hard – wall; fuzzy – teddy bear; smooth – plastic; soft – pillow; lumpy – bean bag; prickly – thorns; shiny – car.

Learning Point 2

Know that materials can be described differently

- Know that some **materials** are **hard, strong, heavy**, and solid
- Know that other **materials** are **soft, weak**, and **light** and can be squashed
- Know that some **materials** can soak up water and are described as **absorbent**,
- Know that some **materials** can be described as runny.
- Know that some **materials** can be described as **smooth** or **rough**
- Know that these descriptions can be applied to every day **materials** around us



Scientific Enquiry – Identifying, Classifying & Grouping – sort materials into groups based on their properties

How can we describe a material?

Year 1 – Everyday Materials (Autumn 2)

Learning Point 3

Know that the material of an object is different to the object itself

- Know that a **material** describes what the object is made out of.
- Know from observations whether an object is made out of **wood, plastic, metal, fabric, glass**.
- Know that different **materials** can make up an object (e.g. chair – plastic and metal; sometimes wood and fabric).



Scientific Enquiry – Identifying, Classifying & Grouping – sort objects based on the materials they are made out of

What different materials are there around us?

Learning Point 4

Know that objects can be sorted based upon their properties.

- Know that **materials** can be sorted based on their **properties** e.g. soft, squishy, hard etc.



Scientific Enquiry – Pattern Seeking – investigate whether there is a pattern in the types of materials that are used to make objects around school. Explain why this is.

Why are materials chosen for certain jobs?

Learning Point 5

Scientist Study: Zaha Hadid

- Know about **Zaha Hadid** and the use of a range of materials in architecture and building structures.
- Know that scientific thinking has changed over time and continues to change.



Scientific Enquiry – Research using Secondary Sources – find out about the life and work of Zaha Hadid

Who was Zaha Hadid and what did she do?

Year 1 – Everyday Materials (Autumn 2)

Assessment

What are the things that I use made from?

Draw pictures of given objects, and name the material they are made from. Sort the objects based on their material.

Zaha Hadid (1950-2016)



Dame Zaha Hadid was a British-Iraqi architect, artist, and designer, recognised as a major figure in architecture in the late 20th and early 21st centuries.

John McAdam (1756-1836)



John Loudon McAdam was a Scottish civil engineer and roadbuilder. He was the inventor of tarmac, and effective and economical method of constructing roads.

John Boyd Dunlop (1840-1924)



John Boyd Dunlop was a Scottish born inventor and veterinary surgeon. Familiar with making rubber devices, he invented the first practical tyres for a child's tricycle and developed them for use in cycle racing.

Famous Scientists

Please refer to the above scientists to expand children's scientific capital

Year 1 – Everyday Materials (Autumn 2)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

Only fabrics are materials
Only building materials are materials
Only writing materials are materials
The word 'rock' describes an object rather than a material
'solid' is another word for hard



The 'Big Ideas' explored in this unit:

B2: Living things on Earth come in a huge variety of different forms that are all related because they all came from the same starting point 4.5 billion years ago

B3: The different kinds of life, animals, plants and microorganisms, have evolved over millions of generations into different forms in order to survive in the environments in which they live.



Year 1

Animals, including Humans

Year 1 – Animals, including Humans (Spring 1)

Learning Point 1

Recap of previous learning.

- Know and talk about the different factors that support overall health and wellbeing:
 - Regular physical activity
 - Healthy eating
 - Toothbrushing
- Know the names of some parts of the body

Learning Point 2

Know a range of common animals

- Know that animals vary in many ways, having different structures and skin coverings, e.g. wings, tails, ears, claws, fins, scales, feathers, fur, beaks, paws, hooves.
- Know that an animal with a backbone (spine) is called a **vertebrate**.
- Know that **vertebrates** can be sorted into different groups, according to their structure and skin coverings.
- Know that there are five main **vertebrate** groups called: **fish**, **amphibian**, **reptile**, **mammal** and **bird**.
- Know that a **fish** has: scales, lays eggs, has fins
- Know that an **amphibian** has: smooth skin, lays eggs, can live on land and in water
- Know that a **reptile** has: scaly skin, lays eggs (usually rubbery)
- Know that a **mammal**: gives birth to live young, warm-blooded (can control own body temperature)
- Know that a **bird**: has feathers, a beak, and lays eggs
- Know that a trout is an example of a **fish**; a frog is an example of an **amphibian**; a lizard is an example of a **reptile**; a robin is an example of a **bird**; a rabbit and a human are examples of a **mammal** and explore further examples of each animal type.



Scientific Enquiry – Identifying, Classifying & Grouping – make first hand, close observations of animals from each of the groups. Identify animals by matching them to named images. Classify animals using a range of features.

What are the different types of animals?

Year 1 – Animals, including Humans (Spring 1)

Learning Point 3

Know that different animals eat different things

- Know that **herbivorous** animals eat plants; **carnivorous** animals eat other animals; **omnivorous** animals eat both animals and plants
- Know that a cat is an example of a **carnivore**; that a rabbit is an example of a **herbivore**; know that many humans are examples of **omnivores** (though not vegetarians)



Scientific Enquiry – Identifying, Classifying & Grouping – classify animals according to what they eat

Which animals are carnivores, herbivores and omnivores?

Learning Point 4

Scientist Study: Jane Goodall

- Know about **Jane Goodall** and the animal behaviours she discovered.
- Know that scientific thinking has changed over time and continues to change.



Scientific Enquiry – Research using Secondary Sources – find out about the life and work of Jane Goodall

Who is Jane Goodall and what has she done?

Learning Point 5

Know and label the basic parts of the human body

- Know that humans have key parts in common.
- Know the names of the key parts that humans have in common: **feet, legs, arms, hands, torso, head, skin, eyes, ears, nose, mouth** and **tongue**.



Scientific Enquiry – Identifying, Classifying & Grouping – make first-hand, close observations to the different parts of the body

What are the different parts of my body called?

Year 1 – Animals, including Humans (Spring 1)

Learning Point 6

Know that humans have key parts in common, but these vary from person to person.

- Know that although humans have key **body parts** in common, these vary from person to person.
- Know that we can **compare** body parts using comparative language: measure, compare, small, smaller, smallest, big, bigger, biggest, tall, taller, tallest, long, longer, longest



Scientific Enquiry – Pattern Seeking – take (non-standard) measurements of parts of my body. E.g. Do people with big hands have big feet?

Are all humans the same?

Learning Point 7

Know that humans find out about the world using their five senses.

- Know that humans have five main **senses** called: **sight, touch, hearing, taste** and **smell**.
- Know that the **senses** are linked to particular areas of the body.
Know that the eyes are associated with **sight**.
- Know that ears are associated with **hearing** sound.
- Know that the nose is associated with **smell**.
- Know that the tongue is associated with **taste**.
- Know that the skin is associated with **touch**.



Scientific Enquiry – Comparative & Fair Testing – Is our sense of smell better when we can't see?

What are our five senses and what do they do?

Year 1 – Animals, including Humans (Spring 1)

Assessment

Are humans different to other animals?

Label the body parts on of different animals

Jane Goodall (1934-Present)



Dame Jane Morris Goodall DBE, is an English primatologist and anthropologist. She is considered the world's foremost expert on chimpanzees, after 60 years studying the social and family interactions of wild chimpanzees.

David Attenborough (1926 -Present)



Sir David Frederick Attenborough is an English broadcaster, biologist, natural historian and author. He is best known for writing and presenting TV documentary shows portraying animal and plant life on Earth.

Joseph Lister (1827-1912)



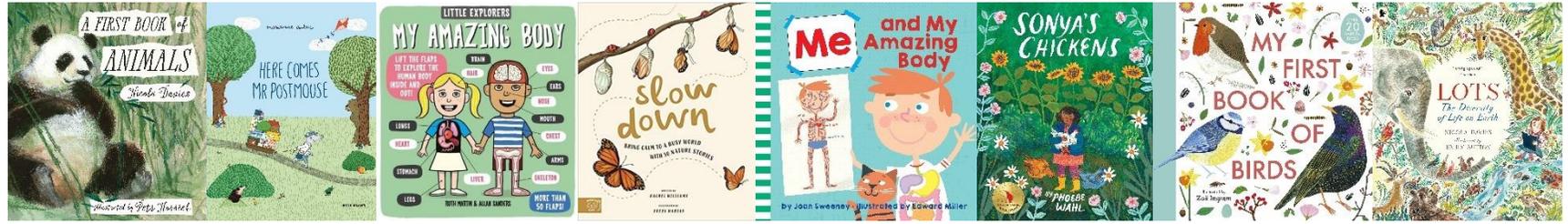
Joseph Lister was a British surgeon, medical scientist, experimental pathologist and a pioneer of antiseptic surgery and preventative medicine. Joseph Lister revolutionised the craft of surgery in the same manner that John Hunter revolutionised the science of surgery.

Famous Scientists

Please refer to the above scientists to expand children's scientific capital

Year 1 – Animals, including Humans (Spring 1)

Fiction & Non-Fiction Books to Support Learning



Possible Misconceptions

Humans are not animals
Some people have a sixth sense



The 'Big Ideas' explored in this unit:

B2 - Living things on Earth come in a huge variety of different forms that are all related because they all came from the same starting point 4.5 billion years ago.



Year 1

Plants

Year 1 – Plants (Spring 2)

Learning Point 1

Recap or previous learning:

- Know that most plants do not eat other plants or animals for food.
- Know that plants can be big like trees, or small like wees.
- Know some plants that you may see around: grass, weeds, trees, bushes, flowers, stinging nettles, and dandelions.

Learning Point 2

Know a rose bush, a sunflower and a dandelion by sight.

- Know that **plants** have different parts which we can use to **identify** them.,
- Know the names of **trees** and other **plants** that I see regularly.



Scientific Enquiry – Identifying, Classifying & Grouping – ... make close observations of leaves, seeds, flowers etc... use simple charts to identify plants.

How do we know what type of plant we can see?

Learning Point 3

Know an oak tree, birch tree, and a horse chestnut tree by sight.

- Know that not all **trees** are the same.
- Know that a tree has **roots** and that its **stem** is called a **trunk**.
- Know the names of **trees** in my local area – **oak tree**, **birch tree**, and a **horse chestnut tree**.
- Know that some **trees** have different features (such as the shape and size of **leaves**) that help us to **identify** them.
- Be able to name the parts of a **tree**, recognising that they are not always the same, e.g. **leaves** and **stems** may not be green.



Scientific Enquiry – Identifying, Classifying & Grouping - ... classifying leaves, seeds, flowers etc. using a range of characteristics (focus on trees)... compare two leaves

How do we know what type of tree we can see?

Year 1 – Plants (Spring 2)

Learning Point 3

Know that evergreen trees maintain their leaves throughout the year and that deciduous trees shed their leaves in autumn.

- Know that there are different types of **trees** – **evergreen** and **deciduous**.
- Know that some **trees** lose their leaves (**deciduous**), while some don't (**evergreen**).
- Identify some **trees** which are **deciduous** and those that are **evergreen**.



Scientific Enquiry – Observing Over Time - ... make observations of how plants change over a period of time (using photographs) ... collect information on features that change over the year.

How do deciduous and evergreen trees change throughout the year?

Learning Point 4

Know the different parts of plants

- Know that a **plant** with **flowers** has **roots**, a **stem**, **leaves** and **flowers**.
- Know that a tree has **roots**, and that its **stem** is called a **trunk**.
- Know that a **bulb** is a plant that grows underground.
- Know that a plant produces **seeds**.
- Identify and name the parts of a plant – roots, stem, leaves, flowers.



Scientific Enquiry – Identifying, Classifying & Grouping - ... classify leaves, seeds, flowers etc. using a range of characteristics (focus on flowers)

What are the different parts of a plant?

Year 1 – Plants (Spring 2)

Learning Point 5

Know that we can grow plants and trees from seeds.

- Know that **plants** produce **seeds**.
- Know a **seed** is like a tiny parcel containing everything a new plant needs to start growing.
- Know that **plants** can be grown when a **seed** falls to the ground.
- Use **seeds** to grow **plants**.



Scientific Enquiry – Observing Over Time - ...observe a plant as it grows from a seed over time and record observations.

How does a plant grow from a seed?

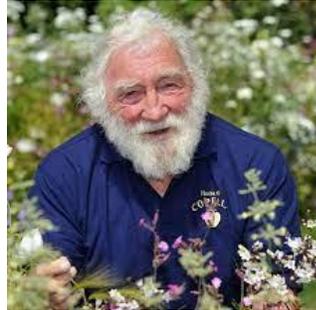
Year 1 – Plants (Spring 2)

Assessment

Why do plants have so many different parts and what is their function?

Name a range of different plants and label their parts

David Bellamy (1933-2019)



David James Bellamy OBE was an English botanist, television presenter, author, and environmental campaigner.

Alan Titchmarsh (1949-Present)



Alan Titchmarsh is an English gardener, broadcaster, TV presenter, poet, and novelist. After working a professional gardener and a gardening journalist through appearances on television gardening programmes.

Janaki Ammal (1897-1984)



Janaki Ammal was an Indian botanist who worked on plant breeding. Her most notable work involved studies on sugarcane and eggplant.

Famous Scientists

Please refer to the above scientists to expand children's scientific capital

Year 1 – Plants (Spring 2)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

Plants are flowering plants grown in pots with coloured petals and leaves and a stem
Trees are not plants
All leaves are green
All stems are green
A trunk is not a stem
Blossom is not a flower

End of Year 1 Expectations

Plants

Pupils should be able to:

- Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees
- Identify and describe the basic structure of a variety of common flowering plants, including trees

Animals, including Humans

Pupils should be able to:

- Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals
- Identify and name a variety of common animals that are carnivores, herbivores and omnivores
- Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets)
- Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense

Everyday Materials

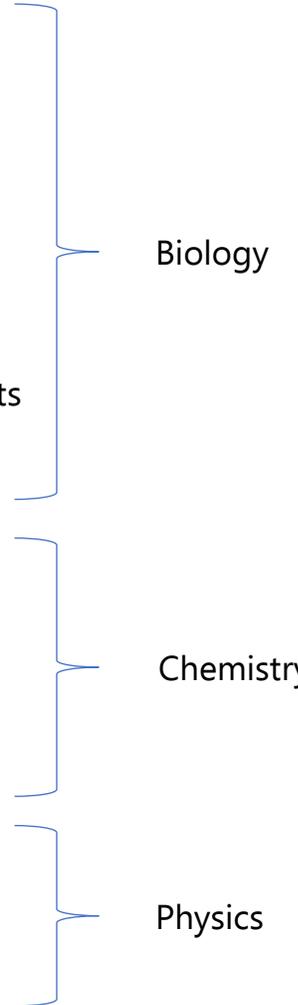
Pupils should be able to:

- Distinguish between an object and the material from which it is made
- Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock
- Describe the simple physical properties of a variety of everyday materials
- Compare and group together a variety of everyday materials on the basis of their simple physical properties

Seasonal Change

Pupils should be able to:

- Observe changes across the four seasons
- Observe and describe weather associated with the seasons and how day length varies





The 'Big Ideas' explored in this unit:

B1 - Living things are special collections of matter that make copies of themselves, use energy, and grow.

B3 – The different kinds of life, animals, plants and microorganisms, have evolved over millions of generations into different forms in order to survive in the environments in which they live.



Year 2

Living Things and Their Habitats

Year 2 – Living Things & Their Habitats (Autumn 2)

Learning Point 1

Recap or previous learning:

- Know that dandelions, rose bushes, grass, ash trees, birch trees and conifers are examples of plants.
- Know that trees can be deciduous or evergreen.
- Know that a trout is an example of fish; a frog is an example of an amphibian; a lizard is an example of a reptile; a robin is an example of a bird; a rabbit and humans are examples of a mammal.
- Know that a herbivorous animal eat plants; a carnivorous animal eats other animals; omnivorous animals eat both animals and plants.

Learning Point 2

Know that all objects are either living, dead, or have never been alive

- Know that living things move, grow, consume **nutrients** and **reproduce**; that **dead** things used to do these things, but no longer do; and that things that never lived have never done these things.
- Know that living things are plants (including seeds), animals and humans.
- Know that **dead** things include **dead** animals and plants and part of plants and animals that are no longer attached e.g. leaves and twigs, shells, fur, hair and feathers.
- Know that an object made of wood is classed as **dead**.
- Know that objects made of rock, metal and plastic have never been alive.



Scientific Enquiry – Identifying, Classifying & Grouping – explore the outside environment to find objects that are living, dead and have never lived... classify objects found in the local environment and sort them into living, dead and never lived

Living, dead or never alive – How can you tell?

Year 2 – Living Things & Their Habitats (Autumn 2)

Learning Point 3

Know that animals are adapted to their environment

- Know that animals live in a **habitat** to which they are suited.
- Know that the **habitat** provides the basic needs of the animals – shelter, food and water.
- Know that animals have suitable features that help them move and find food (e.g. big feet, thick fur, long eye lashes, **camouflage** etc.),
Know that a camel is well **adapted** for the desert due to its flat, large feet; thick fur on top to shade them from the sun, and thin fur elsewhere to allow heat to escape; and the ability to survive with very little water.
- Know that polar bears are well **adapted** due to their fur, which helps them to remain **camouflaged**; thick layers of fat and fur to help them stay warm; large feet to help them spread their weight and increase grip.
Know that woodlice live under logs – an example of a **microhabitat** - as they need somewhere dark and damp so that they do not dry out.
Know that frogs can live in ponds – an example of a **microhabitat** - as they need water in which to lay their eggs (frogspawn).

Scientific Enquiry – Observing Over Time – observe animals carefully, drawing and labelling diagrams... explain using key features why an animal is suited to a habitat and micro-habitat, e.g. the caterpillar cannot live under the soil like a worm because it needs fresh leaves to eat.



How are animals adapted to their environment?

Year 2 – Living Things & Their Habitats (Autumn 2)

Learning Point 4

Know that plants are adapted to their environment

- Know that plants live in a **habitat** to which they are suited.
- Know that the habitat provides the basic needs of the plants – shelter, nutrients and water.
- Know that plants have suitable features that help grow well (deep roots, big leaves, sturdy stem etc.)
- Know that a cactus is well **adapted** to thrive with very little water (they have spikes instead of leaves, therefore they lose less water); they have deep, spreading roots to retain as much water as possible; and that their spikes help to keep away **predators**.
- Know that pine trees have thick bark, which helps protect them against cold **environments**.



Scientific Enquiry – Observing Over Time – observe plants carefully, drawing and labelling diagrams... explain using key features why a plant is suited to a habitat and micro-habitat, e.g. the daffodil cannot live in the desert because it doesn't have deep roots

How are plants adapted to their environment?

Year 2 – Living Things & Their Habitats (Autumn 2)

Learning Point 5

Know how animals obtain their food from plants and other animals, using the idea of a simple food chain.

- Know that a **food chain** shows the foods animals need to survive.
- Know that arrows on a **food chain** show the direction the **energy** travels
- Know that there are different **food chains** in different **environments**.
- Know that a **food chain** starts with a plant (e.g. grass).
- Know that a **herbivore** eats the plant (e.g. cow).
- Know that a **carnivore** eats the **herbivore** (e.g. human)



Scientific Enquiry – Research using Secondary Sources – create simple food chains for a familiar local habitat from first hand observation and research... create simple food chains from information given, e.g. in picture books... use a food chain to explain what animals eat.

