

# A bespoke Science Pathway- The Tilstock Way

***“It is important to view knowledge as a sort of a semantic tree- make sure you understand the fundamental principles, i.e. the trunk and big branches, before you get into the leaves/details or there is nothing for them to hang on to.”***

***Elon Musk***

## Intent

Science teaching at Tilstock aims to give all children a strong understanding of the world around them whilst acquiring specific skills and knowledge to help them to think scientifically, to gain an understanding of scientific processes and also an understanding of the uses and implications of Science, today and for the future.

From the EYFS through to KS2, scientific enquiry skills are embedded in each topic the children study and these topics are revisited and developed throughout their time at school. Topics, such as animals including humans, are taught in Key Stage One and studied again in further detail throughout Key Stage two.

Developing a love of reading is a priority for our school and therefore each science unit is linked to carefully chosen, high quality texts. We also ensure that all classrooms and corridors enable a continuous provision, from a full size skeleton to classroom plants, enabling children to explore science in the everyday. Our Forest School provision and Pets as Therapy animals provide a further opportunity to relate learnt knowledge and skills taught to real life contexts. Furthermore, subject specialist vocabulary (tier 3) for topics is taught and built upon using vocab-lab, and effective questioning to communicate ideas is encouraged.

During our weekly science lessons and whole school STEM afternoons, all children are encouraged to develop and use a range of skills including observations, planning and investigations, as well as being encouraged to question the world around them and become independent learners in exploring possible answers for their scientific based questions. Scientific skills have been carefully mapped out across the year groups to ensure these are developed over time. All staff and pupils have science skills wheels to regularly monitor their skills through self-assessments, identifying their strengths as well as their next steps. STEM afternoons enable them a further opportunity to develop and apply their scientific enquiry in a way that meets the need of each individual child and their interests.

This ‘Tilstock way’ is designed to allow children to consistently build upon their prior knowledge in small steps, embed procedural knowledge into long-term memory, whilst increasing their enthusiasm for the subject. Concepts taught are reinforced and children know how to develop as a scientist. With Oracy a priority across the school, children are encouraged to explain their understanding of new concepts through stories, assemblies and videos- to teach others



# Assessment of skills and knowledge

## Skills

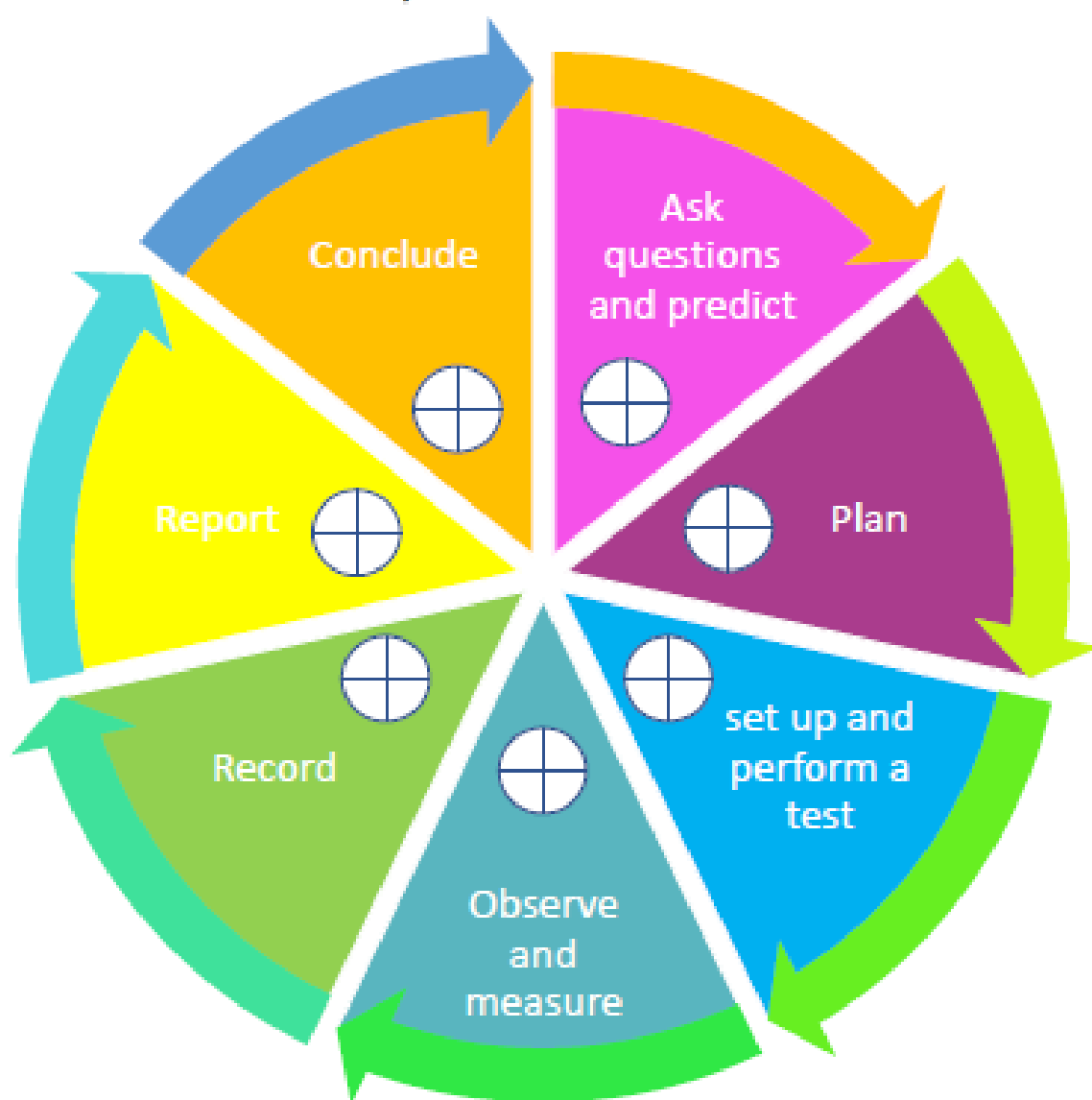
We ensure that all our children know and understand the skills required as part of their science curriculum.

