Science Long Term Plan

Acomb First School

Intent	Implementation	Impact and Next Steps
Our intent is to provide an **ambitious, progressive and transformative** Science curriculum that not merely fulfils the National Curriculum objectives but celebrates Science, encourages children to **think of themselves as scientists from a young age** and which challenges children to think deeply. This is because of our local context of children with high baselines and a proportion of families who work in Science industries, including academia. It is rooted in the idea of wanting our education to lead our community to **discover life in all its fullness**. Science allows us to discover and to inspire awe and wonder, understanding the complex ways that the people have shaped our understanding of it and that this pursuit is an on-going one. As a result, children will learn not just about scientific knowledge, but also some of the many men and women who have changed the way we think about the world around us. The Acomb First School curriculum and science pedagogy is rooted in research-based practice and which is owned by all teachers. Staff understand that **deep bodies of knowledge** are required within each science topic taught, knowing that this knowledge is delineated into **substantive** (or declarative) and **disciplinary** (or procedural) knowledge. The curriculum is planned around up-to-date research and understanding of what good Science teaching looks like, with staff understanding that teacher-directed instruction to encourage scientific enquiry is essential. A high-quality curriculum must be progressive, well-sequenced and with carefully planned and	Science is one of four core subjects at Acomb First School and is a priority in school. Implementing the ambitious vision for Science requires: - A clear, sequential and progressive sequence of lessons, collated by subject leaders, reviewed regularly by teaching staff with freedom to make suitable adjustments if necessary, particularly with relation to scientific misconceptions. - A strong understanding of scientific education pedagogy, particularly ways in which subject material in lessons is presented and ordered. - High expectations of work, including high standards of literacy, both scientific and English. To ensure that deep bodies of knowledge are very well understood and embedded within children's thinking, teachers plan lessons in a systematic fashion using the long-term plans. This puts **substantive knowledge first** before application through **disciplinary knowledge.** This means avoiding 'cold' tasks e.g. 'what you know, what you would like to know…' tasks and avoiding experimentation too early. Staff understand that research shows that children often approach new topics with misconceptions and that teaching to 'wow' moments, particularly early on as a 'hook' can often further embed misconceptions. Teaching will use a lot of **whole-class discussion**, with the teacher modelling good use of scientific thinking and probing throughout the first school age range, scaffolding knowledge carefully. This is extended through the use of teacher-direct instruction, including **teacher-led demonstrations and experimentation**, to model high standards of scientific practice. As a result, **teachers will ensure they have excellent subject knowledge.** All children are given opportunities to extend and apply their disciplinary knowledge through experimentation, including that led by themselves, but this is very carefully sequenced and placed at the end of teaching substantive knowledge. Where there are gaps in substantive knowledge, teachers will ensure that this is well-addressed before children experiment themselves. As children progress through the school, they are given increasingly more freedom to design and conduct their own experiments, including understanding when	Children will: - Be inspired and talk positively about their scientific experiences, from our Reception to those about to leave for middle school. - Be expert scientists, in that they can confidently apply their scientific knowledge and principles. - Be ambitious for their own further science development, including their future career options (e.g. seeing a link between their scientific knowledge and becoming a doctor, or researching new inventions etc.) - Standards of work will be very high in whichever way it is presented.

thought out vocabulary to ensure that children have the knowledge to become **expert scientists.** This must be from the very beginning of school life towards preparation for middle school and beyond. Our aim is that staff understand the need to **address misconceptions carefully, in a thoughtful and planned manner**. Misconceptions can be addressed too early and, given the age range with which we serve, understanding when to challenge and when to scaffold so children can independently undo their cognitive dissonance (an example of cognitive conflict) and celebrate this as part of the **scientific enquiry** process. We understand that working scientifically is a key part of the science curriculum and plan our application (the procedural knowledge) carefully to ensure it further embeds their knowledge and encourages all children to be scientists. The school understands that research shows science success is interdependently linked very closely with success in other subjects, particularly reading, and that opportunities to extend scientific knowledge within other subjects and vice versa should be taken, both planned and incidental. In turn, children will have the ability to think scientifically, independently, raising scientific questions about the world no matter their age or attainment, demonstrating their scientific capabilities to apply their secure, deep knowledge.	experiments do not work properly and analysing why. This involves following the enquiry process of **hypothesis, design, conduct, evaluate**, with vocabulary differentiated according to each year group. The time children leave in Year 4, children will understand how experimentation is the careful control, evaluation and measuring of different variables, including the words dependent, independent and control. This will be taught through a progressive model for writing up experimentation. The curriculum will, in conjunction with other subjects, **celebrate local links where relevant**, both in terms of our immediate community, **the historic role that Northumberland and the North East has played** in terms of scientific discovery and the role it **still plays today** (e.g. the universities, the Centre for Life). Educational visits are well-planned and linked to topics and not merely incidental and other key events, including National Science Week, are also well-planned, relevant and which extends scientific knowledge as well as celebrates science. This will also raise the profile across the wider school community through stakeholder involvement. Children's understanding of what Science is will be deepened not just by lessons and visits but also **understanding who scientists are**, that science is an ongoing investigative process performed by a diverse group of people, both historically and today. In turn, this will help foster a passion for Science.	