What do animals eat?

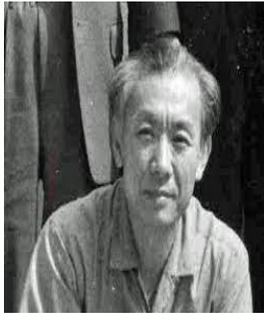
Year 2 – Living Things & Their Habitats (Autumn 2)

Assessment

Why do different animals live in different places?

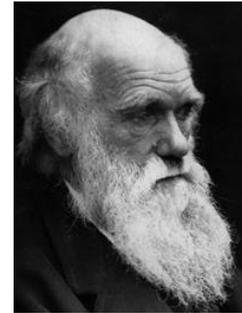
Using given animals and plants write an explanation of where their habitat and how they are adapted to live their successfully

Taskasi Tokioka (1913-2001)



Takasi Tokioka was a Japanese zoologist. He published over 200 scientific articles on marine animals. He was Professor of Zoology at Kyoto University working at the Seto Marine Biological Laboratory in Shirahama, Japan.

Charles Darwin (1809-1882)



Charles Darwin was an English naturalist, geologist and biologist, best known for his contributions to evolutionary biology. His proposition that all species of life have descended from a common ancestor is now widely accepted and considered a fundamental concept in science.

Janaki Ammal (1897-1984)



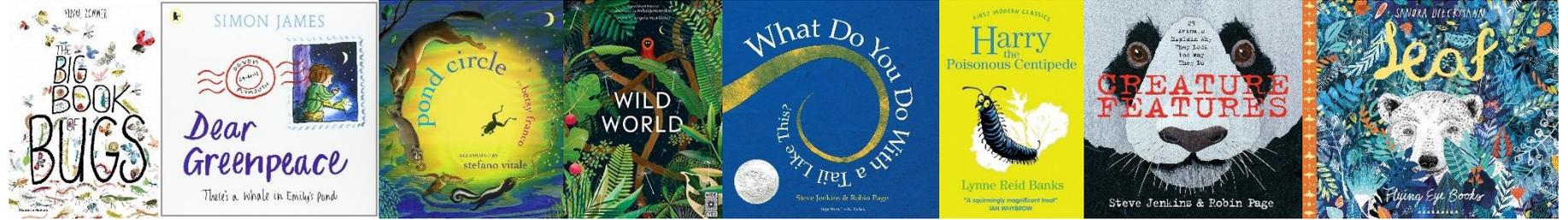
Janaki Ammal was an Indian botanist who worked on plant breeding. Her most notable work involved studies on sugarcane and eggplant.

Famous Scientists

Please refer to the above scientists to expand children's scientific capital

Year 2 – Living Things & Their Habitats (Autumn 2)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

An animal's habitat is like its 'home'
Fire is living
Arrows in a food chain mean 'eats'
All animals that live in the sea are fish



The 'Big Ideas' explored in this unit:

B1 – Living things are special collections of matter that make copies of themselves, use energy and grow.

B3 – The different kinds of life, animals, plants and microorganisms, have evolved over millions of generations into different forms in order to survive in the environments in which they live.



Year 2

Plants

Year 2 – Plants (Spring 1)

Learning Point 1

Recap or previous learning:

- Know that dandelions, rose bushes, grass, ash trees, birch trees and conifers are examples of plants.
- Know that trees can be deciduous or evergreen.

Learning Point 2

Know that plants may grow from either seed or bulbs

- Know that **plants** may grow from either **seeds** or **bulbs**.
- Know that **seeds** or **bulbs germinate** into **seedlings** which continue to grow into **mature plants**.
- Know that mature plants may have flowers which then develop into **seeds, berries, fruits** etc.
- Know that **seeds** and **bulbs** need to be planted outside at particular times of year and they will **germinate** and grow at different times. .



Scientific Enquiry – Observing Over Time – make close observations and measurements of plants growing from seeds and bulbs

How do plants grow?

Year 2 – Plants (Spring 1)

Learning Point 3

Know what plants need to stay alive

- Know that **plants** need light
- Know that **plants** need to get **nutrients** from the soil.
- Know that **plants absorb** water through their roots
- Know that **plants** need air
- Know that In the absence of these things, a **plant** will stop growing and die.



Scientific Enquiry – Comparative & Fair Testing – grow plants in different conditions and compare how they grow... nurture seeds and bulbs into mature plants, identifying the different requirements of different plants

What do plants need to stay alive?

Year 2 – Plants (Spring 1)

Learning Point 4

Know that seeds and bulbs need to be planted outside at particular times of year.

- Know that **seeds** and **bulbs** need to be buried underground in soil.
- Know that once a seed gets warmth, **nutrients**, from the **soil** and **water**, it will grow in to adults (**mature**) **plants**.
- Know that **seeds** and **bulbs** need to be planted outside at a particular times of the year.
- Know that some **plants** grow better in spring, e.g. daffodils, hyacinths, bluebells and daisies.
- Know that some **plants** grow better in summer e.g. lavender, lilies, roses, sunflowers
- Know that some **plants** grow in autumn e.g. poppies, chrysanthemums, amaryllis.
- Know that some **plants** grow in winter e.g. holly, mistletoe, poinsettias.
- Know that some **plants** are better suited to grow in full sun (e.g. lavender) and some grow better in partial or full shade (e.g. geranium)
- Know that **seeds** and **bulbs** will **germinate** and grow at different rates.



Scientific Enquiry – Research using Secondary Sources – find out about the best plants to grow in spring, summer, autumn and winter,,, find out about plants which grow better in full sun, or full shade.

Scientific Enquiry – Observing Over Time – make comparisons between plants as they grow

Scientific Enquiry – Comparative & Fair Testing – make comparisons between plants as they grow

When do plants grow best?

Year 2 – Plants (Spring 1)

Learning Point 5

Know the life cycle of a plant

- Know that many **plants** grow out of **seeds** and **bulbs**.
- Know that seeds grow **roots** and **shoots**.
- Know that roots and **shoots** then grow leaves above ground.
- Know that many **plants** make flowers, which turn into **fruits**.
- Know that **flowers** and **fruits** make their own **seeds**.
- Know that we call this a **life cycle**.



Scientific Enquiry – Observing Over Time – observe a plant through its life cycle and identify each stage in real time (e.g. sunflower from planting the seeds to gaining new seeds from the dried head).

What is the lifecycle of a plant?

Learning Point 6

Scientist Study: George Washington Carver

- Know about **George Washington Carver** and the promotion of methods to prevent soil depletion.
- Know that scientific thinking has changed over time and continues to change.



Scientific Enquiry – Research using Secondary Sources – research about the life and work of George Washington Carver

Who was George Washington Carver and what did he do?

Year 2 – Plants (Spring 1)

Assessment

How and what do plants need to grow?

Order the different developments in a plants life cycle and explain what is happening at each development, including information about what is needed for it to grow and why.

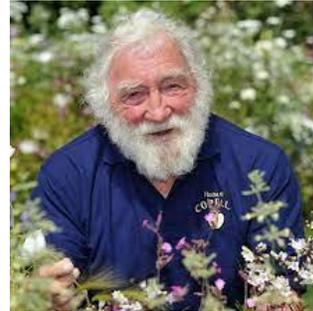
Famous Scientists

George Washington Carver (1864-1943)



George Washington Carver was an American agricultural scientist and inventor who promoted alternative crops to cotton and methods to prevent soil depletion. He was the most prominent black scientist of the early 20th century.

David Bellamy (1933-2019)



David James Bellamy OBE was an English botanist, television presenter, author and environmental campaigner.

Janaki Ammal (1897-1984)



Janaki Ammal was an Indian botanist who worked on plant breeding. Her most notable work involved studies on sugarcane and eggplant.

Please refer to the above scientists to expand children's scientific capital

Year 2 – Plants (Spring 1)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

Plants are not alive as they are not seen to move
Seeds are not alive
All plants start out of seeds
Seeds and bulbs need sunlight to germinate



The 'Big Ideas' explored in this unit:

B1 – Living things are special collections of matter that make copies of themselves, use energy and grow.

B3 – The different kinds of life, animals, plants and microorganisms, have evolved over millions of generations into different forms in order to survive in the environments in which they live.



Year 2

Animals, including Humans

Year 2 – Animals, including Humans (Spring 1)

Learning Point 1

Recap or previous learning:

- Know that a trout is an example of fish, a frog is an example of an amphibian, a lizard is an example of a reptile, a robin is an example of a bird, a rabbit and a human are examples of mammals.
- Know that herbivorous animals eat plants, carnivorous animals eat other animals, omnivorous animals eat both animals and plants.

Learning Point 2

Know what 'offspring' is

- Know that animals, including humans, have **offspring** which grow in to **adults**.
- Know that in humans and some animals, these **offspring** will be live young, such as babies or kittens, that grow into **adults**.
- Know that in other animals, such as chickens or insects, there may be **eggs** laid that hatch to young or other stages which then grow to **adults**
- Know that the stages of **growth** from birth to death is called a life cycle
- Know that most **offspring** are very much, but not exactly, like their parents
- Know that the young of some animals do not look like their parents e.g. tadpoles do not look like frogs
- Know that the babies of animals including humans need to be fed and cared for by their parents



Scientific Enquiry – Research Using Secondary Sources – ask questions and find out about the life cycles of some animals.

What do animals look like when they are first born?

Year 2 – Animals, including Humans (Spring 1)

Learning Point 3

Know that animals including humans have important, basic needs

- Know the basic needs of animals, including humans, for survival: water, food, air, shelter.
- Know that if these needs are not met, animals (including humans) will experience negative effects, e.g. **starvation**, **dehydration** and could die



Scientific Enquiry – Research Using Secondary Sources – explain how development and healthy might be affected by different conditions and needs being met / not met.

What do I need to grow and stay healthy?

Learning Point 4

Know that to grow into healthy adults, humans need exercise and good hygiene

- Know that exercise is important because it keeps us strong and fit.
- Know that keeping clean and **hygienic** can help us to stay healthy because it prevents infections and illnesses.
- Know that ways to practice good **hygiene** are: handwashing, teeth cleaning (twice per day) and having regular showers etc.



Scientific Enquiry – Comparative & Fair Testing – explore the effect of exercise on my body

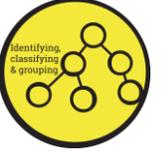
What happens to my body when I exercise?

Year 2 – Animals, including Humans (Spring 1)

Learning Point 5

Know that to grow into healthy adults, humans need the right amounts and types of food.

- Know that there are five main **food** groups: fruit and vegetables, carbohydrates, protein, dairy, fat and sugar.
- Know that a **balanced diet** is one which has a variety of food from each **food** group. Know that the Eatwell Guide helps us to eat the right amounts of each **food** group (a **balanced diet**).
- Know that different foods help us to grow, give us energy, and give us **vitamins/minerals** that we need to stay **healthy**.



Scientific Enquiry – Identifying, Classifying & Grouping – classify food in a range of ways, including using the Eatwell Guide

What foods do I need to eat to be healthy?

Year 2 – Animals, including Humans (Spring 1)

Assessment

What do animals, including humans need in order to grow and stay healthy?

Sort foods into their groups and explain why it is important that we eat each of the five food groups as part of a healthy, balanced diet.

Famous Scientists

Carl Linnaeus (1707-1778)



Carl Linnaeus was a Swedish botanist, zoologist, taxonomist, and physician who formalised the modern system of naming organisms. He is known as the "father of modern taxonomy".

Rujuta Diweka (1973-Present)



Rujuta Diwekar is a celebrity fitness expert whose books are massive bestsellers. She was given the Nutrition Award by the Asian Institute of Gastroenterology in 2010. She has also received accreditation from Sports Dietitians Australia.

James Herriot (1916-1995)

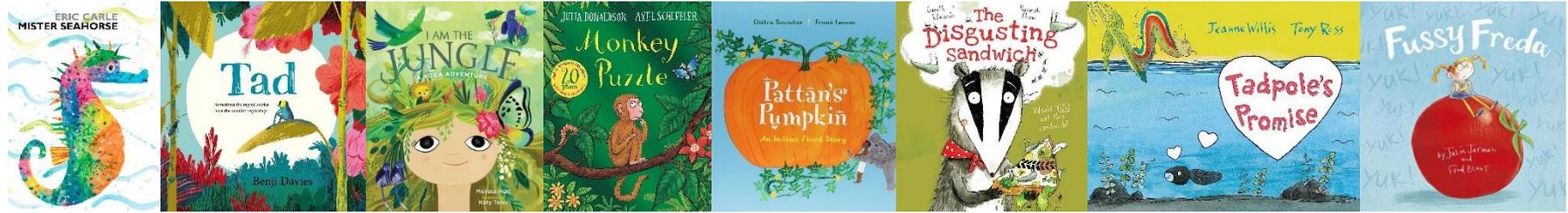


James Herriot was a British veterinary surgeon and author. Born in Sunderland, Herriot graduated from Glasgow Veterinary College in 1939, returning to England to become a veterinary surgeon in Yorkshire where he practised for almost 50 years.

Please refer to the above scientists to expand children's scientific capital

Year 2 – Animals, including Humans (Spring 1)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

An animal's habitat is like its 'home'
All animals that live in the sea are fish.
Respiration is breathing.
Breathing is respiration.



The 'Big Ideas' explored in this unit:

C1 – All matter (stuff) in the universe is made up of tiny building blocks

C2 – The arrangement, movement and type of the building blocks of matter and the forces that hold them together or push them apart explain all the properties of matter (e.g. hot/cold, soft/hard, light/heavy, etc).



Year 2

Everyday Materials

Year 2 – Everyday Materials (Summer 1)

Learning Point 1

Recap or previous learning:

- Know that that objects are made from materials such as wood, plastic, glass, metal, water and rock.
- Know that materials have properties such as being hard, soft, strong, weak, absorbent, heavy, light, solid, runny, smooth, and rough; these descriptions denote the properties of a material.
- Know that objects can be sorted based on their properties .
- Know that the material an object is made from is different to the material itself.

Learning Point 2

Know that materials can have useful properties

- Know some materials don't allow water to pass through them and these are known as **waterproof**.
- Know that some materials hold water and these are known as **absorbent**.
- Know that some materials are: strong, **flexible**, see-through (**transparent**), soft, light, heavy.
- Know that these **properties** are useful in different contexts.

Scientific Enquiry – Comparative & Fair Testing – investigate materials to discover if they are waterproof or absorbent... investigate materials to discover their properties

Scientific Enquiry – Identifying, Classifying & Grouping – sort materials based on their properties

What are the useful properties of materials?



Year 2 – Everyday Materials (Summer 1)

Learning Point 3

Know that materials can be used for a variety of reasons

- Know the materials can be used for different objects e.g. glass to make a window, or a vase, or a bowl.
- Know that (e.g. tables) can be made from different materials, e.g. metal, wood, glass, plastic



Scientific Enquiry – Identifying, Classifying & Grouping – sort objects into groups based on the materials that they are made out of.

What are the different uses of a material?

Learning Point 4

Know that sometimes materials can be changed

- Know that some materials are **malleable** e.g. playdough
- Know that some materials can become hard e.g. metal when it sets
- Know that some materials can become soft e.g. plastic when heated
- Know that the shape of some materials can be changed without breaking them



Scientific Enquiry – Comparative & Fair Testing – explore how materials can be changed

How can some materials be changed?

Learning Point 5

Scientist Study: John McAdam

- Know about John McAdam and his work engineering and road building, leading to the invention of Tarmac
- Know that scientific thinking has changed over time and continues to change



Scientific Enquiry – Research using Secondary Sources – research about the life and work of John McAdam

Who was John McAdam and what did he do?

Year 2 – Everyday Materials (Summer 1)

Assessment

How do we choose the best material for a job?

Choose materials to make different objects and explain what properties they have that make them the best materials for that job

Famous Scientists

Zaha Hadid (1950-2016)



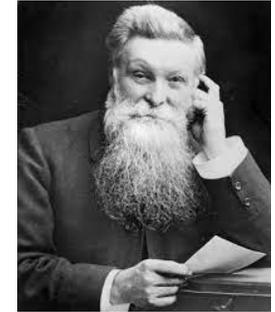
Dame Zaha Hadid was a British-Iraqi architect, artist, and designer, recognised a major figure in architecture in the late 20th and early 21st centuries.

John McAdam (1756-1836)



John Loudon McAdam was a Scottish civil engineer and roadbuilder. He was the inventor of tarmac, and an effective and economical method of constructing roads.

John Boyd Dunlop (1840-1924)

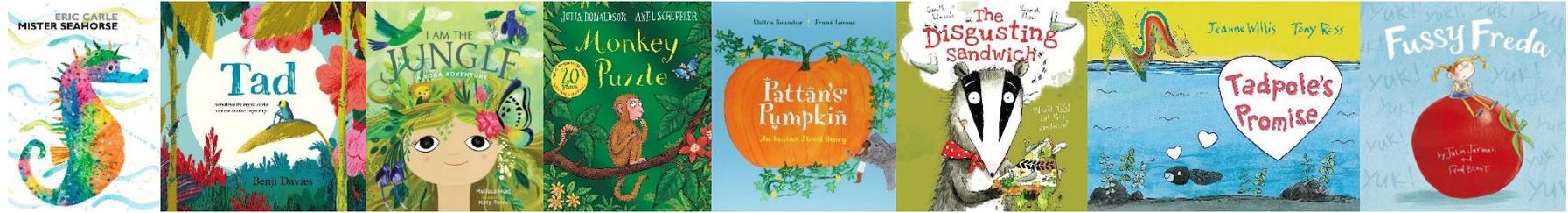


John Boyd Dunlop was a Scottish born inventor and veterinary surgeon. Familiar with making rubber devices, he invented the first practical types for a child's tricycle and developed them for use in cycle racing.

Please refer to the above scientists to expand children's scientific capital

Year 2 – Everyday Materials (Summer 1)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

An animal's habitat is like its 'home'
All animals that live in the sea are fish.
Respiration is breathing.
Breathing is respiration.

End of Year 2 Expectations

Living Things and their Habitats

Pupils should be able to:

- Explore and compare the differences between things that are living, dead and things that have never been alive
- Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other
- Identify and name a variety of plants and animals in their habitats, including micro-habitats
- Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.

Plants

Pupils should be able to:

- Observe and describe how seeds and bulbs grow into mature plants
- Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy

Animals, including Humans

Pupils should be able to:

- Notice that animals, including humans, have offspring which grow into adults
- Find out about and describe the basic needs of animals, including humans, for survival (water, food and air)
- Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene

Use of Everyday Materials

Pupils should be able to:

- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper, and cardboard for particular uses
- Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching

Biology

Chemistry



The 'Big Ideas' explored in this unit:

C1 – All matter (stuff) in the universe is made up of tiny building blocks

C2 – The arrangement, movement and type of the building blocks of matter and the forces that hold them together or push them apart explain all the properties of matter (e.g. hot/cold, soft/hard, light/heavy, etc).

C3 – Matter can change if the arrangement of these building blocks changes

E3 – The Earth is made up of several layers, including a relatively thin, rocky surface which is divided into tectonic plates, and the movement of these plates leads to many geological events (such as earthquakes and volcanoes) and geographical features (such as mountains).