Children are actively encouraged to reflect and discuss on the key skills they have shown either during a science lesson or in a STEM afternoon project.

This is a really useful way not only for staff to assess the skills that are developed overtime, but for children to self-assess as part of their ongoing development.



Which Science skills have I used today?



Colour in a segment of the colour wheel each time you complete a skill

## Knowledge

At the beginning of each unit, children are provided with a **key knowledge organiser** including subject specific terminology they should learn and use throughout the unit. This is used and referred to within all lessons. At the end of each science unit, children take part in subject specific quizzes.

Children are also invited to present their knowledge through **online VLOGS** or through our **student subject seminars**, which take place every half-term in classes. This is a wonderful way to assess children's understanding of scientific knowledge, concepts and vocabulary.

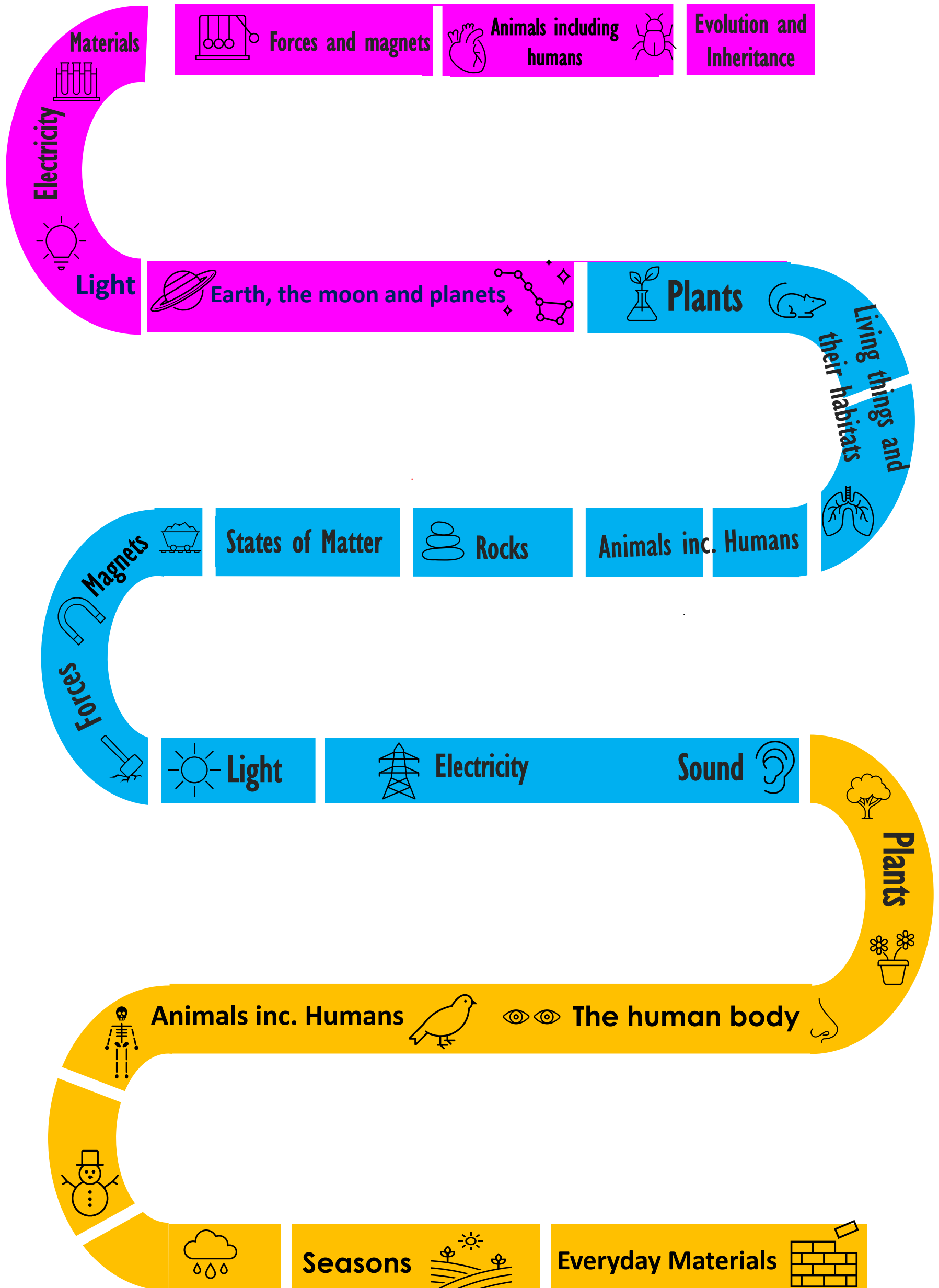
# Tilstock Science Pathway



Years 1, 2

Years 3, 4

Years 5, 6