Reception	Autumn Term		Spring Term		Summer Term	
Overarching Topic Title	**Marvellous Me**	**Let's Celebrate**	**Frozen Planet**	**Growing**	**Amazing Animals**	**Seaside Adventures**
Texts	Why should I brush my teeth? My first time going to the dentist My Trex has a toothache The children's book of healthy eating.	Pumpkin soup Little red hen We gather together Oliver's Vegetables	What is snow? Ice non-fiction	A seed in need The enormous turnip Jack and the beanstalk Life cycle: seed to flower	Owl babies Nocturnal: night time animals Forest/wild animal books	Greta Thunberg: little people big dreams The mess we made What a waste Lift the flap question and answer about plastic
Science Focus	**Healthy eating:** How to keep our teeth healthy	**Understanding changing states:** making soup and recognising the differences between the vegetables when they are raw and cooked. The effect heat has on food.	**Understanding changing states:** freezing and melting as a reversible change, looking at ice.	**Understanding what plants need and making predictions:** growing cress in different conditions (soil, cotton wool, paper towel, seeds only)	**Animal habitats:** Animals that live in a range of habitats (both local and wider) and their adaptations to survive.	**Human impact on the environment:** water/plastic pollution, how this affects the environment and how we can help.
Continuous	Seasonal changes – Using observational drawing and scientific tools to investigate the environment around them and notice change. Begin to use more scientific language e.g. 'the temperature is getting warmer' and understanding that many weathers can happen in all seasons. Specific explanation around snow, hail and rain, including where they come from (clouds). Children will understand that some trees don't lose their leaves.					
Continuous DM and ELG	*DM:* Understand the effect of changing seasons on the natural world around them. *ELG:* Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter. Explore the natural world around them, making observations and drawing pictures of animals and plants					

Specific Development Matters Coverage (Rest is covered continuously)	Know and talk about the different factors that support their overall health and wellbeing: • healthy eating • toothbrushing	Talk about the changes they notice.	Talk about the changes they notice.	Plant seeds and care for growing plants. Understand the key features of the life cycle of a plant. Explore the natural world around them	Recognise some environments that are different from the one in which they live.	Explore the natural world around them Describe what they see, hear and feel whilst outside. Begin to understand the need to respect and care for the natural environment and all living things.
ELGs	• 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 in class. • Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter					
Specific scientific vocabulary to teach	Plaque Cavities Rot Decay	Change Heat Observe Equipment Ingredients Vegetable	Solid, liquid, gas Ice Water Steam Melt, Experiment Arctic Change	Growth Hydrated/ dehydrated Sunlight nutrients	Nocturnal Hunt Prey and predator Urban/rural Habitats African plains Vegetation Drought Herbivore Omnivore Carnivore Life cycle	Pollution Effect Cause Human impact Waste Environment
Why this? Why now?	Focus on healthy eating and promoting oral health.	Links to celebrations during this time. Autumn (vegetables).	Links with time of year (winter)	Progressive from Nursery – growing seeds. Links with time of year and	Linked to interests of children Building on learning from forest school	Links with time of year (summer). Important topic to cover as a worldwide issue.