Year 3

Rocks

Year 3 – Rocks (Autumn 1)

Learning Point 1

Recap or previous learning:

- Know that **rocks** are a type of material
- Know that applying forces to objects can change their shape, by squeezing, stretching, bending and twisting

Learning Point 2

Know that rocks can be identified based on their properties.

- Know that **rock** is a naturally occurring material.
- Know that there are different types of **rock**, e.g. sandstone, limestone, granite, basalt, marble and slate etc. which have different properties.
- Know that **rocks** can be hard or soft.
- Know that some **rocks** have different sizes or **grains** of crystal.
- Know that **rocks** may **absorb** water.
- Know that **rocks** can be different shapes and sizes (stones, pebbles, boulders).

Scientific Enquiry – Identifying, Classifying & Grouping – observe rocks closely, classifying them in different ways and using appropriate vocabulary (appearance)

Scientific Enquiry – Observing Over Time – observe how rocks change/have changed over time (e.g. gravestones, old buildings)

Scientific Enquiry – Comparative & Fair Testing – devise tests to explore the properties of rocks (hardness, absorption) and use date to rank the rocks... link rocks changing over time with their properties, e.g. soft rocks get worn away more easily



How can rocks be classified?

Year 3 – Rocks (Autumn 1)

Learning Point 3

Know that there are different types of rocks: igneous, metamorphic and sedimentary

- Know that **sedimentary rocks** are formed from **sediments** that have settled at the bottom of a lake, sea or ocean, and have been compressed over millions of years.
- Know that because of this, **sedimentary rocks** often have layers (e.g. limestone and sandstone).
- Know that **igneous rocks** are formed from **molten rock** that has cooled and solidified (due to a volcanic eruption).
- Know that **igneous rocks** contain randomly arranged interlocking crystals (e.g. granite and basalt).
- Know that the size of the crystals depends on how quickly the **molten magma** solidified.
- Know that **metamorphic rocks** are formed after being subjected to tremendous heat and/or pressure, causing them to change into another type of rock.
- Know that **metamorphic rocks** are usually resistant to **weathering** and **erosion** and are therefore very hard-wearing (e.g. marble and slate).



Scientific Enquiry – Research using Secondary Sources – find out about how sedimentary, metamorphic and igneous rocks are formed.

Scientific Enquiry – Identifying, Classifying & Grouping – sort a variety of rocks (including unfamiliar rocks) into 'sedimentary', 'igneous' and 'metamorphic' base on their properties.

What are the different types of rocks?

Year 3 – Rocks (Autumn 1)

Learning Point 4

Know how fossils form in the earth

- Know that some **rocks** contain **fossils**.
- Know that **fossils** were formed millions of years ago.
- Know that a **fossil** is the **preserved** remains or traces of a dead organism (living thing).
- Know the process by which a **fossil** is formed is called fossilisation.
- Know that it is very rare for living things to become fossilised. Usually, after most animals die, their bodies just rot away and nothing is left behind.
- Know that under certain special conditions, a **fossil** can form.
- Know that after an animal dies, the soft parts of its body **decompose**, leaving the hard parts, like the skeleton, behind. This becomes buried by small particles of **rock** called **sediment**.
- Know that as more layers of **sediment** build up on top, the **sediment** around the skeleton begins to compact and turn to rock.
- Know that the bones then start to be dissolved by water seeping through the rock.
- Know that **minerals** in the water replace the bone, leaving a **rock** replica of the original bone. This is called a **fossil**.
- Know that **fossils** can help us learn about things that lived long ago.

Scientific Enquiry – Research using Secondary Sources – research how fossils are formed... present in different ways my understanding of how fossils are formed.

How are fossils formed?

Learning Point 5

Scientist Study: Mary Anning

- Know about **Mary Anning** and the **fossils** she discovered.
- Know that scientific thinking has changed over time and continues to change

Scientific Enquiry – Research using Secondary Sources – research the life and work of Mary Anning

Who was Mary Anning and what did she do?



Year 3 – Rocks (Autumn 1)

Learning Point 6

Know that soils are made from rocks and organic matter

- Know that **soil** is made of small particles of **rocks**, dead plants and animals (organic matter), air and water.
- Know the type of **rock**, size of **rock** pieces and the amount of organic matter affect the property of the **soil**.
- Know that **soil** can be sandy, chalky or clay soil.
- Know that **soil** provides an environment for plants to grow.
- Know that **soil** stores nutrients and water for plants.
- Know that **soil** provides a location for roots to anchor a plant in to the ground.



Scientific Enquiry – Identifying, Classifying & Grouping – observe soils closely... identify plant / animal matter and rocks in samples of soil... classify soils in a range of ways, based on their appearance.

Scientific Enquiry – Comparative & Fair Testing – devise a test to explore the water retention of soils.... Observe how soils can be separated through sedimentation

How are soils formed and why are they important to us?

Year 3 – Rocks (Autumn 1)

Assessment

How are fossils formed and what do they tell us?

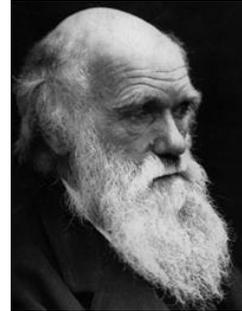
Explanation, with diagrams, about how fossils are formed and the why they only form in certain rocks.

Mary Anning (1799-1847)



Mary Anning was an English fossil collector, dealer and palaeontologist who became known around the world for the discoveries she made in Jurassic marine fossil beds in the cliffs along the English Channel at Lyme Regis in the county of Dorset in Southwest England

Charles Darwin (1809-1882)



Charles Darwin was an English naturalist, geologist and biologist, best known for his contributions to evolutionary biology. His proposition that all species of life have descended from a common ancestor is now widely accepted and considered a fundamental concept in science.

Florence Bascom (1862-1945)



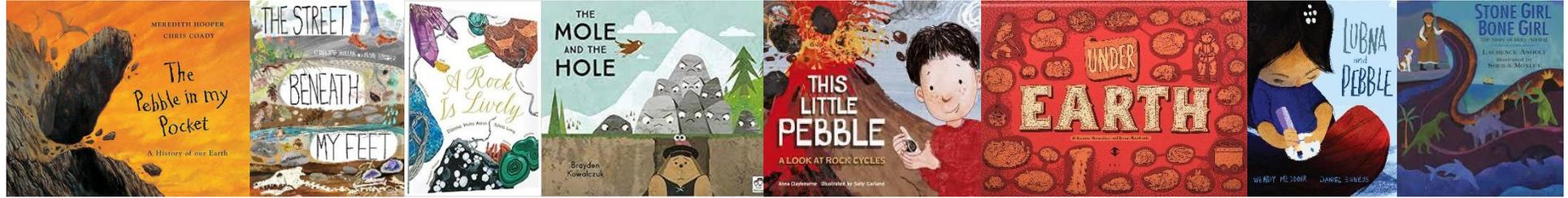
Florence Bascom was an American pioneer for women as a geologist and educator. Bascom became an anomaly in the 19th century when she earned two bachelor's degrees.

Famous Scientists

Please refer to the above scientists to expand children's scientific capital

Year 3 – Rocks (Autumn 1)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

Rocks are all hard in nature

Rock-like man-made substances such as concrete or brick are rocks

Materials that have been polished or shaped for use, such as a granite worktop, are not rocks as they are no longer 'natural'

Certain found artefacts, like old bits of pottery or coins, are fossils

A fossil is an actual piece of an extinct animal or plant

Soil and compost are the same thing

Rocks were made with a particular purpose in mind



The 'Big Ideas' explored in this unit:

P1 - The universe follows unbreakable rules that are all about forces, matter and energy.

P3 - Energy, which cannot be created or destroyed, comes in many different forms and tends to move away from objects that have lots of it.



Year 3

Light

Year 3 – Light (Spring 1)

Learning Point 1

Recap or previous learning:

- Know that energy comes in many forms
- Know that energy can't be created or destroyed: it can only be transferred from one form to another

Learning Point 2

Know that we need light to see and that darkness is the absence of light

- Know that **light** is a form of energy
- Know that energy comes in different forms and can neither be created nor destroyed, only changed from one form to another
- Know that we need **light** to see things
- Know that everything we see it either a **light source** or a something that is **reflecting light** into our eyes.
- Know that light can come from different **sources**
Know that some sources of **light** are natural (e.g. the sun, stars, fire)
- Know that some sources of **light** are man-made (e.g. lightbulb or a **torch**)
- Know that **darkness** is just the absence of **light**

Scientific Enquiry – Identifying, Classifying & Grouping - sorting and grouping objects based on whether they are light sources or non-light sources

What is light?



Year 3 – Light (Spring 1)

Learning Point 3

Know that light travels in straight lines

- Know that when **light** travels, it travels in straight lines from a **light source** to an object
- Know that shadows happen because **light** does not bend around objects
- Know that the **darkness** created in a **shadow** is evidence of **light** travelling in straight lines



Scientific Enquiry – Pattern Seeking – ...use mirrors to discover how light travels in straight lines by creating reflections.

Does light travel around corners?

Learning Point 4

Know that reflection happens when light 'bounces' off a surface

- Know that light is **reflected** when it travels from a **light source** and then 'bounces' off an object.
- Know that light bounces off **reflective** objects, enabling us to see **reflections**
- Know that some materials aren't **reflective** because light is scattered by their surfaces



Scientific Enquiry – Identifying, Classifying & Grouping – investigate and group materials based on their reflective properties

What materials are reflective?

Learning Point 5

Scientist Study: Thomas Edison

- Know about **Thomas Edison** and the invention of the incandescent **light** bulb.
- Know that scientific thinking has changed over time and continues to change.
- Know that filaments in traditional bulbs heat up until they glow, giving off **light** and heat
- Know that fluorescent bulbs glow when electricity adds energy to a gas within the bulb



Scientific Enquiry – Research using Secondary Sources – research about the life and work of Thomas Edison

Who was Thomas Edison and what did he do?

Year 3 – Light (Spring 1)

Learning Point 6

Know that we can see objects due to their relationship with light

- Know that we can see objects because **light** is **reflected** off them
- Know that everything that we can see is either a **light source** or something that is **reflecting light** from a **light source** into our eyes



Scientific Enquiry – Research using Secondary Sources – research how we see things and how light is reflected off objects so we see colour

How do we see objects?

Learning Point 7

Know that shadows are created when light is blocked by an object

- Know that **opaque** objects block **light** creating **shadows** and that **light** passes through **transparent** objects
- Know that **opacity/transparency** and **reflectiveness** are properties of a material
- Know that as objects move towards a **light source**, the size of the **shadow** increases



Scientific Enquiry – Pattern Seeking – investigate how the length of a shadow changes throughout the day

Scientific Enquiry – Pattern Seeking – investigate how the size of a shadow changes when the object moves closer or further away from the light source

How are shadows created?

Year 3 – Light (Spring 1)

Assessment

How are shadows formed?

Produce a shadow puppet show to retell a familiar fairy-tale.

Thomas Edison (1847-1931)



Thomas Alva Edison was an American inventor and businessman. He developed many devices in fields such as electric power generation, mass communication, sound recording, and motion pictures.

Ibn al-Haytham (965-1040)



Hasan Ibn al-Haytham was an Arab mathematician, astronomer, and physicist of the Islamic Golden Age. Referred to as the father of modern optics he made significant contributions to the principles of optics and visual perception.

Annie Jump Cannon (1863-1941)



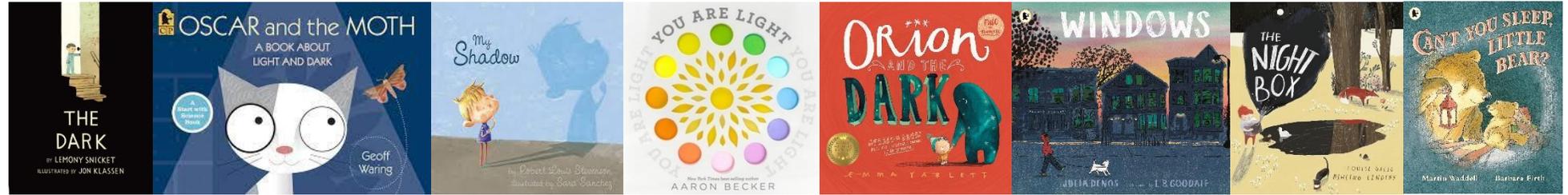
Annie Jump Cannon was an American astronomer whose cataloguing work was instrumental in the development of contemporary stellar classification.

Famous Scientists

Please refer to the above scientists to expand children's scientific capital

Year 3 – Light (Spring 1)

Fiction & Non-Fiction Books to Support Learning



Possible Misconceptions

- We can still see even when there is an absence of any light
- Our eyes 'get used to' the dark
- The moon and reflective surfaces are light sources
- A transparent object is a light source
- Shadows contain details of the object, such as facial features on their own shadow
- Shadows result from objects giving off darkness



The 'Big Ideas' explored in this unit:

P2 - Forces are different kinds of pushes and pulls that act on all the matter that is in the universe. Matter is all the stuff, or mass, in the universe.



Year 3

Forces and Magnets

Year 3 – Forces & Magnets (Spring 1)

Learning Point 1

Recap or previous learning:

- Know that a force is a **push** or a **pull**
- Know ways in which we use forces in our everyday lives, e.g. opening a door, playing on a swing, climbing up a climbing frame
- Know that **gravity** is a force which keeps us on Earth's surface (the mass of the earth can be thought of as '**pulling**' us toward it).
- Know that **pushing** and **pulling** forces can be used to start or stop something moving

Learning Point 2

Know how objects move differently on different surfaces

- Know that **friction** occurs when two objects rub together
- Know that **friction** can change the speed at which an object moves
- Know that when an object moves on a surface, the texture of the surface and the material of the object making contact with the surface, affects how it moves.
- Know that a material moves more quickly on surfaces where **friction** is low (such as an ice rink)
- Know that a material moves slower on surfaces of higher **friction**
- Know that tread on tyres and on shoes are designed to increase **friction** and keep us safe, by preventing skidding and slipping.

Scientific Enquiry – Identifying, Classifying & Grouping – sort photos into groups of 'push' and 'pull' forces using a Venn diagram... identify push and pull forces used in everyday life.

What is a force and what do they do?



Year 3 – Forces & Magnets (Spring 1)

Learning Point 3

Know that some forces work without objects touching

- Know that **magnetism** is an example of a non-contact force
- Know that a **magnet attracts magnetic** material.
- Know that Iron and nickel and other materials containing these, e.g. stainless steel, are **magnetic**.



Scientific Enquiry – Identifying, Classifying & Grouping – explore what materials are attracted to a magnet... classify materials according to whether they are magnetic... use classification evidence to identify that some, but not all, metals are magnetic

How do forces work?

Learning Point 4

Know that the strongest parts of a magnet are the poles

- Know that a **magnet** has two **poles: north** and **south** and the magnetic field is strongest at these points
- Know that there are many different types of **magnets** including: bar **magnet**, ring **magnet**, button **magnet**, horseshoe **magnet**
- Know that **magnets** have different strengths, but that the strength of a **magnet** is not determined by its size



Scientific Enquiry – Comparative & Fair Testing – devise an investigation to test the strength of magnets... use test data to rank magnets.

Does the size of a magnet affect its strength?

Year 3 – Forces & Magnets (Spring 1)

Learning Point 5

Know that the poles of a magnet attract and repel

- Know that **magnets** have two **poles** – a **north pole** and a **south pole**.
- Know that if two like **poles**, e.g. two **north poles**, are brought together they will push away from each other – **repel**
- Know that if two unlike **poles**, e.g. a **north** and **south**, are brought together they will pull together – **attract**



Scientific Enquiry – Identifying, Classifying & Grouping – explore the way that magnets behave in relation to each other. Through my exploration... show how like poles repel and unlike poles attract... use a marked magnet to find the unmarked poles on other types of magnets and name the unmarked poles.

Do all magnets attract?

Learning Point 6

Know that for some forces to act there must be contact, but some forces can also act at a distance

- Know that for some forces to act, there must be contact, e.g. a hand opening a door, the wind pushing the trees.
- Know that some forces can act at a distance, e.g. **magnetism** - the **magnet** does not need to touch the object that it **attracts**.



Scientific Enquiry – Identifying, Classifying & Grouping – explore how magnets work at a distance e.g. through the table, in water, jumping paper clips off the table.

Do forces need contact to act on an object?

Year 3 – Forces & Magnets (Spring 1)

Assessment

How do forces impact our daily lives?

Complete an end of unit assessment on forces and magnets

Masato Sagawa (1943-Present)



Masato Sagawa is a Japanese scientist and entrepreneur, and the inventor of the sintered permanent magnet. He is also involved in energy conservation.

Isaac Newton (1643-1727)



Sir Isaac Newton was an English mathematician, physicist, astronomer and author widely recognised as one of the greatest mathematicians and physicists of all time and among the most influential scientists.

Michael Faraday (1791-1867)



Michael Faraday was an English scientist who contributed to the study of electromagnetism and electrochemistry.

Famous Scientists

Please refer to the above scientists to expand children's scientific capital

Year 3 – Forces & Magnets (Spring 1)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

The bigger the magnet the stronger it is
All metals are magnetic



The 'Big Ideas' explored in this unit:

B1 - Living things are special collections of matter that make copies of themselves, use energy and grow.

B2 - Living things on Earth come in a huge variety of different forms that are all related because they all came from the same starting point 4.5 billion years ago.



Year 3

Plants

Year 3 – Plants (Summer 1)

Learning Point 1

Recap or previous learning:

- Know that evergreen trees maintain their leaves through the year and that deciduous trees shed their leaves in autumn.
- Know that flowering plants consist of roots, stem, leaves and flowers and that a tree's stem is called a trunk
- Know that living things move, grow, consume nutrients and reproduce
- Know that plants absorb energy from the Sun
- Know that seeds and bulbs need to be buried underground in soil and that they will grow into adult plants under the right conditions (warmth, water)
- Know that plants that are deprived of light, food or air to survive

Learning Point 2

Know the names for the parts of the plants and their function

- Know that many plants, but not all, have roots, stems/trunks, leaves and **flowers/blossom**.
- Know the roots absorb water and nutrients from the soil and anchor the plant in place.
- Know the stem holds the leaves and flowers upright in the air and transports water to the leaves
- Know the leaves use sunlight and water to produce the plant's food.

Scientific Enquiry – Research using Secondary Sources – draw and label a diagram of a flowering plant to show its parts and their function

Scientific Enquiry – Identify, Classifying & Grouping – sport flowers, seeds, berries and fruits outside throughout the year.

Scientific Enquiry – Observation Over Time – observe what happens to plants over time when the leaves or roots are removed.

What do each of the different parts of a plant do?



Year 3 – Plants (Summer 1)

Learning Point 3

Know that the stem transports water and nutrients / minerals around the plant

- Know that the roots absorb water and **nutrients** from the soil.
- Know that the stem transports water to the leaves



Scientific Enquiry – Observing Over Time – observe the effect of putting cut white carnations or celery in coloured water and explain what is happening.

What is the function of the stem in plant growth and survival?

Learning Point 4

Know that pollination is the act of moving pollen from one plant to another to create seeds

- Know that some plants produce **flowers** which enable the plant to **reproduce**.
- Know that **pollen**, which is produced by the male part of the flower (**stamen**) is transferred to the female part of other flowers (**stigma**). This process is called **pollination**.
- Know that **insects** such as bees and butterflies are known as **pollinators** because they attract **pollen** and transport it from plant to plant.
- Know that **pollination** forms seeds, sometimes contained in berries or fruits. which are then **dispersed** in different ways.
- Know that a seed contains the young plant (**embryo**) and a store of food. This is wrapped up in a tough, protective coat.