# Year 5/6 Science learning Pathway

**Life Cycles**, reproduce, reproduction, stamen, stigma, sepal, petal, ovary, pollen, style, germinate, germination, fertilise, fertilisation, pollinate, pollination, disperse, dispersal, life cycle, babyhood, childhood, adolescence, adulthood

**Gases Around Us**, gas, gases, air, oxygen, carbon dioxide, helium, natural gas, carbon monoxide, evaporate, evaporation, condense, condensation, change of state, liquid, solid, properties, material **More About Dissolving**, dissolve, dissolving, undissolved, solution, mixture, evaporate, condense, pure, separate, clear, cloudy, filter, solid **Reversible & Irreversible Changes**, reversible, irreversible, change, melting, freezing, evaporating, condensing, filtering, separating, burning, insoluble,

**Keeping Healthy**, diet, balanced diet, side effect, fats, sugars, starches, food types, heart, circulation, heart beat, pulse, pulse rate, muscle, blood, blood vessel, lung, breathe, growth, activity

## Subject Specific Terminology

Air resistance, Water resistance, Friction, Gravity, Newton, Gears, Pulleys

**Earth, Sun & Moon**, Earth, Sun, Moon, sphere, revolve, orbit, spin, rotate, axis, sunrise, sunset, north, south, east, west, light source, shadow

**How We See Things**, light, beam, reflect, reflection, opaque, mirror, light travelling, source, reflected, travel, block, shiny surface