Enrichments (visits/visitors)	Random acts of kindness	Possible firefighter visit Possible visit to place of worship		Allotment visit?	Visit to the farm Caterpillars in Frogspawn in classroom or pond visits	Possible visit to the beach Litter picking
Possible lesson progression/ activities	1. Read 'Make Way for Tooth Decay'. Discuss what bacteria is and what it does to your teeth. 2. Read 'Why should I brush my teeth?' Discuss how to protect your teeth. 3. (You may wish to do this over two lessons) Before the experiment, use extensive questioning to encourage children to think about how the class could make an experiment. Have children write down how they could do it. Encourage children to think about what they would need, keeping it open-ended. Discuss in next lesson what children suggested. Explain the substitution of an egg for teeth. Then, use questioning to extend and see what children can think about in terms of making it 'fair' i.e. 'does it matter if we add lots of coke and only a tiny bit of orange juice?' Then, encourage children to think about how they are testing their prediction and that that's what all experiments are. Conduct the experiment, use orange juice and	1. Read the Enormous Turnip. Look at a turnip. How does it feel, smell on the outside/inside. Record vocabulary the children come up with. Discuss where the turnip comes from – ensure children understand that it is a vegetable because it comes from the ground. 2. Read Pumpkin Soup. Introduce the words ingredients and equipment. Throughout the story talk about the equipment and the ingredients the animals used. 3. Reread Pumpkin Soup, ask the children to think about the equipment and ingredients used. Make a list of ingredients and a list of equipment. 4. Make pumpkin soup and observe the changes. What has happened to the pumpkin? Does it still look the same? What	1. Use a non-fiction book to look at the environment in the Arctic. Talk about what the children see. Identify the Arctic is made up of snow and ice. 2. Begin by looking at pictures of ice, ask the children what it is, how it feels etc. Talk about how ice is a solid. It stays in one place, it keeps it shape. Look at pictures of water. What can you see? Water is a liquid. Liquids can be poured. Look at a picture of steam. What is it? Steam is a gas. Ask the children to re-look at the photos. Can they name them? (solid, liquid, gas) 3. Explain to the children we are going to undertake an experiment. Ask the children if they think you can change a state of matter e.g. can we change the solid state of ice to anything else or will it always be ice? Record the children's predictions. Carry out an experiment to change ice to water. What changes	1. Look at some plants and talk about whether they look happy and healthy or not – why? What did the plants need to grow? Make a list of things a plant needs to grow. 2. Carry out an experiment to grow cress. Will we need soil to grow cress? Take the children's idea. Change the variable so that the experiment has a pot with soil, a pot with cotton wool, a pot with a paper towel and a pot with seeds only. Take the children's predictions about what they think will happen. Will the seeds grow? 3. After a few days, check which pots have begun to grow? Why do you think this is? Children will record their observations. 4. Look at all of the pots. Which pot has successfully grown?	1. After reading owl babies, discuss the word nocturnal. Give the children a list of woodland animals. Children to find out if the animals are nocturnal or not. 2. We know that an owl lives in the woodland for their habitat and for food. What does an owl eat? Ask the children for ideas. (Look at the barn owl trust for videos) and discuss. An owl hunts and eats smaller animals. An animal that hunts and eats other animals is called a predator. The animal it hunts is called they prey. 3. Look at photos of different animals and sort them into predator or prey groups. 1. Look at a range of habitats e.g. plains, lake and desert. You may wish to split this lesson into smaller lessons e.ga lesson on one or two habitats. 2. Look at a range of animals and discuss which habitats these animals come from. Children to sort animals into groups.	

	water with an egg to represent enamel. Children to make predictions about what might happen to the enamel. Have continual visual checks as part of routine, recording results somewhere. 4. Discuss your findings. Were your predictions correct? What have we learnt? Link back to how this is what scientists do – make predictions, experiment, then decide what to do next. 5.	has caused the changes?	did the children observe? Were their predictions correct? Ensure vocabulary 'melt' is used to discuss how the solid has changed to a liquid? Challenge thinking by asking if they know of any other solids that could do this? E.g. chocolate. Can it be reversed? 4. Explain that today we are going to see if we can change the state of liquid to a solid. Encourage discussion to make predictions. Experiment – using melted chocolate, can it be turned back to a solid?	Which pot has not? Why do you think this is? Were your predictions right?	3. Recap which animals live in the Arctic. Would you find these animals in Africa? Why not? Children should look at Arctic animals and explain why you would not find them in Kenya and vice versa (e.g. 'the bear has a fluffy coat and would be too hot'). 4. Make your own animal for different scenarios, considering what would make the best animal for different scenarios.	