Scientific Enquiry – Observing Over Time – observe flowers carefully to identify the pollen... observe flowers being visited by pollinators e.g. bees and butterflies in summer... draw and label a diagram of a flowering plant to show the method of pollination

How does pollination happen?

Year 3 – Plants (Summer 1)

Learning Point 5

Know that seeds are dispersed in different ways

- Know that some seeds are **dispersed** by wind and have seeds designed to float, glide or spin through the air.
- Know that plants growing near a river may use the flowing water to transport their seeds.
- Know that some seed pods are designed to explode and project the seeds a good distance from the parent plants.
- Know that many plants use animals to carry seeds around. These seeds may have hooks which attach to an animal's fur.
- Know that plants might make **fruit** to enclose the seeds, which attract animals to eat them. These are then excreted onto the ground.



Scientific Enquiry – Observing Over Time – observe seeds being blow from the trees e.g. sycamore seeds

Scientific Enquiry – Research using Secondary Sources – research different types of seed dispersal... draw and label a diagram of a flowering plant to show the method of seed dispersal

Scientific Enquiry – Identifying, Classifying & Grouping – look at features of seeds to identify their method of dispersal... classify seeds in a range of ways, including by how they are dispersed.

How are seeds dispersed?

Year 3 – Plants (Summer 1)

Learning Point 6

Know that different plants require different conditions for germination and growth

- Know that for a seed to start growing, it needs the right conditions. These can be different depending on the plant; however, for most plants, it's moisture from the soil, oxygen and the right temperature.
- Know a seed falls to the ground and becomes buried in the soil.
- Know in warm and moist conditions the seed breaks open and it sends out a root and a green shoot. This is called **germination**.
- know the root grows down to take up nutrients from the soil and the shoot grows up towards the sunlight to become a stem. The seed becomes a seedling.
- Know that as the first leaves emerge, the plant is able to produce its own food.
- Know that leaves make food by trapping light and using its energy to turn carbon dioxide and water into carbohydrates. This is called **photosynthesis**.



Scientific Enquiry – Comparative & Fair Testing – investigate what happens to plants when they are put in different conditions e.g. in darkness, in the cold, deprived of air, different types of soil, different fertilisers, varying amount of space

What conditions are required by plants to germinate and grow?

Year 3 – Plants (Summer 1)

Assessment

How do plants grow?

Explanation text
- Plant lifecycle.

Famous Scientists

George Washington Carver (1864-1943)



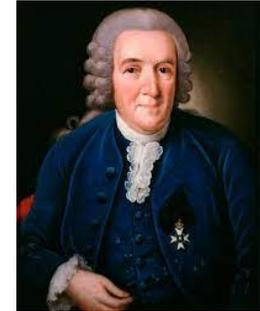
George Washington Carver was an American agricultural scientist and inventor who promoted alternative crops to cotton and methods to prevent soil depletion. He was the most prominent black scientist of the early 20th century.

Janaki Ammal (1897-1984)



Janaki Ammal was an Indian botanist who worked on plant breeding. Her most notable work involved studies on sugarcane and eggplant.

Carl Linnaeus (1707-1778)



Carl Linnaeus was a Swedish botanist, zoologist, taxonomist, and physician who formalised the modern system of naming organisms. He is known as the “father of modern taxonomy”.

Please refer to the above scientists to expand children’s scientific capital

Year 3 – Plants (Summer 1)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

Plants eat food
Food comes from the soil via the roots
Flowers are merely decorative rather than a vital part of the life cycle in reproduction
Plants only need sunlight to keep them warm
Roots suck in water which is then sucked up the stem



The 'Big Ideas' explored in this unit:

B3 - The different kinds of life, animals, plants and microorganisms, have evolved over millions of generations into different forms in order to survive in the environments in which they live.



Year 3

Animals, including Humans

Year 3 – Animals, including Humans (Summer 1)

Learning Point 1

Recap or previous learning:

- Know that living things move, grow consume nutrients and reproduce; that dead things used to do these but no longer do; and that things that have never lived have never done these things
- Know that plants absorb energy from the Sun; that this energy is consumed by herbivorous animals; and that carnivorous animals eat other animals
- Know that the arrows on a food chain show the direction that the energy travels
- Know that animals including humans need food, water and air to survive
- Know that there are food groups: fruit & vegetables, carbohydrates, protein, dairy, fat and sugary foods.
- Know that more than half of our diet should be made up of carbohydrates and fruit & vegetables
- Know that fats and sugary foods should be eaten rarely and in small amounts

Year 3 – Animals, including Humans (Summer 1)

Learning Point 2

Know that food have different nutritional values

- Know that animals (including humans), unlike plants which can make their own food, need to eat in order to get the nutrients they need.
 - Know that food contains a range of different nutrients called: carbohydrates (including sugars), protein, vitamins, minerals, fats, sugars, water and fibre.
 - Know that these nutrients are needed in different amounts by the body to stay healthy.
 - Know that carbohydrates give us energy.
 - Know that protein helps muscle growth and repair.
 - Know that vitamins and minerals come from fruit and vegetables and help keep away illnesses such as colds.
 - Know that fats can be healthy (unsaturated) and unhealthy (saturated) – we need healthy fats in small amounts, but we don't need saturated fats, so these should be eaten in small amounts, as treats.
 - Know that sugars are not needed by the human body to be healthy, so sugary foods need to be eaten in small amounts, as treats.
 - Know that eating the right amount of each food group is called a **balanced diet**
 - Know that fibre is needed for healthy digestion – it helps us go to the toilet regularly.
 - Know that a piece of food will often provide a range of nutrients.
 - Know that some foods can cause ill health when eaten too much, e.g. saturated fats and sugar.
 - Know that too much food can lead us to building up fat that we don't need – this can lead to obesity and increase the strain on **joints** and growing bones
- Know that too much unhealthy food can lead to certain diseases such as heart disease or diabetes.



Scientific Enquiry – Identifying, Classifying & Grouping – classify food in a range of ways, e.g. those that are high or low in particular nutrients

What foods have the best nutritional value?

Year 3 – Animals, including Humans (Summer 1)

Learning Point 3

Know that some animals, including humans have a skeleton, which helps them to move and provides protection and support

- Know that the **skeleton** is made of lots of bones
- Know that some animals, including humans have their skeleton on the inside of their bodies. This is called an **endoskeleton**.
- Know the name of some of the key bones of the skeleton: skull, spine, **ribcage**, pelvis
- Know the function of the **skeleton** is to protect vital **organs**, allow animals including humans to stay upright and to move
- Know that the skull protects the brain, the **ribcage** protects the heart and lungs
- Know that the **skeleton** has **joints** which allows animals including humans, to move.
- Know that **joints** are where two or more bones join together, e.g. **elbows, shoulders**, knees, ankles etc.
- Know that some animals have their **skeleton** on the outside of their bodies. This is called an **exoskeleton**.
- Know that some animals do not have a **skeleton** (for example, earthworms, slugs). These are called **invertebrates**.
- Know that **invertebrates** have water held inside by **muscles** which acts like a **skeleton**.



Scientific Enquiry – Research using Secondary Sources – research the parts and functions of the skeleton

What are the different parts of the skeleton and their functions?

Year 3 – Animals, including Humans (Summer 1)

Learning Point 4

Know that some animals and humans have muscles which help them move

- Know that **muscles** can only pull (**contract**), they can't push.
- Know that **muscles** are attached to bones by **tendons** which help them to move.
- Know that our **joints** are controlled by **muscles** that work in pairs, e.g. our **elbow** joint has two **muscles**, to move your forearm up and down.
- Know that the **muscles** in the arm are called the biceps that pull your arm up, and the triceps that pull your arm down.
- Know that our **muscles** are a little bit like elastic bands, they can get longer or shorter.
- Know that when a **muscle contracts**, it gets shorter.
- Know that when a **muscle relaxes**, it gets longer.
- Know that often, our **muscles** work in pairs to move our bodies, e.g. biceps and triceps.
- Know that in our leg, if the **muscle** on the back of our thigh **contracts** and gets shorter, it bends our leg at our knee **joint**. If we want to extend our leg, the **muscle** on the front of our thigh **contracts** and gets shorter, and it extends our leg.



Scientific Enquiry – Pattern Seeking – investigate patterns, asking questions such as: Do people who exercise more have stronger muscles? Use the data to look for patterns (or lack of them) when answering the enquiry questions.

What happens to our muscles when we move?

Year 3 – Animals, including Humans (Summer 1)

Assessment

Why is it important that animals, including humans, get the right types & amounts of nutrition?

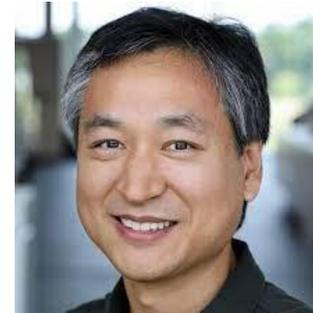
PowerPoint presentation about the importance of a balanced diet and exercise.

Rujuta Diweka (1973-Present)



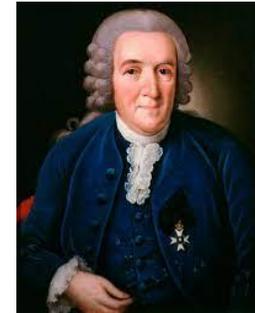
Rujuta Diwekar is a celebrity fitness expert whose books are massive bestsellers. She was given the Nutrition Award by the Asian Institute of Gastroenterology in 2010. She has also received accreditation from Sports Dietitians Australia.

Zheng Ji (1900-2010)



Zheng Ji was a Chinese nutritionist and pioneering biochemist. He was reputed to be the world's oldest professor and the founder of modern nutrition science in China, having lived to the age of 110.

Carl Linnaeus (1707-1778)



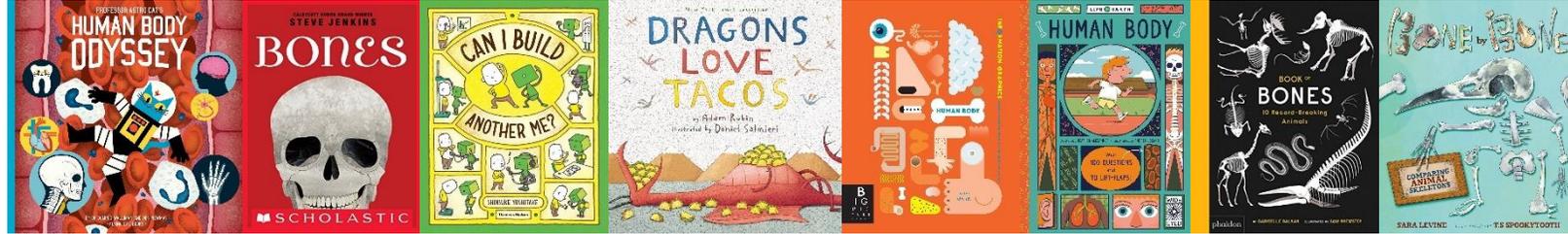
Carl Linnaeus was a Swedish botanist, zoologist, taxonomist, and physician who formalised the modern system of naming organisms. He is known as the "father of modern taxonomy".

Famous Scientists

Please refer to the above scientists to expand children's scientific capital

Year 3 – Animals, including Humans (Summer 1)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

Certain food groups like fats are bad for you.
Certain specific foods, like cheese, are bad for you.
Diet and fruit drinks are good for you.
Snakes are similar to worms, so they must also be invertebrates.
Invertebrates have no form or skeleton.

End of Year 3 Expectations

Plants

Pupils should be able to:

- Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers
- Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plants to plants.
- Investigate the way in which water is transported.
- Explore the part that flowers play in the life cycle.

Animals, including Humans

Pupils should be able to:

- Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat.
- Identify that humans and some other animals have skeletons and muscles for support, protection and movement.

Rocks

Pupils should be able to:

- Compare and group together different kinds of rocks and on the basis of their appearance and simple physical properties.
- Describe in simple terms how fossils are formed when things that have lived are trapped within rocks.
- Recognise that soils are made from rocks and organic matter.

Biology

Chemistry

Light

Pupils should be able to:

- Recognise that they need light in order to see things and that dark is the absence of light.
- Notice that light is reflected from surfaces
- Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.
- Recognise that shadows are formed when the light from a light source is blocked by a solid object.
- Find patterns in the way that the size of shadows change.

Forces and Magnets

Pupils should be able to:

- Compare how things move on different surfaces
- Notice that some forces need contact between two objects, but magnetic forces can act at a distance
- Observe how magnets attract or repel each other and attract some materials and not other.
- Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials.
- Describe magnets as having two poles
- Predict whether two magnets will attract, or repel each other, depending on which poles are facing

Physics



The 'Big Ideas' explored in this unit:

B3 - The different kinds of life, animals, plants, and microorganisms, have evolved over millions of generations into different forms in order to survive in the environments in which they live.



Year 4

Animals, including Humans

Year 4 – Animals, including Humans (Autumn 1)

Learning Point 1

Recap or previous learning:

- Know that proteins are good for growth, carbohydrates for energy and fruit and vegetables provide vitamins and minerals which help keep us healthy (e.g. calcium for healthy bones and teeth)
- Know that a food group can cause ill health, such as tooth decay due to excess sugar
- Know that living things move, grow, consume nutrients, and reproduce
- Know that plants absorb energy from the Sun; that this energy is consumed by herbivorous animals; and that carnivorous animals eat other animals

Learning Point 2

Know the function of the digestive system in humans

- Know food enters the body through the mouth.
- Know **digestion** starts when the teeth start to break the food down.
- Know that **saliva** is added and the **tongue** rolls the food into a ball.
- Know the food is swallowed and passes down the **oesophagus** to the **stomach**. Here the food is broken down further by being churned around and other chemicals are added.
- Know that further **enzymes** and **bile** break down the food further as it moves through the **duodenum** towards the **small intestine**.
- Know the food passes into the **small intestine**. Here nutrients are removed from the food and leave the digestive system to be used elsewhere in the body.
- Know the rest of the food then passes into the **large intestine**. Here the water is removed from undigested food for use elsewhere in the body.
- Know that what is left is then stored in the **rectum** until it leaves the body through the **anus** when you go to the toilet.



Scientific Enquiry – Research using Secondary Sources – find out about the function of the parts of the digestive system

What is the digestive system?

Year 4 – Animals, including Humans (Autumn 1)

Learning Point 3

Know the role of teeth in digestion

- Know that there are three types of teeth: **incisors**, **canines** and **molars** (including premolars) - and that each type of tooth does a different job.
- Know that **incisors** slice (cut), **canines** tear food (especially meat), and **molars** and premolars grind (chew).



Scientific Enquiry – Comparative and Fair Testing – compare what happens to eggs when left in different liquids.

What happens to our teeth when we eat different foods?

Learning Point 4

Know that living things can be classified as producers, predators and prey according to their place in the food chain.

- Know that a food chain explains how energy moves from plants to animals (and then other animals).
- Know that some animals eat plants (herbivores), which is where they get their energy, and that some animals eat other animals (carnivores), which is where they get theirs.
- Know that children develop an initial set of teeth which are gradually replaced between the ages of 6 and 12.
- Know that plants are called **producers** of energy, and that **consumers** take in energy by eating the plants or other animals.
- Know that some animals are **prey** (these are animals which are eaten by other animals).
- Know that some animals are **predators** (these are animals which eat other animals - carnivore).
- Know that the first **consumer** in a food chain is called a **primary consumer**; the second is a **secondary consumer**; above it is the **tertiary consumer**.



Scientific Enquiry – Identifying, Classifying & Grouping – classify animals as herbivores, carnivores or omnivores according to the types of teeth they have in their skulls.

Where is an animal's place in the food chain?

Year 4 – Animals, including Humans (Autumn 1)

Assessment

What do our bodies do with the food we eat?

Produce an informational video about how our bodies digest food, with reference to good oral hygiene.

David Attenborough (1926-Present)



Sir David Frederick Attenborough is an English broadcaster, biologist, natural historian, and author. He is best known for writing and presenting TV documentary shows portraying animal and plant life on Earth.

Mary Seacole (1885-1881)



Mary Jane Seacole was a British-Jamaican nurse and businesswoman who set up the 'British Hotel' behind the lines during the Crimean War. She provided medical care for wounded men on the battlefield, nursing many of them back to full health.

Joseph Lister (1827-1912)



Joseph Lister was a British surgeon, medical scientist, experimental pathologist and a pioneer of antiseptic surgery and preventative medicine. Joseph Lister revolutionised the craft of surgery in the same manner that John Hunter revolutionised the science of surgery.

Famous Scientists

Please refer to the above scientists to expand children's scientific capital

Year 4 – Animals, including Humans (Autumn 1)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

Your stomach is where your belly button is
Food is digested only in the stomach
When you have a meal, your food goes down one tube and your drink down another
The food you eat becomes 'poo' and the drink becomes 'wee'



The 'Big Ideas' explored in this unit:

C1 - All matter (stuff) in the universe is made up of tiny building blocks.

C2 - The arrangement, movement and type of the building blocks of matter and the forces that hold them together or push them apart explain all the properties of matter (e.g., hot/cold, soft/hard, light/heavy, etc).



Year 4

States of Matter

Year 4 – States of Matter (Autumn 2)

Learning Point 1

Recap or previous learning:

- Know that an object is made from / of a material
- Know that materials can be hard, soft, strong, weak, absorbent, heavy, light, solid, runny, smooth, rough etc. – these descriptions denote the properties of a material.
- Know that materials are made up of matter (tiny building blocks that we can't see with the naked eye, called **particles**).

Learning Point 2

Know that objects can be classified as solid, liquids or gases.

- Know that all things are composed of a material in one of the three states of matter: **solid, liquid** or **gas**.
- Know that objects are made out of a huge number of **particles** and that these are organised differently in different states.
- Know that in **solids, particles** are packed very tightly together and they do not have much space to move, meaning they do not flow like a **liquid** or **gas**.
- Know that the **particles** in **liquids** are arranged in a random way and are close together, touching many of their neighbours. There are some gaps, but **liquids** cannot usually be compressed or squashed.
- Know that the **particles** in **gases** are widely spaced and randomly arranged, meaning they can be easily compressed or squashed.



Scientific Enquiry – Identifying, Grouping & Classifying – sort and group objects based on whether they are solids, liquids or gases

How are solids, liquids and gases different?

Year 4 – States of Matter (Autumn 2)

Learning Point 3

Know that objects can change their state of matter

- Know that materials can change state when their temperature changes
- Know that there are bonds between **particles** in a **solid**, and as the temperature of the **particles** increase, the particles do not get bigger but vibrate and move, which causes them to move slightly further apart and become a **liquid**.
- Know that with a further increase in temperature, the **particles** move even further apart and have more room to move, which changes the **liquid** in to a **gas**.
- Know that when a **solid** turns in to a **liquid**, this is called **melting**; when a **liquid** turns in to a solid, it is called **freezing**.
- Know that when **liquids** turn to **gas**, this is called **evaporation**; the reverse is called **condensation**.
- Know that when a solid turns into a gas without passing through the liquid state, this is called **sublimation**.
- Know that the **freezing point** of water is 0°C; the **evaporation** point is 100°C; anything between these is **liquid** water.