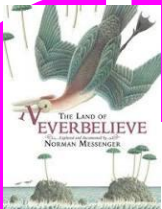
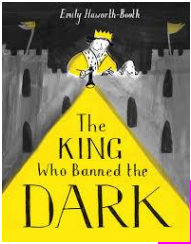
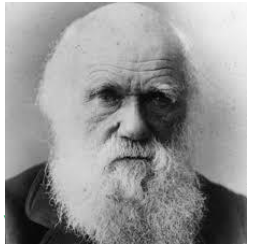
**Changing Circuits**, circuit, complete circuit, conductor, insulator, symbol, circuit diagram, electricity, component, voltage

**Interdependence & Adaptation**, plant growth, fertiliser, nutrients, consumer, producer, predator, prey, food chain, key, suited, plant food, produces, identify, habitats, life processes

Identifying scientific evidence that has been used to support or refute ideas or arguments

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.

**Charles Darwin**



## Animals including humans

Identify and name the main parts of the human circulatory system, and describe the functions of the heart, 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.

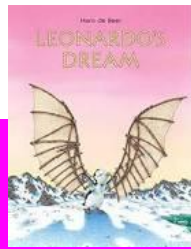
## Evolution and Inheritance

**Summer**



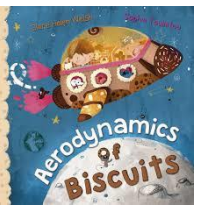
David Attenborough

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** Describe the changes as humans develop to old age



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.

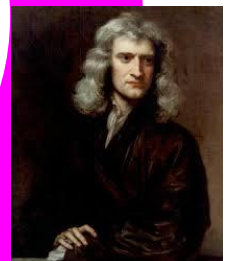
## Forces and magnets



Ruth Benerito (Wrinkle-Free Cotton)

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. Recognise 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 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.

Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations



Isaac Newton

## Materials



Spencer Silver, Arthur Fry and Alan Amron (Post-It Notes)



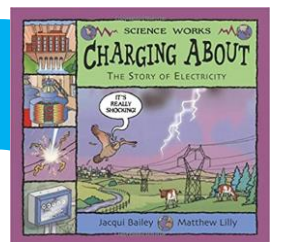
Using test results to make predictions to set up further comparative and fair tests

Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs

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 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

Michael Faraday

## Electricity



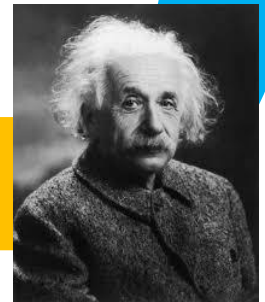
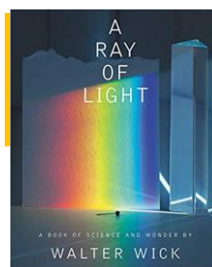
Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate

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 light into the eye. Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.

**Spring**



## Light



Albert Einstein

Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary

Neil Armstrong



## Earth, the moon and planets

Describe the movement of the Earth, and the 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.



Tim Peake





# Year 3/4 Science learning pathway

**Magnets & springs**, magnet, spring, metal, iron, copper, aluminium, steel, brass, attract, repel, magnetic, non-magnetic, attraction, repulsion, force, elastic, pull towards, push away from, stretch, squash, compress

**Keeping warm**, warm, warmth, cold, temperature, thermometer, degrees, Celsius, conductor, insulator, thermal, thermal conductor, thermal insulator, conduct, insulate, measure, room temperature

**Using electricity**, electricity, bulb, bulb holder, buzzer, battery, battery holder, switch, connection, wire, mains, crocodile clip, break, dim, bright, light, plug, socket, brighter

**Teeth & eating**, feed, feeding, growth, activity, food groups, vegetables, meat, fish, cereals, sugars, fats, fruits, starches, tooth, teeth, incisor, molar, canine, diet, healthy, unhealthy, root, decay, food, balanced diet

**Light & shadows**, light, dark, shadow, transparent, opaque, direction, light travels, translucent, shortest, longest, highest, object, material, light source, sun, night, day

**Moving & growing**, skeleton, bone, bones, ribs, spine, skull, vertebrate, contract, relax, contraction, joint, move, muscles, muscle

## Subject Specific Terminology

**Rocks & soils**, rock, slate, granite, sandstone, chalk, soil, clay, sand, limestone, quartz, marble, stone, pebble, texture, absorbent, characteristic, surface