Maple Class Year 1 of 2	**Autumn Term**		**Spring Term**		**Summer Term**	
Science Topic Title National Curriculum Coverage (substantive knowledge)	**Animals, including humans** Focus on animals only NC: Identify and name a variety of common animals that are birds, fish, amphibians, reptiles 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 (birds, fish, amphibians, reptiles, mammals and invertebrates, including pets)	**Animals, including humans** Focus on humans NC: 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**		**Plants** How does a plant grow	**Plants** Different types of plants/trees
Why this? Why now?	Long Term which allows opportunities for depth and embed complex knowledge. Builds on Reception Links to birds in our school grounds	Links to DT/PE/Healthy living	Children will be able to make links between materials other areas of the curriculum.	Children will be able to make links between materials other areas of the curriculum. Links to DT Sc1 focus building on Materials knowledge in Spring 1	Links to Geog teaching, both previous term and this term Builds on knowledge of seasonal changes Links made in Forest school Consolidate capacity/length & height (WRMH Spring 2)	Links to Geog teaching Builds on knowledge of seasonal changes WRMH- Link to time/length of day Link to trees in our grounds and at Forest School Link to DT food topic
Working Scientifically Skills (procedural knowledge)	Asking simple Qs/answer in diff ways (link also to English) Identify & classify Observe closely to use simple equipt (compare and contrast animals) in local habitat and in pictures	Asking simple Qs/answer in diff ways (link also to English) Observe closely- Senses to compare Designing experiments	Asking simple Qs/answer in diff ways (link also to English) Identify & classify	Asking simple Qs/answer in diff ways (link also to English) Identify & classify	Asking simple Qs/answer in diff ways (link also to English) Performing simple tests Using observations & ideas to answer Qs Gather and record data to answer Qs Observe closely to use simple equipt (ruler)	Asking simple Qs/answer in diff ways (link also to English) Identify & classify
Resources	Resources to identify living things in environment, including magnifying glasses and microscopes Animal skulls/teeth	Human body resources Feely bag Blindfolds	Everyday materials box (see below to materials) Example household objects to identify below materials Resources for building a den (see Spring 2 experiment)		Plants to grow (see below) Measuring cups Magnifying glasses	Magnifying glasses

Science vocabulary to teach	Fish (**Name**: goldfish, salmon, cod, maceral) Amphibian (**Name**: Frog, toad, newt) Reptiles (**Name**: lizard, snake, tortoise) Birds (**Name**: seagull, sparrow, robin, magpie, pigeon, blackbird) Mammals (**Name**: Human, whale, dolphin, cats, dogs, pigs) Pet Vertebrate (the above five groups) Invertebrate (at Year 1 level, anything that does not fit into the above five) Carnivore Herbivore Omnivore Similarity Difference	Head Neck Arms Elbows Legs Knees Face Ears Eyes Hair Mouth Teeth Experiment	Hard/soft Stretchy/stiff Shiny/dull Rough/smooth Bendy/rigid Waterproof/not waterproof Absorbent/not absorbent Opaque/transparent Materials: Wood, plastic, glass, metal, water, rock, **Fair test**		Plant Roots Stem Leaves Flower (petals) Fruit Seed Evergreen Deciduous Vegetables (Variety of common plant names, e.g. geranium, dandelion, oak, bean)	Deciduous Evergreen Trunk Branches **Name:** Hawthorn, oak, willow,
Application of Core Subjects/Progression	Animals link to writing English: Write n-f text	Senses link to descriptive writing within English	Measurement (how far can items stretch etc. for ruler use; additionally, weight and volume) Instructions- DT (Spring 2)		WRMH- Consolidate capacity/length & height (Spring 2)	WRMH- Link to time/length of day (Summer 2)
Enrichments (visits/visitors)	Exotic animals, bug guy Zoo, aquarium etc.				Acomb field work	
Proposed Lesson Progression and Justification	1. Finding similarities and differences across animals already known (pets). Children should explore animals they know well, finding basic similarities and differences. What makes a dog different to a goldfish? How do we know? Encourage children to explore different ways to categorise and delineate between animals they know. You could explore how there many different types of dog, as there are many different types of fish This lesson is more focused on children considering how	1. Understand and label parts of the human body. Children will be able to name most parts of their body from prior learning but they should finish the lesson understanding that each part has a purpose and sometimes multiple purposes. Comparisons could be made with other animals also (building into L3). 2. Understand and name the five senses (You may wish to do some	1. Find similarities and differences across different everyday items. Children should be encouraged to ask good scientific questions and use their observation skills to group items in different ways. They should be given a wide range of items they can hold. It should not be immediately obvious how items should be grouped and materials should be one way of grouping them. Allow it to be child-led initially. After that, encourage children to do so entirely	1. Compare the properties of materials This should recap and extend the final lesson from Spring 1, but with a comparison angle. Children should begin to see that items' and their materials' properties have different utilities at a very basic level (building into Year 2). Higher attaining pupils should begin to delineate between personal taste, 'I like it because it's soft' and 'It isn't as useful as A in X scenario because it's soft, but in Y scenario it is	[Read this progression alongside the Humanities curriculum closely as the two interrelate] The first two lessons are information dense – success will be more likely if the concepts are explored in prior learning. 1. Label the parts of a plant (flowering) Children should be aware of the parts of a plant as, through on-going teaching, Forest School etc. children should have been exposed to them. This is a good point to	Note the shortness of this topic – this is deliberate to allow crossover from Summer 1 topic). 1. Identify and label the parts of a tree Children must be able to label the parts of a tree and understand their function closely. This should consolidate Summer 1 learning. Children should be invited to consider how seasons affect trees which will likely have been explored previously. They may begin to name different