Scientific Enquiry – Comparative & Fair Testing – Investigate the melting points of different solids e.g. soft and hard fats, chocolate, wax etc.

Do all solids have the same melting point?

Year 4 – States of Matter (Autumn 2)

Learning Point 4

Know the water cycle

- Know that water flows around our world in a continuous process called the **water cycle**
- Know that, along with **evaporation**, water on the Earth's surface moves to the air in a process called **transpiration** in which water turns into water vapour (**gas**) on the surface of leaves on plants
- Know that rain **condenses** in clouds and falls to earth as rain, snow or hail in a process called **precipitation**
- Know that water flows across the land in rivers and streams in a process called **surface run-off** and under the ground as groundwater



Scientific Enquiry – Research using Secondary Sources – research and create an information leaflet about the water cycle

What is the water cycle?

Year 4 – States of Matter (Autumn 2)

Assessment

How does water exist in all three states of matter?

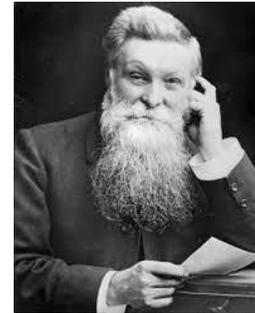
Create poster about the water cycle which explains each stage.

John McAdam (1756-1836)



John Loudon McAdam was a Scottish civil engineer and roadbuilder. He was the inventor of tarmac, an effective and economical method of constructing roads.

John Boyd Dunlop (1840-1924)



John Boyd Dunlop was a Scottish born inventor and veterinary surgeon. Familiar with making rubber devices, he invented the first practical types for a child's tricycle and developed them for use in cycle racing.

Charles Macintosh (1766-1843)



Charles Macintosh was a Scottish chemist and the inventor of the modern waterproof raincoat. The Mackintosh raincoat is named after him.

Famous Scientists

Please refer to the above scientists to expand children's scientific capital

Year 4 – States of Matter (Autumn 2)

Fiction & Non-Fiction Books to Support Learning



Possible Misconceptions

'solid' is another word for hard or opaque

Solids are hard and cannot break or change shape easily and are often in one place

Substances made of very small particles like sugar or sand cannot be solids

Particles in liquids are further apart than in solids and they take up more space

When air is pumped into balloons, they become lighter

Water in different forms – steam, water, ice – are all different substances

All liquids boil at the same temperature as water (100 degrees)

Melting, as a change of state, is the same as dissolving

Steam is visible water vapour (only the condensing water droplets can be seen)



The 'Big Ideas' explored in this unit:

P1 - The universe follows unbreakable rules that are all about forces, matter, and energy.

P3 - Energy, which cannot be created or destroyed, comes in many different forms, and tends to move away from objects that have lots of it.



Year 4

Sound

Year 4 – Sound (Spring 1)

Learning Point 1

Recap or previous learning:

- Know that energy comes in different forms and can be neither created nor destroyed; only changed from one form to another
- Know that sound is generated when an object **vibrates**; some of the energy from the **vibrating** object is transferred to the air, making the air **particles** (which are loosely arranged as the air is a gas) move

Learning Point 2

Know that sound can only travel through particles interacting

- Know that sound is a form of energy that travels in a **longitudinal wave** that transfers from one **particle** to the next **particle** like in a slinky
- Know that sound travels through a medium (e.g. particles in the air)
- Know that sound can travel through solids (e.g. when we place a glass next to a wall to hear better)
- Know that sounds can not travel through a vacuum (e.g. in space) which has no particles in it at all



Scientific Enquiry – Pattern Seeking – investigate sound travelling through different objects

How does sound travel?

Year 4 – Sound (Spring 1)

Learning Point 3

Know that the ear detects sounds, and the brain interprets them

- Know that **sound waves** (the **vibrations** of **particles**) hit the ear drum
- Know that these **sound waves** are sent via very small bones and nerves to the brain
- Know that the brain interprets the signals sent from the ear and translates them to sound



Scientific Enquiry – Research using Secondary Sources – research how sound travels so we can hear

How do we hear sounds?

Learning Point 4

Know that sound travels at different speeds

- Know that sound travels at different speeds through different objects
- Know that sound travels at around 340 metres per second in the air
- Know that sound travels much quicker through solids – approx. 6000 metres per second – as the particles are closer together
- Know that sound travels much slower than light; this is why we often hear thunder after we see lightning as the light reaches our eye before the sound reaches our ears.



Scientific Enquiry – Comparative & Fair Testing – how quickly sound travels over a distance through different medium

How fast does sound travel?

Year 4 – Sound (Spring 1)

Learning Point 5

Know that different sounds occur and why they are different

- Know that **pitch** is how high or low a sound is and that this is determined by how many **vibrations** per second are being made by the **vibrating** object; the number of **vibrations** per second is called **frequency**
- Know that **volume** is how loud or quiet a sound is and that this is determined by the amount of energy in the wave (e.g. from how hard or soft a percussion instrument is hit)
- Know that the **volume** of a sound is quieter if the listener is further away from the object



Scientific Enquiry – Pattern Seeking – investigate how the length of vibrations change as the length of a ruler increases... record the height of the vibration, the speed of vibration and the pitch produced

How does the speed of vibrations affect the pitch of the sound produced?

Learning Point 6

Scientist Study: Ludwig Van Beethoven

- Know about Ludwig Van Beethoven and how work in music production
- Know that scientific thinking has changed over time and continues to change



Scientific Enquiry – Research using Secondary Source – research about the life and work of Ludwig Van Beethoven

Who was Ludwig Van Beethoven and what did he do?

Year 4 – Sound (Spring 1)

Assessment

How can we make different sounds?

End of unit assessment.

Arif Mardin (1932-2006)



Arif Mardin was a Turkish-American music producer, who worked with hundreds of artists across many different styles of music, including jazz, rock, soul, disco and country.

Ludwig Van Beethoven (1770-1827)



Ludwig van Beethoven was a German composer and pianist. Beethoven remains one of the most admired composers in the history of Western music; his works rank amongst the most performed of the classical music repertoire.

Christian Doppler (1803-1853)



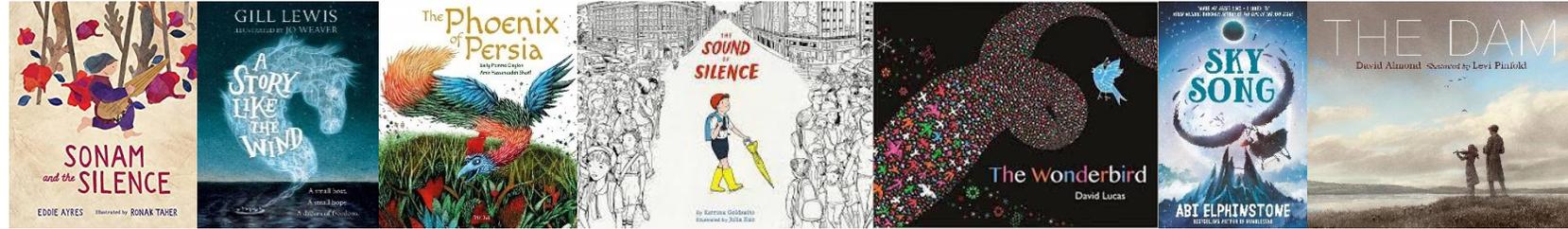
Christian Doppler was an Austrian mathematician and physicist. He is celebrated for his principle – known as the Doppler effect – that the observed frequency of a wave depends on the relative speed of the source and the observer.

Famous Scientists

Please refer to the above scientists to expand children's scientific capital

Year 4 – Sound (Spring 1)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

Sound is only heard by the listener
Sound only travels in one direction from the source
Sound can't travel through solids and liquids
High sounds are loud and low sounds are quiet



The 'Big Ideas' explored in this unit:

P1 - The universe follows unbreakable rules that are all about force and energy.

P3 - Energy, which cannot be created or destroyed, comes in many different forms and tends to move away from objects that have lots of it.

C2 - The arrangement, movement, and type of the building blocks of matter and the forces that hold them together or push them apart explain all the properties of matter (e.g., hot/cold, soft/hard, light/heavy, etc).



Year 4

Electricity

Year 4 – Electricity (Spring 1)

Learning Point 1

Recap or previous learning:

- Know that an object is made from a material, and most are made of several different materials
- Know that metal is a material from which objects can be made
- Know that matter (stuff) is made from building blocks which are too small to be seen with the naked eye
- Know that energy comes in different forms and can be neither created nor destroyed, only changed from one form to another

Learning Point 2

Know what electricity is

- Know that electrical energy is one of many forms of energy
- Know that some of the particles (building blocks) in a material carry electric **charges**
- Know that some of these are 'negative' charges and some are 'positive' **charges**
- Know that static electricity is an imbalance of **charged** particles on a material
- Know that when we get a small electric 'shock', this is because of **static electricity**
- Know that **current electricity** is the flow of charged particles called '**electrons**' around a circuit
- Know that **current electricity** is the form of electricity that we use in our lives in lights, computers, televisions, etc



Scientific Enquiry – Identifying, Classifying & Grouping – sort machines or appliances into a Venn diagram, deciding whether they always need electricity, sometimes need electricity or never need electricity.

What is electricity?

Year 4 – Electricity (Spring 1)

Learning Point 3

Know what an electrical current is

- Know that some electricity flows around a **circuit**, and that this is called an electrical **current**
- Know that electrical **current** flows well through some materials, called electrical **conductors**, and poorly through other materials, called electrical **insulators**
- Know that **conductors** have free **electrons** (tiny, negatively charged particles) and that when electrical **current** flows around a **conductor** the **electrons** move
- Know that electrical **conductivity** (how well a material **conducts** electricity) is an example of a property
- Know that metals are good electrical **conductors**

Scientific Enquiry – Pattern Seeking – use different materials to discover whether they are conductors or insulators of electricity... look for patterns in which materials are conductors and which are insulators.

How does electricity flow?



Year 4 – Electricity (Spring 1)

Learning Point 4

Know that several parts are required for an electrical circuit to work

- Know that a **chemical reaction** inside a **cell** produces the **charged** particles that can flow around a **circuit**
- Know that more than one **cell** lined up to work together is called a **battery**
- Know that **cells, batteries** and the **mains** are all sources of electrical energy
- Know that electrical **current** can flow if there is a complete **circuit**
- Know that **wires** – which contain a **conductor** inside them, usually made of metal – can allow electrical **current** to flow around a **circuit**
- Know that when electrical **current** flows through a **circuit** components within that **circuit** – such as **buzzers** which make a noise and **bulbs** which **emit** light – begin to work
- Know that a **switch** functions by completing or breaking a complete **circuit**
- Know how to construct a simple **circuit** using components
- Know that exposure to high levels of electrical **current** can be dangerous



Scientific Enquiry – Comparative & Fair Testing – investigate whether the number of batteries affects the brightness of bulbs in a circuit.

What do we need to make a circuit?

Year 4 – Electricity (Spring 1)

Assessment

What can we do with electricity?

Create buzz wire games.

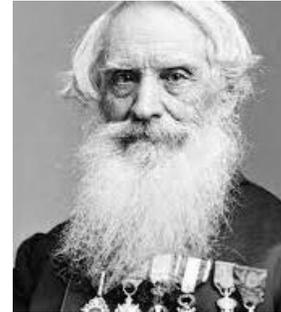
Famous Scientists

Nikola Tesla (1856-1943)



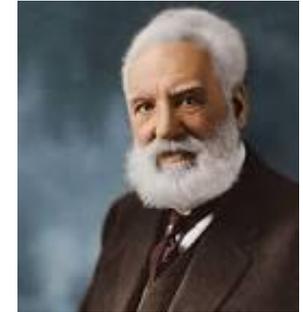
Nikola Tesla was a Serbian American inventor, electrical engineer, mechanical engineer, and futurist best known for his contributions to the design of the modern alternating current electricity supply system.

Samuel Morse (1791-1872)



Samuel Finley Breese Morse was an American inventor and painter. After establishing his reputation as a portrait painter, in his middle age Morse contributed to the invention of a single-wire telegraph system based on European telegraphs.

Alexander Graham Bell (1847-1922)



Alexander Graham Bell was a Scottish-born inventor, scientist and engineer who is credited with patenting the first practical telephone.

Please refer to the above scientists to expand children's scientific capital

Year 4 – Electricity (Spring 1)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

Electricity flows to bulbs, not through them
Electricity flows out of both ends of a battery
Electricity works by simply coming out of one end of a battery into the component



The 'Big Ideas' explored in this unit:

B2 - Living things on Earth come in a huge variety of different forms that are all related because they all came from the same starting point 4.5 billion years ago.

B3 - The different kinds of life, animals, plants and microorganisms, have evolved over millions of generations into different forms in order to survive in the environments in which they live.



Year 4

Living Things and their Habitats

Year 4 – Living Things and their Habitats (Summer 2)

Learning Point 1

Recap or previous learning:

- Know that a habitat is an environment in which an animal lives
- Know that light plays an important role in providing food for animals
- Know that a food chain shows the foods that animals need to survive
- Know that animals and plants are adapted to survive in their habitats

Learning Point 2

Know that living things can be group into different types

- Know that, broadly, living things can be grouped in to animals, plants and **micro-organisms**.
- Know that all animals grow, take in air, reproduce, excrete, and need nutrition
- Know that animals can be grouped in to different types such as amphibians, reptiles, mammals, fish, insects and birds
- Know that plants, like animals, are living things made of different types of cells (the building blocks that make an animal/plant)
- Know that plants, unlike animals, do not move or seek out their food; like animals, they grow, take in air, reproduce and need nutrition.



Scientific Enquiry – Identifying, Classifying & Grouping – identify and group living things based on their characteristics

How can living things be grouped?

Year 4 – Living Things and their Habitats (Summer 2)

Learning Point 3

Know that animals can be classified as invertebrates or vertebrates

- Know that there are different **classifications** of animal: amphibians, reptiles, mammals, fish, insects and birds
- Know that a **classification key** uses questions and **criteria** to sort and identify different living things
- Know that scientists split animals in to two broad groups: vertebrates and invertebrates.
- Know that to be a vertebrate means to have a backbone; to be an invertebrate means animals do not possess a backbone.
- Know that mammals, amphibians, fish, reptiles and birds are vertebrates.
- Know that invertebrates often have a hard shell which protects them.
- Know that butterflies, dragonflies, spiders, jellyfish, lobsters, slugs and snails are examples of invertebrates



Scientific Enquiry – Identifying, Classifying & Grouping – identify and classify animals as invertebrates or vertebrates.

What are invertebrates and vertebrates?

Learning Point 4

Know that invertebrates can be found in lots of different places

- Know that approx. 80% of living things (98% of all animal life) is invertebrate.
- Know that insects such as crickets, flies, ladybirds etc are invertebrates.
- Know that an annelid (worms, leeches etc) is an invertebrate.
- Know that crustaceans are invertebrates which can be found in the ocean and on land (crab, lobster; woodlice)
- Know that molluscs are invertebrates which can also be found on the land or in the ocean (octopus, snail, slug)
- Know that arachnids are invertebrates which can be found on land (spiders, scorpions, ticks)



Scientific Enquiry – Identifying, Classifying & Grouping - ...explore the local environment and identify different organisms. ...create their own classification key by asking dichotomous questions... group animals based on their characteristics

Where do invertebrates live?

Year 4 – Living Things and their Habitats (Summer 2)

Learning Point 5

Know that habitats can change over time

- Know that animals rely on their habitat for food, water, shelter and reproduction
- Know that the local environment can change for several reasons including natural change and change due to human activity such as deforestation, **pollution** (creating **climate change**) and urbanisation.
- Know that such changes to an environment mean that animals are often less well **adapted** than they should be and find it difficult to survive and reproduce ; in extreme cases this can lead to **extinction** where an entire **species** dies out



Scientific Enquiry – Pattern Seeking – ... select a habitat in the local environment... record how it looks now and describe the weather, temperature, and daylight hours... predict how the habitat will change as the seasons change

How do habitats change throughout the year?

Learning Point 7

Scientist Study: David Attenborough

- Know about David Attenborough and their work into habitats understanding animal life in the wild.
- Know that scientific thinking has changes over time and continues to change



Scientific Enquiry – Research using Secondary Sources – research about the life and work of David Attenborough

Who is David Attenborough and what has he done?

Year 4 – Living Things and their Habitats (Summer 2)

Assessment

How are living things grouped?

Create a branching database for a variety of living things.

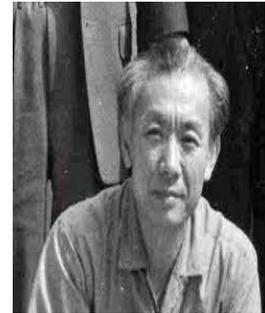
Famous Scientists

David Attenborough (1926-Present)



Sir David Frederick Attenborough is an English broadcaster, biologist, natural historian, and author. He is best known for writing and presenting TV documentary shows portraying animal and plant life on Earth.

Taskasi Tokioka (1913-2001)



Takasi Tokioka was a Japanese zoologist. He published over 200 scientific articles on marine animals. He was Professor of Zoology at Kyoto University working at the Seto Marine Biological Laboratory in Shirahama, Japan.

Carl Linnaeus (1707-1778)

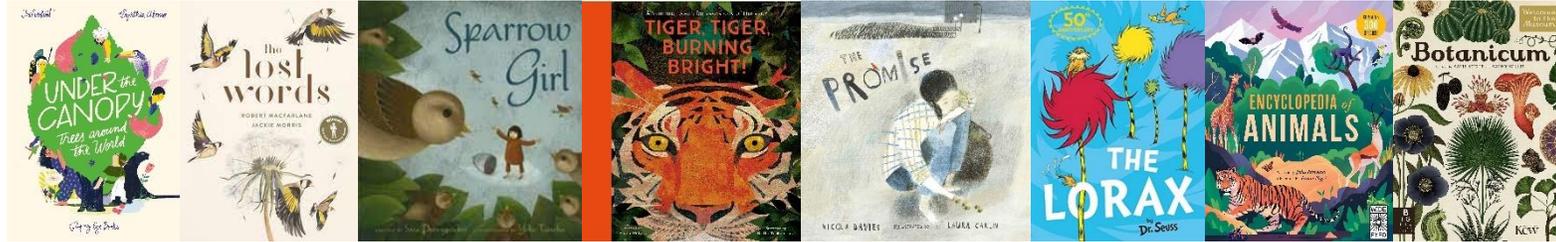


Carl Linnaeus was a Swedish botanist, zoologist, taxonomist, and physician who formalised the modern system of naming organisms. He is known as the “father of modern taxonomy”.