**Changing Sounds**, sounds, pitch, loudness, vibrate, vibration, muffle, tuning, quiet, soft, noise, sound, source, loud, high, low, vibrating, soundproof

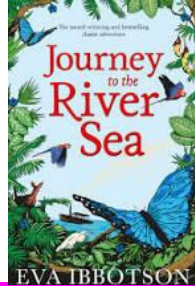
**Solids, liquids & separating materials**, solid, liquid, melt, freeze, solidify, dissolve, solution, filter, undissolved, dissolved, separate, sieve, mix

**Changing State**, evaporate, evaporation, condense, condensation, change of state, state, gas, conditions, solidify, freezing, melting

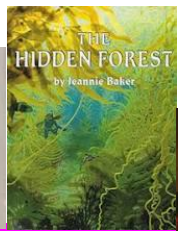
**Helping plants grow** well, plants, light, warmth, water, leaves, roots, stem, grow, growth, height

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.

**Jaques Cousteau**



Using straightforward scientific evidence to answer questions or to support their findings.



**Joseph Banks (Botanist)**



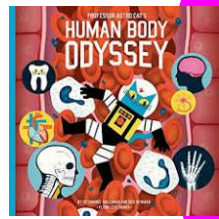
### Living things and their habitats

Identifying differences, similarities or changes related to simple scientific ideas and processes

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 animals have skeletons and muscles for support, protection and movement.

Describe the simple functions 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 chains, identifying producers, predators and prey.

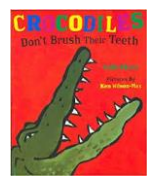
Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions



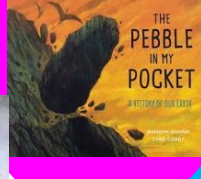
**Animals inc. Humans**

### Plants

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 plant to plant.  
Invest the way in which water is transported within plants  
Explore the part of the flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal



### Rocks



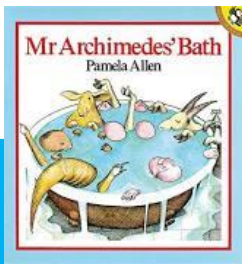
**Mary Anning**

### Rock, Paper, Scissors

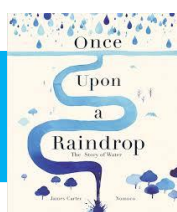
Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties.  
Describe in simple terms how fossils are formed when things that have lived are trapped within rock.  
Recognise that soils are made from rocks and organic matter.



Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions



Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.



### States of Matter



### Magnets

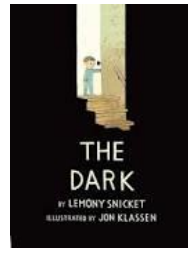
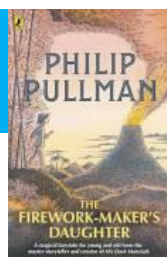
Compare how things move on different surfaces.  
Notice that some forces need contact between two objects, but magnetic forces can act at a distance.  
Observe how magnets attract or repel each other and attract some materials and not others.  
Compare and group together a variety of everyday materials 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.

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 this happens in degrees Celsius.



### Forces

Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions

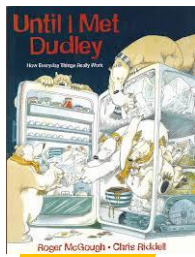


### Light

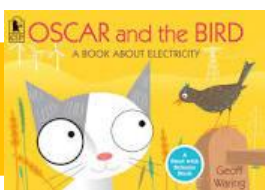
Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables



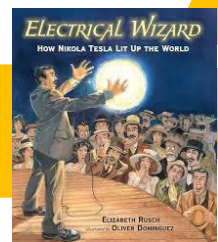
Identify common appliances that run on electricity  
Construct a simple electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.  
Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of 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 some common conductors and insulators, and associate metals with being good conductors.