	we categorise things through observation rather than vocabulary usage at this point. 2. Finding similarities and differences across vertebrates Introduce children to the term vertebrates. Consider which pets studied last week are vertebrates and which are not. Then, introduce them to the following terms: mammal, bird, fish, reptile and amphibian. What makes them similar? What makes them different? Children do not at this stage need to immediately correctly sort animals into the five different groups but should be able to use the terms, identify some basic differences, and understand that these five classes are types of vertebrates. This lesson should be focused on finding similarities and differences and children arriving at the realisation that these differences are why they are grouped into the five classes. 3. Group vertebrates according to their class Children should continue to classify animals but should by the end of this lesson know the specifics of each class and have examples they can use for each of them (see vocab box). This lesson can be split up further if categories need further examination and if five are too many. 4. Group animals according to what they eat. Children should learn the	form of fun activity to start off, but avoid repetition for L4.) Children should understand the way that there are particular senses that require different body parts. Children should understand why we have these particular body parts and what role these would have played. Children should be introduced, particularly at the higher attaining end, to the idea that senses are there to protect us and that humans did not always live as they live now (link to History topic) and that these senses were particularly helpful in the past. Further extension may be made with reference to additional senses: movement (this includes proprioception – not a term they need to know!), balance, pain etc. The main part is understanding that senses serve purposes. 3. Hypothesising for differences in body parts between humans and other animals Building upon previous term's learning, children should work on their ability to ask and answer questions in different ways. Compare how other animals have similar body parts and senses and recap differences between animals in terms of what they eat and their class. You could look at certain	by what they're made from. Use this as an assessment point. Encourage children to realise how different questions can change the way they view the objects. 2. Identify materials and understand their link to everyday objects You may wish to begin with a feely bag where children identify materials on feel. By the end of the lesson, they should be able to delineate how different objects can be made of the same material. By the end of this lesson, children should be able to name glass, plastic, metal, wood etc. confidently and begin to justify how they know (building into properties). 3. Link everyday materials to their properties. Children should begin by hypothesising why objects are the way they are in terms of their feel and their function. They should by the end of the lesson be able to identify materials on properties alone, rather than being reliant on own senses. They should begin to use increasingly more challenging vocabulary to describe the properties. 4. *Children should do an additional lesson on the*	better than A'. However, for the majority of children this lesson should focus on comparing properties and begin to identify that some objects may be better in certain scenarios. **2&3.** Design and test a den to withstand different weather conditions (Likely to be over two lessons – consider linking with Forest School). Children should build upon seasonal changes to understand that, at this time of year, weather can be variable. How would they design a den that can withstand the different weather conditions? Children should have an opportunity to 'experiment' and use different ways to measure success e.g. leaving the den exposed over a windy, wet weekend; measuring temperature inside the tent for heat etc. DT links can be made in this lesson, but the DT heavy aspect is covered in L3. You may wish to teach this initially in small snippets over a number of weeks before writing it up. This should be the introduction of the idea of a 'fair' test and an 'unfair test'. You may wish to (jokingly!) create unfair tests and discuss why they are unfair. (Note the	ensure proper scientific language is used. Plant type may be sunflower to label but this should be done alongside a less similar plant – consider using different, more difficult plants (e.g. where petals are less obvious etc.) as forms of differentiation. Avoid discussion of trees (next term). Children should be able to name a small number of everyday plants also. 2. Identify what plants need to survive. This lesson should be general, rather than specific (see L3). It should consider not just water and sunlight but how location affects these – this could be done by comparing and contrasting different plants from different habitats. Links to location and place from previous topic should be made. References to Autumn learning (how is this similar to animals including us as human beings in terms of what we need to live?) should also be made. 3. What does a sunflower need to survive? [Referenced in the Humanities LTP]. Building upon previous lesson, this should be specific to sunflowers. When do they grow? What time of year do they	trees at this point. They must understand that trees are plants and understand the similarities and differences between what we call flowers and trees. 2. Understand the difference between deciduous and evergreen trees, identifying examples of both This lesson should further their understanding of different trees. Links to local environment would be sensible (also, consider building tree identification into Acomb tours in Geog topic). 3. How do trees survive in the winter? This lesson should further understanding of deciduous and evergreen in the context of colder weather. Children should be invited to hypothesise based on what they know about trees and plants before discovering how they survive. 4. *Children should do at least one additional lesson on the on-going teaching, including a lesson on seasonal change that contrasts with*