Please refer to the above scientists to expand children’s scientific capital

Year 4 – Living Things and their Habitats (Summer 2)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

the death of one of the parts of a food chain or web has no or limited consequences on the rest of the chain
there is always plenty of food for wild animals
animals are only land-living creatures
animals and plants can adapt to their habitats, however they change
all changes to habitats are negative
arrows in a food chain means 'eat'

End of Year 4 Expectations

Living Things and their Habitats

Pupils should be able to:

- Recognise that living things can be grouped in a variety of ways
- Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment
- Recognise that environments can change and that this can sometimes pose dangers to living things

Animals, including Humans

Pupils should be able to:

- Describe the simple function of the basic parts of the digestive system in humans
- Identify the different types of teeth in humans and their simple functions
- Construct and interpret a variety of food chain, identifying producers, predators, and prey

States of Matter

Pupils should be able to:

- Compare and group materials together, according to whether they are solids, liquids or gases
- Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which they happen in degrees Celsius (°C)
- Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature

Biology

Chemistry

Sound

Pupils should be able to:

- Identify how sounds are made, associating some of them with something vibrating
- Recognise that vibrations from sounds travel through a medium to the ear
- Find patterns between the pitch of a sound and features of the object that produced it
- Find patterns between the volume of a sound and the strength of the vibrations that produced it
- Recognise that sounds get fainter as the distance from the sound source increases

Electricity

Pupils should be able to:

- Identify common appliances that run on electricity
- Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers
- Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery
- Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit
- Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit

Physics



The 'Big Ideas' explored in this unit:

E1 - The Earth is one of eight planets that orbit the sun.

E2 - The Earth is tilted and spins on its axis leading to day and night, the seasons and the climate.



Year 5

Earth and Space

Year 5 – Earth and Space (Autumn 1)

Learning Point 1

Recap or previous learning:

- Know that days are longer in the summer and shorter in winter
- Know that weather changes through the year, getting hotter in the summer and colder in the winter
- Know that Earth orbits the Sun and that one complete orbit takes one year: 365 or 366 days
- Know that light is a form of energy
- Know that we need light to see things and that darkness is the absence of light
- Know that light travels in straight lines

Learning Point 2

Know which basic objects make up our universe

- Know that '**universe**' is the word we use to describe all matter and space in existence
- Know that a **celestial body** is a large object in the **universe**, and that a **planet** is an example of a **celestial body**
- Know that a **planet** (e.g Earth) is defined as a **spherical celestial body** that **orbits a star**
- Know that the **moon** is an example of a **celestial body** which is thought to have been a part of the Earth billions of years ago; when another **celestial body** collided with Earth, much of the material making up the Earth was 'blown out' and reformed (due to gravity) to form the **moon**.
- Know that a **star** is an exceptionally hot ball of gas, originally made from hydrogen and helium
- Know that the Sun is a **star** and is the closest one to us



Scientific Enquiry – Research using Secondary Sources – research what makes up the universe

What is the universe and what is found in it?

Year 5 – Earth and Space (Autumn 1)

Learning Point 3

Know what the solar system is

- Know that the Sun and the objects that **orbit** it are collectively known as our **solar system**
- Know that there are eight major **planets** in our **solar system**: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune
- Know that these **planets** orbit the Sun
- Know that the further away an object is from the Sun, the more time it takes to orbit the Sun.
- Know that a **satellite orbits** a planet and that moons are **natural satellites**
- Know that humans have sent man-made **satellites** into **orbit** that assist with telecommunication
- Know that the **universe** is vast and that our **solar system** makes up a tiny fraction of it.
- Know that the **planets** in the **solar system** decrease in density the further away from the Sun they are.



Scientific Enquiry – Pattern Seeking - ... investigate the density of different objects found in or around the classroom.

What is the solar system?

Learning Point 4

Know that the movements of the Earth impact our daily lives

- Know that the Earth **rotates** around an imaginary line through its centre called an **axis** and that this **axis** is tilted
- Know that night and day are the result of the Earth **rotating** on its **axis**; one rotation takes 24 hours.
- Know that the tilt of the Earth towards and away from the Sun's light as the Earth **orbits** the Sun leads to the seasons
- Know that the distance from the Sun throughout the year does not change significantly and that distance from the Sun does not impact seasons
- Know that during winter the light is spread over a wider area



Scientific Enquiry – Observation Over Time – investigate how sun dials help up to tell the time and how the shadow created from the sun changes throughout the day.

How does the movement of the Earth affect our lives?

Year 5 – Earth and Space (Autumn 1)

Learning Point 5

Know that the movements of the moon are important

- Know that the **Moon orbits** the Earth roughly every 28 days
- Know that as the **Moon orbits** the Sun, different parts of it are lit up by the Sun, which is why we see a different shape lit up on the **Moon** as the **lunar** cycle progresses; these are called phases of the **Moon**
- Know that a **solar eclipse** occurs when the **Moon** is between the Sun and the Earth, casting a shadow on the Earth; a **lunar eclipse** occurs when the Earth is between the Sun and the **Moon**, casting a shadow on the **Moon**
- Know that the movement of the **Moon** causes low and high tides

Scientific Enquiry – Research using Secondary Sources – research how the moon’s appearance changes

Scientific Enquiry – Observation Over Time – investigate how the moon’s appearance changes throughout its cycle

What are the phases of the moon?



Learning Point 6

Scientist Study: Mae Jemison

- Know about Mae Jemison and her work as a Nasa Astronaut
- Know that scientific thinking has changed over time and continues to change.

Scientific Enquiry – Research using Secondary Sources – research about the life and work of Mae Jemison

Who is Mae Jemison and what has she done?



Year 5 – Earth and Space (Autumn 1)

Assessment

What is in our Solar System?

Present, using models and diagrams, about how the Earth orbits the Sun, including information about the Moon.

Mae Jemison (1956-Present)



Mae Carol Jemison is an American engineer, physician, and former NASA astronaut. She became the first black woman to travel into space when she served as a mission specialist about the Space Shuttle Endeavor.

Galileo Galilei (1564-1642)



Galileo di Vincenzo Bonaiuti de' Galilei was an Italian astronomer, physicist and engineer, sometimes described as a polymath. He was born in the city of Pisa, then part of the Duchy of Florence.

Annie Jump Cannon (1863-1941)



Annie Jump Cannon was an American astronomer whose cataloguing work was instrumental in the development of contemporary stellar classification.

Famous Scientists

Please refer to the above scientists to expand children's scientific capital

Year 5 – Earth and Space (Autumn 1)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

The sun moves around the Earth
The sun isn't a star
There is no air on the moon hence there is no gravity



The 'Big Ideas' explored in this unit:

P1 - The universe follows unbreakable rules that are all about forces, matter, and energy.

P2 - Forces are different kinds of pushes and pulls that act on all the matter that is in the universe. Matter is all the stuff, or mass, in the universe.



Year 5

Forces

Year 5 – Forces (Spring 1)

Learning Point 1

Recap or previous learning:

- Know that a force can be thought of as a push or a pull.
- Know that as objects move across a surface, there is friction when they rub against each other and sometimes this friction is larger or smaller.
- Know that applying forces to an object can change its shape.
- Know that the roughness of a material is an example of a property.
- Know that objects move differently on rough and smooth surfaces; objects resist movement more on rough surfaces because there is higher friction as the object moves.

Learning Point 2

Know that gravity is a force which can be measured

- Know a force causes an object to start moving, stop moving, speed up, slow down or change direction.
- Know that **gravity** is a force that acts at a distance.
- Know that everything is pulled to the Earth by **gravity**.
- Know that **unsupported** objects to fall because **gravity** pulls them towards the Earth.
- Know that forces are measured in **Newtons**, which is named after **Sir Isaac Newton**, a legendary scientist who made many discoveries in the fields of **gravity** and mathematics.
- Know that one object which measures force is called a **Newton Meter**.
- Know that the amount of matter which makes up an object determines its **mass**.
- Know that **gravity** is a force that acts between all objects in the universe, but that it acts much more strongly between objects that have more **mass**.
- Know that because some planets have a greater **mass**, the **gravity** on those planets is greater as well



Scientific Enquiry – Research using Secondary Sources – research how the work of scientists such as Isaac Newton helped to develop the theory of gravitation

What is gravity?

Year 5 – Forces (Spring 1)

Learning Point 3

Know that contact forces act between moving surfaces (focus on air resistance)

- Know that **air resistance**, **water resistance** and **friction** are contact forces that act between moving surfaces.
- Know that an object may be moving through the air or water, or the air and water may be moving over a stationary object.
- Know that the air around us is made of particles too small to see with the naked eye.
- Know that **air resistance** is a force felt by an object as it moves through the air and against these particles.
- Know that the quicker an object moves, the more particles it collides with, and that this slows the object down.
- Know that **gravity** affects objects in the same way; that dense objects, no matter their size, fall at the same speed and that this can be demonstrated by dropping two objects from the same height at the same time (e.g. feather and a rock).
- Know that an object can be made to fall more slowly by increasing its **air resistance** and that a parachute is one way of doing this.
- Know that the size and shape of a parachute increases **air resistance** and makes an object fall slower.



Scientific Enquiry – Comparative & Fair Testing – investigate the effects of air resistance using parachutes... explain the results of my investigation in terms of the force, showing a good understanding that as the object tries to move through the air, the air resistance slow it down.

What is air resistance and how does it work?

Year 5 – Forces (Spring 1)

Learning Point 4

Know that contact forces act between moving surfaces (focus on water resistance)

- Know that, like the air, water and liquids are made of a huge number of very small particles.
- Know that when an object moves through water, it collides with these particles.
- Know that the shape of an object (such as a boat) can increase or decrease the **water resistance** it experiences.
- Know that, because of this, the shape of an object determines how quickly it moves through the water.



Scientific Enquiry – Comparative & Fair Testing – investigate the effects of water resistance in a range of contexts e.g. dropping shapes through water and pulling shapes, such as boats, along the surface of water ...explain the results of our investigations in terms of the force, showing a good understanding that as the object tries to move through the water or across the surface the particles in the water or on the surface slow it down.

What is water resistance and how does it work?

Year 5 – Forces (Spring 1)



Know that every day objects make use of forces

- Know that levers have a long arm and a **fulcrum**, which is where the arm **pivots** (a turning point).
- Know that the object you are lifting is called the load, and the force you apply to that load through the arm to make the object move is called the effort
- Know a lever is the name of the structure that connects these parts (long arm, **fulcrum**, load).
- Know that everyday levers help us to lift, move, break, squeeze objects and cut things.

- Know that a pulley is a wheel on a fixed axel with a groove in it to guide a rope or cable.
- Know the pulley changes the direction of or the amount of force that is needed to lift the object.
- Know pulley systems include lifts, cranes and cable cars.

- Know that a gear is a rotating wheel with cut teeth that mesh with the teeth of another gear so that turning one gear turns an adjacent gear in the opposite direction.

- Know that gears, levers and pulleys are simple machines that are used to allow a smaller force to have a greater effect; they do this by moving a smaller force over a longer distance at one end of the machine, which the machine turns into a larger forcer over a small distance at the other end.

Scientific Enquiry – Research using Secondary Sources - ...explore how levers, pulleys and gears work and make a product that involves a lever, pulley or gear. ... demonstrate clearly the effects of using levers, pulleys and gears.

Learning Point 5

How are forces used in everyday objects?

Year 5 – Forces (Spring 1)

Learning Point 6

Scientist Study: Sir Isaac Newton

- Know about Sir Isaac Newton and his work about forces and understanding gravity
- Know that scientific thinking has changed over time and continues to change.



Scientific Enquiry – Research using Secondary Sources – research about the life and work of Sir Isaac Newton

Who was Isaac Newton and what did he do?

Year 5 – Forces (Spring 1)

Assessment

How and why do objects move?

Plan, set up, and carry out their own investigation into forces e.g. air-resistance parachute, recording their findings in tables and graphs.

Famous Scientists

Sir Isaac Newton (1643-1727)



Sir Isaac Newton was an English mathematician, physicist, astronomer and author widely recognised as one of the greatest mathematicians and physicists of all time and among the most influential scientists.

Masato Sagawa (1943-Present)



Masato Sagawa is a Japanese scientist and entrepreneur, and the inventor of the sintered permanent magnet. He is also involved in energy conservation.

Mae Jemison (1956-Present)



Mae Carol Jemison is an American engineer, physician, and former NASA astronaut. She became the first black woman to travel into space when she served as a mission specialist about the Space Shuttle Endeavor.

Please refer to the above scientists to expand children's scientific capital

Year 5 – Forces (Spring 1)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

The heavier the object the faster it falls because it has more gravity acting on it

Forces always act in pairs which are equal and opposite

Smooth surfaces have no friction

Objects always travel better on smooth surfaces

A moving object has a force which is pushing it forward and it stops when the pushing force wears out

A non-moving object has no forces acting on it

Heavy objects sink and light objects float



The 'Big Ideas' explored in this unit:

C2 - The arrangement, movement and type of the building blocks of matter and the forces that hold them together or push them apart explain all the properties of matter (e.g. hot/cold, soft/hard, light/heavy, etc).

C3 - Matter can change if the arrangement of these building blocks changes.



Year 5

Properties and Changes in Materials

Year 5 – Properties and Changes in Materials (Spring 2)

Learning Point 1

Recap or previous learning:

- Know that objects can be classified as solids, liquids and gases
- Know that objects can change their state of matter depending on their temperature
- Know the water cycle

What is a monarch?

Learning Point 2

Know how some solids and liquids interact

- Know that in some solid materials the bonds between **particles** break when surrounded by a liquid; this allows the liquid to 'absorb' the solid; when this happens, the solid is called a **solute**, the liquid is called a **solvent** and the result is a **solution**.
- Know that when a solid does **dissolve** in a liquid it is described as being **soluble** in that **solvent** (e.g. sugar in water).
- Know that when a solid cannot **dissolve**, it is **insoluble** (e.g. sand in water)
- Know that a given amount of **solvent** can only absorb a certain amount of solid before no more will **dissolve**; when this happens the liquid is said to be **saturated**
- Know that when a **solvent** is evaporated from a **solution**, the original **solute** is left behind; the remaining solid will often form **crystals** – the slower the **solvent** evaporates, the larger the **crystals** that will be formed



Scientific Enquiry – Identifying, Classifying & Grouping – investigate and classify materials based on whether they dissolve in water

Scientific Enquiry – Comparative & Fair Testing – investigate how the temperature of water affects how well sugar dissolves in it.

What materials dissolve in water?

Year 5 – Properties and Changes in Materials (Spring 2)

Learning Point 3

Know that changes to a material can reversible or irreversible

- Know that a **reversible** change is one where the object(s) can be reversed back to their original state afterward – no chemical reaction has taken place.
- Know that **filtering** allows solids and liquids to be separated and that **sieving** allows solids of different sizes to be separated.
- Know that an **irreversible** change is one that cannot be reversed and that examples of this often involve a chemical change where a new material is made, often a gas (e.g. burning, boiling an egg, the reaction of bicarbonate of soda and acid)



Scientific Enquiry – Comparative & Fair Test – investigate which materials can best be used to filter solids out of water.

Scientific Enquiry – Observing Over Time - investigate making crystals

Can all materials be separated?

Learning Point 4

Know how to test an object for its properties

- Know that some materials are **thermally** conductive, which means heat travels effectively through them.
- Know that some materials are electrically conductive, which means that electricity travels effectively through them.
- Know that some materials are magnetic.
- Know that materials' different properties can be tested through acting upon them, including testing to find whether materials are magnetic, **thermally** conductive and electrically conductive.
- Know that the various properties of different materials make them suitable for a given function.



Scientific Enquiry – Comparative & Fair Testing – investigate materials that will keep hot porridge hot and frozen yoghurt cold.

What materials are good thermal conductors?

Year 5 – Properties and Changes in Materials (Spring 2)

Assessment

How can we change materials?

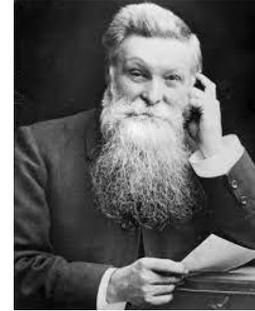
End of unit assessment

John McAdam (1756-1836)



John Loudon McAdam was a Scottish civil engineer and roadbuilder. He was the inventor of tarmac, an effective and economical method of constructing roads.

John Boyd Dunlop (1840-1924)



John Boyd Dunlop was a Scottish born inventor and veterinary surgeon. Familiar with making rubber devices, he invented the first practical types for a child's tricycle and developed them for use in cycle racing.

Charles Macintosh (1766-1843)



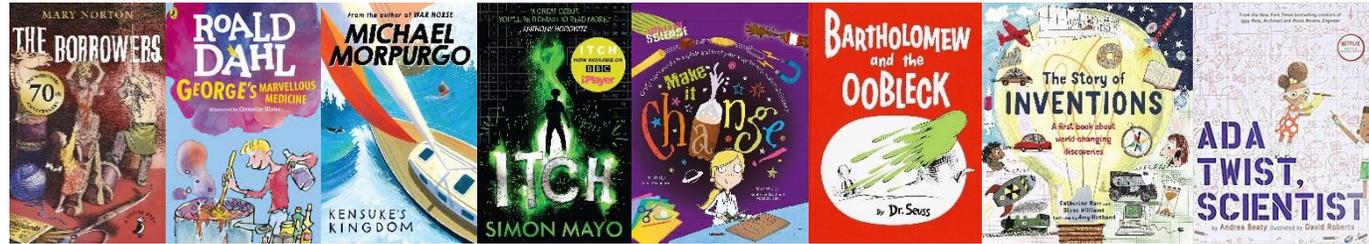
Charles Macintosh was a Scottish chemist and the inventor of the modern waterproof raincoat. The Mackintosh raincoat is named after him.

Famous Scientists

Please refer to the above scientists to expand children's scientific capital

Year 5 – Properties and Changes in Materials (Spring 2)

Fiction & Non-Fiction Books to Support Learning



Possible Misconceptions

Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed. Some children may think:

- thermal insulators keep cold in or out
- thermal insulators warm things up
- solids dissolved in liquids have vanished and so you cannot get them back
- lit candles only melt, which is a reversible change.



The 'Big Ideas' explored in this unit:

B1 - Living things are special collections of matter that make copies of themselves, use energy, and grow.



Year 5

Living Things and Their Habitats

Year 5 – Living Things and Their Habitats (Summer 2)

Learning Point 1

Recap or previous learning:

- Know that living things can be grouped in to different types
- Know that animals can be broadly grouped in to 'vertebrates' and 'invertebrates'
- Know that invertebrates can be found in different places and far outnumber vertebrate animals
- Know that habitats can change over time and that this can have a negative impact on living things

Learning Point 2

Know the function of different parts of flowers

- Know that the **petal** is the part of a **flower** that is usually very colourful
- Know that the **stamen** is the part of the flower that produces **pollen**
- Know that the **stamen** is made of a slender **filament** which supports the **anther**
- Know that the **anther** is the part of the plant where **pollen** is produced
- Know that the **pistil** is the part of the plant that contains the **ovule**, which produces seeds

Scientific Enquiry – Research using Secondary Sources - research the different parts involved in plant reproduction and their function

What is the function of the different parts of a flower?



Year 5 – Living Things and Their Habitats (Summer 2)

Learning Point 3

Know how reproduction happens in plants

- Know that **germination** is the process by which a plant begins to grow from a seed. This is when roots form under the soil and the stem, leaves and flower emerge above the soil.
- Know that **pollen** produced by a flower is carried by insects or blown by the wind to another flower. This process is called **pollination**.
- Know that when the **pollen** reaches another flower, it travels to the **ovary** where it **fertilises** the egg cells to make seeds. This process is called **fertilisation**.
- Know that these seeds are scattered by animals or the wind. This process is called **dispersal**, and some of the seeds will grow into new plants.



Scientific Enquiry - Research using Secondary Sources – research the different developments in a plants life cycle

How do plants reproduce?