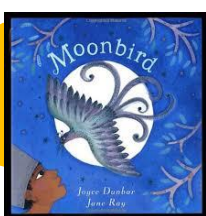
### Electricity



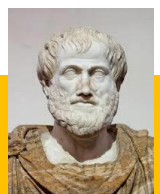
Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers



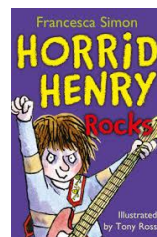
**Gaillileo Galilei**



**Aristotle**



**Alexander Graham Bell**



### Sound



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/volume of a sound and features of the object that produced it.  
Recognise that sounds get fainter as the distance from the sound source increases.

Asking relevant questions and using different types of scientific enquiries to answer them



# Years 1 & 2 Science Learning Pathway



Knowledge Yr1 Yr2 • Skills • Vocabulary

Autumn

Spring

Summer

plant, plants, branch, root, stem, trunk, flower, leaf, leaves, seeds, seedlings, weed, grow, growing, living, alive, not living, not alive, dead, healthy

Describe how plants need water, light and a suitable temperature to grow and stay healthy, and describe the impact of changing these

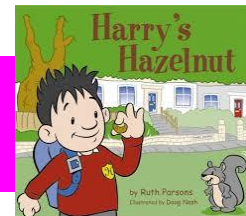
Describe how plants need water, light and a suitable temperature to grow and stay healthy, and describe the impact of changing these

Light, shade, sun, warm, cool, water, grow, healthy, germinate, Performing simple tests

Observe and describe how seeds and bulbs grow into mature plants

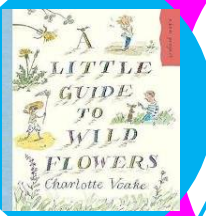


## Plants



Gathering and recording data to help in answering questions.

Identify and describe the basic structure of a variety of common flowering plants, including trees.



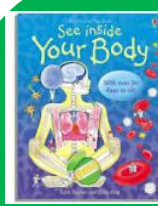
Identify & name a variety of common wild & garden plants, including deciduous & evergreen trees.

reproduce, produce young, produce new plants, animals, plants, shoot, within, under, next to, fruit, earth, soil, seeds

Describe the basic needs of animals, including humans, for survival (water, food and air).



Using their observations and ideas to suggest answers to questions



Identify, name, draw & label the basic parts of the human body and say which part of the body is associated with each sense.



sense, eye, ear, nose, mouth, hand, foot, feet, senses, arm, leg, head, neck, knee, wing, beak, see, hear, smell, touch, feel, alive, living, not alive, human, animal, tall, tallest, taller, like, similar to, different, difference, same, body, bodies, change, short, shorter, shortest, grow, move, adult, young

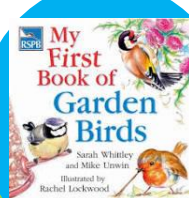
Understand that animals, including humans, have offspring which grow into adults.

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.

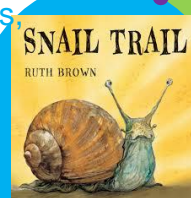


Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets).

Identify and name a variety of common animals that are carnivores, herbivores and omnivores.



## Animals inc. Humans



Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals.

Group animals according to what they eat

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

Observe and describe weather associated with the seasons and how day length varies.

Observe changes across the four seasons. Observing closely, using simple equipment



## After the storm



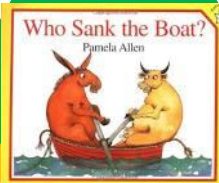
## One year with Kipper



Describe the simple physical properties of a variety of everyday materials.

I can describe how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

fast, slow, faster, slower, go further, safe, danger, be careful, pushing, pushed, pulling, pulled, moving



## Who sank the boat?



## Seasons

Compare & group together a variety of everyday materials on the basis of their simple physical properties.

## The Great paper caper

Pushes & pulls, push, pull, movement, twist, spin, swing, slide, swerve, hop, jump, turn,

I can identify & compare the suitability of a variety of everyday materials, for particular uses.

Asking simple questions and recognising that they can be answered in different ways

Distinguish between an object and the material from which it is made.

Describe how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

change, bake, bend, twist, stretch, squash, heat, cool, freeze, melt, boil, new material



## Everyday Materials



Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock.

Materials, materials, natural, man-made, manufactured, object,

## Identifying and classifying

Identify & compare the suitability of a variety of everyday materials, including wood, metal, plastics, glass, brick, rock, paper and cardboard for particular uses.