	terms carnivore, herbivore, and omnivore. They should be able to classify the animals learned according to class now under what they eat. They should note that classes have examples of all three. You may wish to begin by looking at skulls and teeth or videos (see below). 5. *Children should also do at least one additional dedicated lesson on plants or seasonal change, alternating between them across half-terms*	dog breeds and their keener sense of smell, or examine differences between carnivores and herbivores in terms of eye placement. **4&5:** Produce and conduct an experiment about the senses This is likely to require two lessons. Children should be introduced to the idea of 'experiments' through the concept of figuring out how senses work. Children should be encouraged to ask good questions. The experiment should be partially led by the class and modelled closely by the teacher to ensure good scientific language. The purpose of the experiment should be some way of detecting which senses are working and figuring out ways to remove other senses (e.g. blindfolding which the children should come to independently). A good example would be an experiment around how smell, touch and sight affect taste. 6. *Children should also do at least one additional dedicated lesson on plants or seasonal change, alternating between them across half-terms*	*on-going teaching (see below)*	introduction of independent, dependent and control *without* the terminology at the start of Year 2). **4&5** EXPERIMENT WITH DT OVER TWO LESSONS See DT plan *6. Children should do an additional lesson on the on-going teaching (see below)*	grow? (Links to seasonal changes) Is there a risk of overwatering or too much sun and heat? Children should take enquiry approach within this lesson. **4&5:** Design an experiment to test sunflower growth. [Referenced in the Humanities LTP – **Lessons 2 and 3 of Geog must be taught before this lesson**.] Children should design how they will measure the strength of different places as sunflower growth destinations. For instance, measuring them and making a timetable for them. Children should then be directly involved in the planting of sunflower seeds. 6. End point: Explain where the best place to grow a sunflower is *This topic will have to blend a little into Summer 2 for children to accurately measure them – consider children adding data to books over multiple weeks or finishing unit early (e.g. placing bulk of RE learning at the end of term).* After completing the experiment and measuring over a series of weeks, children should write up their results and	*their Autumn learning*