Learning Point 4

Know the life cycles of mammals

- Know that the life cycle is a series of developments, starting with fertilised eggs
- Know that in most mammals, a fertilised egg develops in the **womb** in to an **embryo**, which develops from there in to a baby.
- Know that baby animals, including humans, are fed on milk before being **weaned** and eating the foods they have adapted to survive on
- Know that when animals, including humans, reach maturity, the animal is able to reproduce and continue the **cycle**



Scientific Enquiry – Pattern Seeking / Research using Secondary Sources – create a life cycle for 3 different mammals

What is the life cycle of a mammal?

Year 5 – Living Things and Their Habitats (Summer 2)

Learning Point 5

Know the life cycle of amphibians

- Know that in amphibians, a fertilised egg develops outside of the body
- Know that the egg will develop in to a tadpole, which later develops the adult features of the animal
- Know that the animal will mature in to an adult, where it will be able to reproduce and continue the **cycle**



Scientific Enquiry -Pattern Seeking / Research using Secondary Sources – create a life cycle for 3 different amphibians

What is the life cycle of an amphibian?

Learning Point 6

Know the life cycles of insects

- Know that in insects, a fertilised egg develops outside of the body
- Know that when the egg hatches, it hatches without wings in a form called **larva** (e.g. **caterpillar**)
- Know that the **larva** will then become a **pupa (chrysalis)** inside a protective **cocoon**.
- Know that the pupa will **metamorphose** in to the adult form of the animal (butterfly) and the **cycle** can begin again.



Scientific Enquiry -Pattern Seeking / Research using Secondary Sources – create a life cycle for 3 different insects

What is the life cycle of an insect?

Year 5 – Living Things and Their Habitats (Summer 2)

Learning Point 6

Know the life cycle of birds

- Know that in birds, a fertilised egg will develop outside of the body and hatch in a nest
- Know that birds are fed by their parents until they are ready to fly
- Know that birds eventually leave their nests in order to begin the **cycle** again

Scientific Enquiry - Pattern Seeking / Research using Secondary Sources – create a life cycle for 3 different birds

What is the life cycle of a bird?



Year 5 – Living Things and Their Habitats (Summer 2)

Assessment

Do all plants and animals reproduce in the same way?

Create an information text/leaflet that explains about the different life cycles of some animals and plants.

David Attenborough (1926-Present)



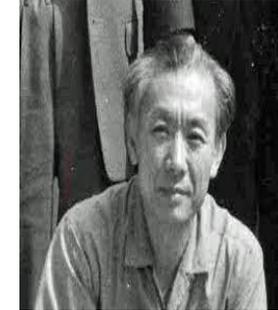
Sir David Frederick Attenborough is an English broadcaster, biologist, natural historian, and author. He is best known for writing and presenting TV documentary shows portraying animal and plant life on Earth.

Steve Irwin (1962-2006)



Stephen Robert Irwin, nicknamed 'The Crocodile Hunter' was an Australian zookeeper, conservationist, television personality, wildlife expert and environmentalist. Irwin grew up around crocodiles and other reptiles and was educated regarding them by his father Bob.

Taskasi Tokioka (1913-2001)



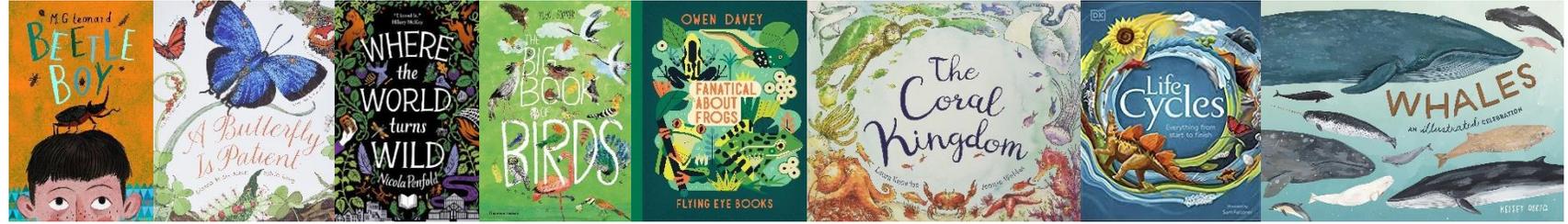
Takasi Tokioka was a Japanese zoologist. He published over 200 scientific articles on marine animals. He was Professor of Zoology at Kyoto University working at the Seto Marine Biological Laboratory in Shirahama, Japan.

Famous Scientists

Please refer to the above scientists to expand children's scientific capital

Year 5 – Living Things and Their Habitats (Summer 2)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

Only birds lay eggs



The 'Big Ideas' explored in this unit:

B1 - Living things are special collections of matter that make copies of themselves, use energy, and grow.



Year 5

Animals, including Humans

Year 5 – Animals, including Humans (Summer 2)

Learning Point 1

Recap or previous learning:

- Know that the life cycle of a living thing is a series of stages of development starting with a fertilized egg in animals or a seed in many plants
- Know that in most mammals a fertilized egg develops in the womb into an embryo and is then born and fed on milk before it is weaned onto the food that it is adapted to eat; it then develops to maturity in a period called adolescence after which it can reproduce and the cycle can begin again.

Learning Point 2

Know that gestation is the first stage in the human life cycle

- Know that animals **reproduce** sexually, meaning that two people (male and female) are required to create new life.
- Know that a **sperm** from a male and an **egg** from a female is required for a new life to occur.
- Know that mammals, including humans, give birth to live young.
- Know that the time period between **conception** and birth is known as **gestation**.
- Know that different animals have different **gestation periods**.
- Know that this can range from a few weeks to almost two years (squirrels have a gestation period of approx. 44 days, pigs of approx. 114 days, humans approx. 280 days and giraffes 425 days)
- Know that, generally, larger animals tend to have longer **gestation periods** as they tend to give birth to larger young.



Scientific Enquiry – Pattern Seeking – investigate whether there is a link between the average weight of a mammal and its gestation period

Does the size of an animal affect its gestation period?

Year 5 – Animals, including Humans (Summer 2)

Learning Point 3

Know how children grow from pre-birth to puberty

- Know that all people start off life as a **foetus** in their mother's **uterus**.
Know that a **foetus** grows in the **womb**, where it gets its nutrition through a tube called the umbilical cord.
- Know that when a woman has a **foetus** growing inside her, we say that she is **pregnant**.
- Know that after around nine months the mother gives birth. From birth to around two years of age we say a child is a baby (we count people's ages from the day that they are born).
- Know that babies are dependent on adults, and need to be fed (with milk at first, then later with food, from around 6 months).
- Know that after the age of approximately 3 years old, children become more independent than babies, and they continue to become more independent as they get older; for example, they begin to eat food that is given to them and dress themselves.
- Know that children develop in to **adolescence** from approximately age 10 to age 19.
- Know that during **adolescence**, children will undergo **puberty**.

Scientific Enquiry – Research using Secondary Sources – find out the stages of development as the foetus grows in the womb until the baby is 1 years old and present findings.

What happens at the different stages of pregnancy?



Year 5 – Animals, including Humans (Summer 2)

Learning Point 4

Know how children change during puberty

- Know that **puberty** is a stage of development between childhood and adulthood.
- Know that physical growth occurs so that the body changes to that of an adult.
- Know that these changes allow people to reproduce.
- Know that at this stage of development, hormones promote growth in height and growth of hair.
- Know that both boys and girls will grow body hair during **puberty**.
- Know that in boys, the larynx grows to form an 'Adam's apple' and the voice becomes deeper; sweat glands produce more sweat; hair begins to grow under the armpits and pubic hair starts to grow; that the scrotum, testes and penis develop; that the body becomes taller as all parts grow, and muscles develop.
- Know that in girls, the larynx grows; that sweat glands produce more sweat; that hair grows under the armpits; that breasts begin to develop; that pubic hair will begin to grow; that **menstruation** begins; that the body becomes taller as all parts grow.

Scientific Enquiry – Research using Secondary Sources – find out the changes that occur to males and females during puberty

What happens to our bodies during puberty?



Year 5 – Animals, including Humans (Summer 2)

Learning Point 5

Know that our bodies change as we develop into adulthood and old age

- Know that in **adulthood**, the body reaches its peak strength between the ages of 18 and 39.
- Know that people often choose to **reproduce** during their adult years.
- Know that as we get older, the cells of our bodies are not as efficient at replacing themselves and this leads to aging.
- Know that as we get older, our muscles can become smaller and our bones and joints more easily damaged, making physical activity harder.
- Know that as we age, our hair often turns grey, our eyesight may become worse, our memory may decline and various other parts of the body decline in their ability to perform as they once did.
- Know that aging is a process that takes time and that changes differ from person to person.
- Know that we can stay healthy in our old age by adopting a healthy diet and maintaining a good level of exercise.
- Know that old age is the final stage of development for humans.



Scientific Enquiry – Research using Secondary Sources – find out about the human body changes between adulthood and old age

What happens to us as we get old?

Year 5 – Animals, including Humans (Summer 2)

Assessment

How do we change as we grow older?

Write an information leaflet for a pregnant lady explaining about the different stages of gestation into early childhood.

Robert Winston (1940-Present)



Lord Robert Winston is known for his pioneering work in the study of fertility and has become a leading voice for science through presenting TV shows, including *The Human Body*, *Child of Our Time* and *Walking with Cavemen*.

Elizabeth Blackwell (1821-1910)



Elizabeth Blackwell was a British and American physician, notable as the first woman to receive a medical degree in the United States, and the first woman on the Medical Register of the General Medical Council for the United Kingdom.

Dame Anne McLaren (1927-2007)



Anne McLaren was one of the most highly respected reproductive biologists of the 20th Century. Her work in genetics paved the way for human in vitro fertilisation (IVF), a medical procedure in which an egg is fertilised by a sperm outside the body in a laboratory.

Famous Scientists

Please refer to the above scientists to expand children's scientific capital

Year 5 – Animals, including Humans (Summer 2)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

A baby grows in a mother's tummy
A baby is 'made'

End of Year 5 Expectations

Living Things and their Habitats

Pupils should be able to:

- Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird
- Describe the life process of reproduction in some plants and animals

Animals, including Humans

Pupils should be able to:

- Describe the changes as humans develop to old age

Earth and Space

Pupils should be able to:

- Describe the movement of the Earth, and other planets, relative to the Sun in the solar system
- Describe the movement of the Moon relative to the Earth
- Describe the Sun, Earth and Moon as approximately spherical bodies
- Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky

Forces

Pupils should be able to:

- Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object
- Identify the effects of air resistance, water resistance and friction, that act between moving surfaces
- Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

Biology

Physics

Properties and Changes of Materials

Pupils should be able to:

- Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets
- Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution
- Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and Chemistry evaporating
- Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic
- Demonstrate that dissolving, mixing and changes of state are reversible changes
- Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.

Chemistry



The 'Big Ideas' explored in this unit:

P1 – The universe follows unbreakable rules that are all about forces, matter, and energy

P3 – Energy, which cannot be created or destroyed, comes in many different forms and tends to move away from objects that have lots of it



Year 6

Light

Year 6 - Light (Autumn 2)

Learning Point 1

Recap or previous learning:

- Know that light is a form of energy.
- Know that we need light to see things and darkness is the absence of light.
- Know that light travels in straight lines.
- Know that everything we see is either a light source or something that is reflecting light.
- Know that opaque objects block light creating shadows and that light passes through transparent objects.
- Know that as an object moves towards a light source, the size of the shadow increases.

Learning Point 2

Know that light behaves differently when it interacts with different objects

- Know that when light passes from one **medium** to another (e.g. from air to water), it changes direction.
- Know that this is called **refraction**.
- Know that this happens because light travels at different speeds in different media
- Know that **translucent** objects allow some light to pass through, but some of the light changes direction as it passes through the object; this means that objects are not clear when seen through a **translucent** object.



Scientific Enquiry – Comparative & Fair Testing – investigate how light is refracted through differently, through different liquids

How are rainbows created?

Year 6 - Light (Autumn 2)

Learning Point 3

Know that light can be split into colours

- Know that white light is a combination of all the colours of the **spectrum**
- Know that when white light hits a prism, it is refracted off two surfaces
- Know that when this happens, white light is spread out so that all of its parts can be seen
- Know that this is called a **spectrum**
- Know that this happens because the different colours of white light travel at different speeds.



Scientific Enquiry – Pattern Seeking – investigate the different colours that make up white light

What colour is white light?

Learning Point 4

Know that colours can be seen due to the reflection of certain colours from an object

- Know that when light hits an object, some colours are absorbed and some are reflected
- Know that the colour that we can see is the part of the **spectrum** which has been **reflected** back to us



Scientific Enquiry – Pattern Seeking – investigate whether coloured filters affect what can be seen and what can't be seen

How do we see colour?

Learning Point 5

Know how reflection can be used to see objects out of sight.

- Know that a **periscope** takes advantage of the predictable **angles of incidence** and **reflection** to allow an image to be shown to a viewer



Scientific Enquiry – Pattern Seeking – investigate how light travels in straight lines based by using mirrors to see objects out of sight and how angles of incidence and reflection are equal

How do periscopes work?

Year 6 - Light (Autumn 2)

Learning Point 6

Know that we are able to see objects due to the way that light interacts with our eyes

- Know that we see things because light travels from light sources to our eyes, or from light sources to objects and then to our eyes
- Know that we have an **iris**, a **lens** and a **retina**
- Know that the **iris** closes or opens to let in more or less light
- Know that the **lens** allows us to see things in focus
- Know that the **retina** takes light and turns it in to signals our brains can interpret



Scientific Enquiry – Research using Secondary Sources – research the different parts of the eye and their function in allowing us to see

How do our eyes work?

Year 6 - Light (Autumn 2)

How do we see things the way they are?

Double page spread to explain about the different aspects of light learnt:

- The colour of light
- How light travels
- Refraction
- How the eye works

Assessment

Famous Scientists

Thomas Edison (1847-1931)



Thomas Alva Edison was an American inventor and businessman. He developed many devices in fields such as electric power generation, mass communication, sound recording, and motion pictures.

Ibn al-Haytham (965-1040)



Hasan Ibn al-Haytham was an Arab mathematician, astronomer, and physicist of the Islamic Golden Age. Referred to as the father of modern optics he made significant contributions to the principles of optics and visual perception.

Annie Jump Cannon (1863-1941)

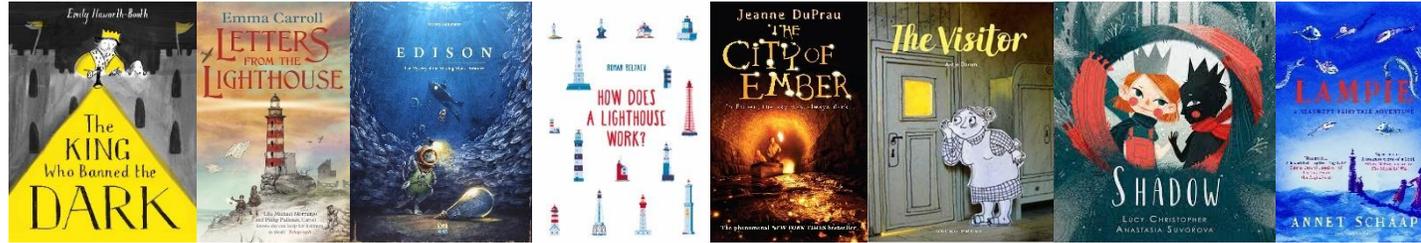


Annie Jump Cannon was an American astronomer whose cataloguing work was instrumental in the development of contemporary stellar classification.

Please refer to the above scientists to expand children's scientific capital

Year 6 - Light (Autumn 2)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

We can still see even where there is an absence of any light

Our eyes 'get used to' the dark

The moon and reflective surfaces are light sources

A transparent object is a light source

Shadows contain details of the object, such as facial features on their own shadow

Shadows result from objects giving off darkness



The 'Big Ideas' explored in this unit:

B2 – Living things on Earth come in a huge variety of different forms that are all related because they all came from the same starting point 4.5 billion years ago



Year 6

Living Things and Their Habitats

Year 6 – Living Things and their Habitats (Spring 1)

Learning Point 1

Recap or previous learning:

- Know that humans change as they get older
- Know the life cycles of mammals, amphibians, insects, and birds.

Learning Point 2

Know how the Linnaean system classifies plants and animals

- Know that Carl Linnaeus was a Swedish scientist who collected a huge number of plants and animals in order to arrange and **classify** them
- Know that in the Linnaean system, living things are **classified** in to groups and levels: domain, kingdom, phylum, class, order, family, genus, species
- Know that the 3 domains are archaea, bacteria and eukarya, and that plants and animals are all eukaryotes
- Know that there are 6 kingdoms which include animals, plants, fungi and bacteria
- Know that the 6 kingdoms are split in to phyla, of which there are more than 30.
- Know that each phyla is split in to classes.
- Know that the order and family divide in to further groups
- Know that the genus includes species which are very closely related and share unique body structures
- Know that a species is defined as a group of animals that can reproduce to produce offspring

Scientific Enquiry – Research using Secondary Source – find out about the Linnaean system works and it was developed

Scientific Enquiry – Identifying, Classifying & Grouping – use the Linnaean system to classify animals and plants based on their characteristics

How are living things classified?



Year 6 – Living Things and their Habitats (Spring 1)

Learning Point 3

Know that animals are split into different phylum and then class.

- Know that an **arthropod** is an invertebrate with a hard, external skeleton and **jointed limbs**.
- Know that insects are a type of **arthropod**; their bodies consist of six legs, a head, a **thorax** and an **abdomen**; most insects also have a pair of **antennae** and a pair of wings.
- Know that an arachnid (e.g. spider) is a type of **arthropod** with eight legs and not **antennae** or wings.
- Know that a crustacean is a type of **arthropod** with two pairs of **antennae** (e.g. woodlouse)
- Know that a myriapod is an **arthropod** with a flat and long cylindrical body and many legs (e.g. a centipede)



Scientific Enquiry – Research using Secondary Sources – research how animals are classified into different groups based on their characteristics and explain how they are related to each other.

How are animals classified?

Learning Point 4

Scientist Study: Carl Linnaeus

- Know about Carl Linnaeus and his work around classifying living things
- Know that scientific thinking has changed over time and continues to change



Scientific Enquiry – Research using Secondary Sources – research about the life and work of Carl Linnaeus

Who was Carl Linnaeus and what did he do?

Year 6 – Living Things and their Habitats (Spring 1)

Learning Point 4

Know that microorganisms are abundant and can help and harm living things

- Know that a **microorganism** is a very small living thing that can only be seen with a microscope
- Know that **microorganisms** can be found all around us and in almost every habitat on Earth
- Know that there are three types of **microorganism** – **viruses**, **fungi**, and **bacteria**
- Know that some animals and plants are considered to be **microorganisms**: dust mites and plankton, for example
- Know that mould is a collection of **microorganisms** known as **fungi**
- Know that yeast is an example of a **microorganism** which can be useful to humans, and that penicillin – which can cure infections - comes from a **fungus**.
- Know that **bacteria** are a single-celled organism which can multiply and either help humans (such as in the stomach) or harm them (such as causing infection)
- Know that a **virus** is often considered to be a **microorganism**, but there is some disagreement over this due to viruses not being 'alive'
- Know how **microorganisms** can help or harm living things
- Know that disease causing **bacteria** are known as 'germs'.



Scientific Enquiry – Comparative & Fair Testing – investigate the best conditions for microorganisms to grow

What are micro-organisms?

Year 6 – Living Things and their Habitats (Spring 1)

Assessment

In what ways can we sort living things?

Design, describe and name a new creature the characteristically sits within the Animalia classification.
Sort new creatures within the Animalia taxonomy

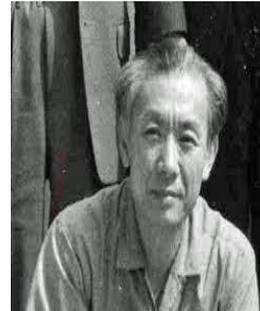
Famous Scientists

Carl Linnaeus (1707-1778)



Carl Linnaeus was a Swedish botanist, zoologist, taxonomist, and physician who formalised the modern system of naming organisms. He is known as the "father of modern taxonomy".

Taskasi Tokioka (1913-2001)



Takasi Tokioka was a Japanese zoologist. He published over 200 scientific articles on marine animals. He was Professor of Zoology at Kyoto University working at the Seto Marine Biological Laboratory in Shirahama, Japan.

David Attenborough (1926-Present)

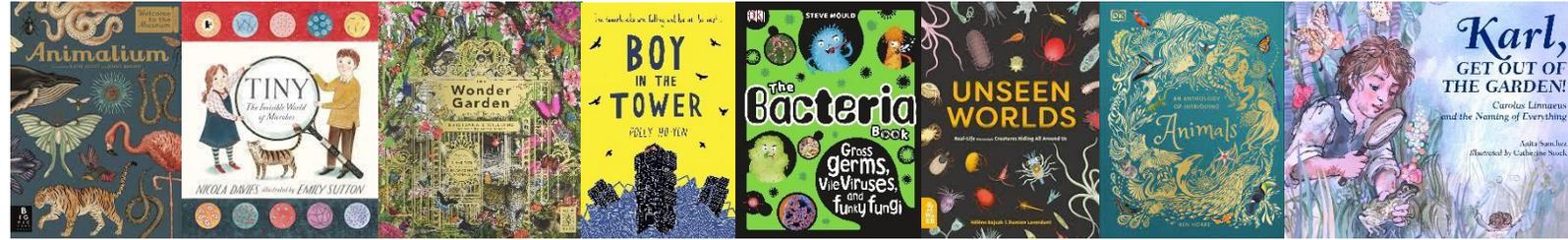


Sir David Frederick Attenborough is an English broadcaster, biologist, natural historian, and author. He is best known for writing and presenting TV documentary shows portraying animal and plant life on Earth.

Please refer to the above scientists to expand children's scientific capital

Year 6 – Living Things and their Habitats (Spring 1)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

All micro-organisms are harmful
Mushrooms are plants



The 'Big Ideas' explored in this unit:

B3 – The different kinds of life, animals, plants, and microorganisms, have evolved over millions of generations into different forms in order to survive in the environments in which they live



Year 6

Evolution and Adaptation

Year 6 – Evolution and Adaptation (Spring 2)

Learning Point 1

Recap or previous learning:

- Know that there are different types of rock such as igneous, sedimentary and metamorphic.
- Know how fossils form in the Earth.

Learning Point 2

Know that offspring have features which are inherited from their parents

- Know that all living things have offspring of the same kind, as features in the offspring are **inherited** from the parents.
- Know that **characteristics** are passed down from parents to their offspring.
- Know that offspring vary and are not identical to their parents
- Know that due to sexual reproduction, the offspring are not identical to their parents and vary from each other.

Scientific Enquiry – Identifying, Classifying & Grouping – identify features in animals and plants that are passed on to offspring and explore this process by considering the artificial breeding of animals or plants e.g. dogs

What do offspring inherit from their parents?



Year 6 – Evolution and Adaptation (Spring 2)

Learning Point 3

Know the process of evolution

- Know that plants and animals have **characteristics** that make them suited (adapted) to their **environment**.
- Know that if the **environment** changes rapidly, some variations of a species may not suit the new **environment** and will die.
- Know that if the **environment** changes slowly, animals and plants with **variations** that are best suited survive in greater numbers to reproduce and pass their **characteristics** on to their young.
- Know that over time, these **inherited characteristics** become more dominant within the population.
- Know that over a very long period of time, these **characteristics** may be so different to how they were originally that a new species is created.
- Know that this is called **evolution**.
- Know that **natural selection** is the cause of this change.
- Know that **natural selection** occurs when there is **variation** within a species; for example, giraffes with longer necks were able to reach leaves which were higher up, whereas those with shorter necks would have been confined to lower leaves and more competition.
- Know that this is one example of competition to survive and reproduce and that members of a species with advantageous **characteristics** survive and reproduce.
- Know that that the gradual change of species over millions of years can be observed by looking at examples of fossils



Scientific Enquiry – Identifying, Classifying & Grouping – identify characteristics that will make a plant or animal suited or not suited to a particular habitat and design a new plant or animals to live in a particular habitat.

Scientific Enquiry – Research using Secondary Sources – use secondary sources to find out about how the population of peppered moths changed during the industrial revolution and explain why the dominant colour of the peppered moth changed over a very short period of time.

What is the process of evolution?

Year 6 – Evolution and Adaptation (Spring 2)

Learning Point 4

Scientist Study: Charles Darwin

- Know about Charles Darwin and his Theory of Evolution.
- Know that scientific thinking has changed over time and continues to change.



Scientific Enquiry – Research using Secondary Sources – research the life and work of Charles Darwin

Who was Charles Darwin and what did he do?

Year 6 – Evolution and Adaptation (Spring 2)

What is evolution, how does it happen and how do scientists know?

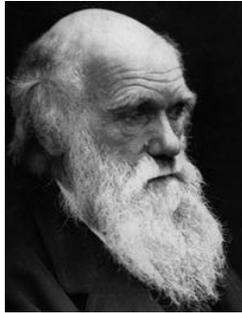
Assessment

Create a double page spread about Evolution. Include:

- What evolution is
- Why it is important to animal survival
- How it occurs
- The work of Charles Darwin
- Common examples of evolution

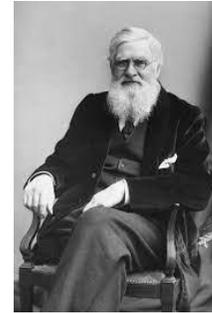
Famous Scientists

Charles Darwin (1809-1882)



Charles Darwin was an English naturalist, geologist and biologist, best known for his contributions to evolutionary biology. His proposition that all species of life have descended from a common ancestor is now widely accepted and considered a fundamental concept in science.

Alfred Russel Wallace (1829-1913)



Alfred Russel Wallace was a British naturalist, explorer, geographer, anthropologist, biologist and illustrator. He is best known for independently conceiving the theory of evolution through natural selection.

Mary Anning (1799-1847)



Mary Anning was an English fossil collector, dealer and palaeontologist who became known around the world for the discoveries she made in Jurassic marine fossil beds in the cliffs along the English Channel at Lyme Regis in the county of Dorset in South West England.

Please refer to the above scientists to expand children's scientific capital

Year 6 – Evolution and Adaptation (Spring 2)

**Fiction & Non-Fiction
Books to Support
Learning**



**Possible
Misconceptions**

Certain found artefacts, such as old bits of pottery or coins, are fossils
A fossil is an actual extinct animal or plant



The 'Big Ideas' explored in this unit:

B1 – Living things are special collections of matter than make copies of themselves, use energy, and grow



Year 6

Animals, including Humans

Year 6 – Animals, including Humans (Spring 2)

Learning Point 1

Recap or previous learning:

- Know that animals including humans need air, water and food to survive
- Know that animals, including humans change as they grow older.
- Know the simple life cycle or a range of animals
- Know the different stages of human development
- Know and be able to explain the changes in humans at different points in their development
- Know the gestation period of humans and some animals

Learning Point 2

Know the purpose of the circulatory system

- Know that a **cell** can be thought of as the microscopic 'building blocks' of the **body**
- Know that every **cell** in the human **body** needs **oxygen** in order to function correctly
- Know that there are different types of **cell** and that they do different jobs
- Know that the purpose of the **circulatory system** is to provide **oxygen** to the **cells** in the **body**
- Know that the **circulatory system** is made of the **heart, lungs** and **blood vessels**
- Know that the **circulatory system** comes from the word 'circular' because the system repeats itself thousands of times per day



Scientific Enquiry – Research Using Secondary Sources – find out how the circulatory system works

What is the circulatory system?

Year 6 – Animals, including Humans (Spring 2)

Learning Point 3

Know the job of different parts of the circulatory system

- Know that when we breathe, we take in the air
- Know that approx. 21% of the air we breathe is **oxygen**
- Know that the **lungs**' main job is to take new air in to the body and expel old air containing waste gases such as **carbon dioxide**
- Know that the **heart** sends blood to the **lungs** to 'collect' the **oxygen**
- Know that **oxygenated** blood is then carried back to the **heart**
- Know that **arteries** are tubes which carry blood containing **oxygen** from the **heart** to the rest of the **body**
- Know that blood then 'delivers' **oxygen** to the cells of the **body** through **capillaries**.
- Know that **veins** carry **de-oxygenated** blood from the **cells** of the **body** to the **heart**
- Know that the **lungs** take in air, extract **oxygen** and expel **carbon dioxide**
- Know that the **heart** is responsible for pumping blood around the **body**



Scientific Enquiry – Identifying, Classifying & Grouping –investigate which organs of the body make up the circulatory system and where they are found.

What do all the parts of the circulatory system do?

Year 6 – Animals, including Humans (Spring 2)

Learning Point 4

Know how water and nutrients are transported within the body

- Know that our **circulatory system** transports water and nutrients throughout our **body**
- Know that our blood is made up of several elements: **red blood cells** to carry **oxygen**, **white blood cells** to fight diseases, **platelets** (which cause clotting) and **plasma** (which is the 'liquid' part of the **blood**).
- Know that nutrients and water are carried in the **plasma** of the blood.
- Know that when food is digested, nutrients are passed in to the bloodstream through the intestines.
- Know that the **circulatory system** then carries the blood (and therefore the nutrients) to all the parts of the **body**.



Scientific Enquiry – Research using Secondary Sources – investigate and ask questions about what our blood is made up of and what its purpose in the body is.

What is in our blood?

Learning Point 5

Know the impact of exercise on the body

- Know that when we exercise, our **body** has to work hard to transport blood to different parts of the **body**
- Know that this means our **heart rate** increases and we become out of breath
- Know that our **lung** capacity increases due to exercise
- Know that we **perspire** in order to keep our **bodies** cool
- Know that we breathe faster in order to take in more **oxygen**
- Know that our muscles get bigger the more we use them, and get smaller when we don't.



Scientific Enquiry – Comparative & Fair Testing – investigate how the length of time we exercise for affects our heart rate.

How does exercise affect our bodies?

Year 6 – Animals, including Humans (Spring 2)

Learning Point 6

Know the impact of drugs and alcohol on the body

- Know that a drug is a chemical made outside of the body which has an impact on the body
- Know that some drugs are medicinal and help our bodies to heal or prevent disease
- Know that some drugs (including alcohol) can be harmful to the body
- Know that drugs and alcohol have certain physical and mental effects on the individual
- Know that drugs and lifestyle can affect how well our **heart** and **lungs** work
- Know that drugs and lifestyle can affect how likely we are to suffer from conditions such as diabetes, how clearly we think, and generally how fit and well we feel.
- Know some conditions are caused by deficiencies in our diet e.g. lack of vitamins can cause anaemia.



Scientific Enquiry – Research using Secondary Sources – research the negative effects of drugs (e.g. tobacco)... explain both the positive and negative effects of drugs, including alcohol, on the body... present information e.g. a health leaflet describing impact of drugs and lifestyle on the body.

Are drugs bad for us?

Year 6 – Animals, including Humans (Spring 2)

How do our lifestyle choices affect how our bodies work?

Assessment

Write an information leaflet about how to stay healthy. Include:

- Information about the circulatory system
- Information about the heart
- Effects of healthy eating
- Effects of exercise
- Effects of drugs and alcohol

Famous Scientists

Marie Curie (1867-1934)



Marie Salomea Sklodowska-Curie was a Polish and naturalised-French physicist and chemistry who conducted pioneering research on radioactivity. She was the first woman to win a Nobel Prize and the only woman to ever win a Nobel Prize twice.

Joseph Lister (1827-1912)



Joseph Lister was a British surgeon, medical scientist, experimental pathologist and a pioneer of antiseptic surgery and preventative medicine. Joseph Lister revolutionised the craft of surgery in the same manner that John Hunter revolutionised the science of surgery.

Mary Seacole (1885-1881)



Mary Jane Seacole was a British-Jamaican nurse and businesswoman who set up the 'British Hotel' behind the lines during the Crimean War. She provided medical care for wounded men on the battlefield, nursing many of them back to full health.

Please refer to the above scientists to expand children's scientific capital

Year 6 – Animals, including Humans (Spring 2)

Fiction & Non-Fiction Books to Support Learning



Possible Misconceptions

- Your heart is on the left side of your chest
- The heart makes blood
- The blood travels in one loop from the heart to the lungs and around the body
- When we exercise, our heart beats faster to work the muscles more
- Some blood in our bodies is blue and some blood is red
- We just eat food for energy
- All fat is bad for you
- All dairy is good for you
- Protein is good for you, so you can eat as much as you want
- Foods only contain fat if you can see it
- All drugs are bad for you.



The 'Big Ideas' explored in this unit:

P1 – The universe follows unbreakable rules that are all about forces, matter, and energy

P3 – Energy, which cannot be created or destroyed, comes in many different forms, and tends to move away from objects that have lots of it



Year 6

Electricity

Year 6 – Electricity (Summer 2)

Learning Point 1

Recap or previous learning:

- Know that current electricity is the flow of charged particles called electrons around a circuit.
- Know that conductors have free electrons, and when the current flows through a conductor the electrons move like people in a queue.
- Know a chemical reaction inside a cell produces the charged particles that can flow around a circuit.
- Know more than one cell lined up to work together is called a battery.
- Know that an electrical current can only flow if there is a complete circuit.
- Know that a switch functions by completing or breaking a complete circuit.
- Know that a simple circuit can be constructed using components
- Know that exposure to high levels of electrical current can be dangerous.

Learning Point 2

Know how to draw simple circuit diagrams

- Know that electrical **circuits** can be represented by simple diagrams
- Know the recognized symbols for a battery, bulb, motor, buzzer and wire
- Know that these items should be arranged in a specific way for a **circuit** to work



Scientific Enquiry – Research using Secondary Sources – research and use symbols in circuit diagrams

How are circuits represented in instructions?

Year 6 – Electricity (Summer 2)

Learning Point 3

Know what the voltage of an electrical current means

- Know that **voltage** is what we use to measure of the power of a cell to produce electricity; it is a measure of the 'push' of **electric current**
- Know that as the number and **voltage** of cells in a circuit increases, the brightness of a bulb or the volume of a buzzer will increase (though too high a voltage may overload the bulb or buzzer, which will lead to it breaking)
- Know that high **voltages** are dangerous if precautions aren't taken



Scientific Enquiry – Pattern Seeking – investigate how the number of cells in a circuit affects the bulbs brightness...
construct a range of circuits with different numbers of cells to test

How does the voltage in a circuit affect the brightness of a bulb?

Learning Point 4

Know that several factors will impact how effective an electrical circuit is

- Know that two bulbs in a circuit can be wired up to create a **series circuit** or a **parallel circuit**
- Know that if one bulb is removed in a **series circuit** the other will not shine as the **circuit** has been broken
- Know that if one bulb is removed in a **parallel circuit**, there will still be a complete **circuit** for the other bulb so it will continue to shine
- Know that we can use this knowledge to explain the advantages of using **parallel circuits**



Scientific Enquiry – Pattern Seeking – investigate how the number of bulbs in a circuit affect the bulbs brightness...
construct a range of circuits with different numbers of components to test

How does the number of bulbs in a circuit affect their brightness?

Year 6 – Electricity (Summer 2)

Assessment

How can circuits be changed?

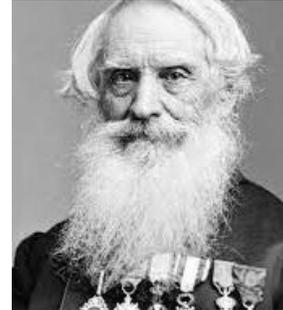
Plan and carry out their own investigation systematically exploring the effect of different components in a circuit.

Nikola Tesla (1856-1943)



Nikola Tesla was a Serbian American inventor, electrical engineer, mechanical engineer, and futurist best known for his contributions to the design of the modern alternating current electricity supply system.

Samuel Morse (1791-1872)



Samuel Finley Breese Morse was an American inventor and painter. After establishing his reputation as a portrait painter, in his middle age Morse contributed to the invention of a single-wire telegraph system based on European telegraphs.

Michael Faraday (1791-1867)



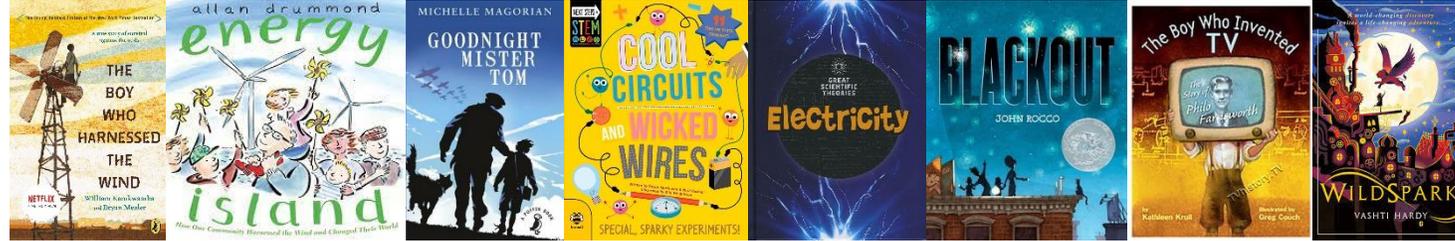
Michael Faraday was an English scientist who contributed to the study of electromagnetism and electrochemistry. His main discoveries include the principle underlying electromagnetic induction and electrolysis.

Famous Scientists

Please refer to the above scientists to expand children's scientific capital

Year 6 – Electricity (Summer 2)

Fiction & Non-Fiction
Books to Support
Learning



Possible
Misconceptions

Larger sized batteries make bulbs brighter
A complete circuit used up electricity
Components in a circuit that are closer to the battery get more electricity

End of Year 6 Expectations

Living Things and their Habitats

Pupils should be able to:

- Describe how living things are classified into Pupils should be taught to: broad groups according to common observable
- Give reasons for classifying plants and animals they give out or reflect light into the eye based on specific characteristics

Animals, including Humans

Pupils should be able to:

- Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood
- Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function
- Describe the ways in which nutrients and water are transported within animals, including humans

Evolution and Inheritance

Pupils should be able to:

- Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago
- Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents
- Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution

Biology

Light

Pupils should be able to:

- Recognise that light appears to travel in straight lines
- Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye
- Explain that we see things because light travels from light sources to objects and then to our eyes
- Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them

Electricity

Pupils should be able to:

- Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit
- Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches
- Use recognised symbols when representing a simple circuit in a diagram

Physics