					argue for where they think the best place for a sunflower is. GD children and potentially middle attaining too should consider on a deeper level whether the best place for a sunflower is necessarily where it grows the fastest (for instance, would it look better for visitors by the front entrance?)	
Possible lesson progression/ activities	20 Qs Feely box – feathers, fur etc. Look at DVD clips / pictures of animals eating. Discuss. Identify carnivores, herbivores & omnivores. Sorting activity. Compare plastic skulls of carnivore (dog) & herbivore (sheep) & omnivore (human). Note teeth differences (introduce words), muscle strength and eye placement. From the teeth guess what food they eat.	Sense detectives-type activities Songs and games for body parts/Simon Says	Feely bag of materials 20 Qs			
Ongoing Science Teaching	**Animals, including humans** Use the local environment throughout the year to explore & answer Qs about animals in their habitat. (Be aware that invertebrates do not need to be known in depth and the animal groups they need to know and are unlikely to be ones seen in the local environment) – **USE FOREST SCHOOL OPPS** **Plants** Use the local environment throughout the year to explore & answer Qs about plants growing in their habitat- **PLANT VEG** **Seasonal Changes** ● Observe changes across the 4 seasons ● Observe and describe weather associated with the seasons and how day length varies **DO THROUGH CLASSROOM ROUTINES & DISPLAYS**		**Animals, including humans** Use the local environment throughout the year to explore & answer Qs about animals in their habitat – **USE FOREST SCHOOL OPPS** **Plants** Use the local environment throughout the year to explore & answer Qs about plants growing in their habitat- **PLANT VEG** **Name:** daisy, daffodil, dandelion **Seasonal Changes** ● Observe changes across the 4 seasons ● Observe and describe weather associated with the seasons and how day length varies **DO THROUGH CLASSROOM ROUTINES & DISPLAYS**		**Animals, including humans** Use the local environment throughout the year to explore & answer Qs about animals in their habitat – **USE FOREST SCHOOL OPPS** **Plants** Use the local environment throughout the year to explore & answer Qs about plants growing in their habitat- **PLANT VEG** **Name:** hawthorn, oak, willow, **Seasonal Changes** ● Make tables and charts about the weather **DO THROUGH CLASSROOM ROUTINES & DISPLAYS**	
Scientist of the term	**See addendum draft list**		**See addendum draft list**		**See addendum draft list**	

Maple Class Year 2 of 2	**Autumn Term**		**Spring Term**		**Summer Term**	
Science Topic Title National Curriculum Coverage (substantive knowledge)	**Animals, including Humans**	**Uses of everyday materials**		**Plants**	**Living things & their habitats** Content	**Living things & their habitats** Rock pool habitat
Why this? Why now?	Complex topic needing longer term. Link with Plants ongoing teaching. DT link (Healthy eating & hygiene) School Nurse visit	Depth of understanding opportunities within long term – run up to Christmas allows flexibility. DT link in Spring 1. Builds progressively on understanding about wooden houses from Aut 1 and 2.		Precursor to habitats	Link back to materials Studied plants and humans so can build into it	Builds on Summer 1 geog. Natural link with Summer 2 visit.
Working Scientifically Skills (procedural knowledge)	Asking simple questions and recognising that they can be answered in different ways. Identify and classify	Asking simple Qs & answer in different ways Perform simple tests Identify & classify Using observations to answer Qs Gather & record data to answer Qs Observe closely using simple equip (ruler)		Asking simple Qs & answer in different ways Observe closely using simple equip (thermometer, ruler etc) Using observations to answer Qs Perform simple tests Gather & record data to answer Qs	Asking simple Qs & answer in different ways Identify & classify	Observe closely using simple equip (microscopes, nets, magnifying glasses)
Resources						
Science vocabulary to teach	Animal Human Basic needs Water Food Air Survival Food types Hygiene Growth Reproduction *(not how it occurs!)* Carnivore Omnivore Herbivore Baby Toddler Offspring Teenager Balanced diet Exercise Fitness	Wood Metal Plastic Glass Brick rock Paper Cardboard Squashing Bending Twisting Stretching	Macintosh or Dunlop (up to Teacher)	Seed Germination Bulb Reproduction Growth Survival Mature Temperature Suitable conditions	Living Dead Never been alive Dormant Definition MRS GREN (see below) e.g. Is a flame living, is a deciduous tree dead in winter? P4C	**Apply knowledge to Rock pool habitat:** Habitat Microhabitat Food chain Shelter Sources of food

Application of Core Subjects/Progression	interpret and construct simple pictograms, tally charts, block diagrams and tables					**WRMH-** **Writing as a Scientist within the experiment**
Enrichments (visits/visitors)	Tape measures Example to scale animals Food (see below and see DT plan) School nurse	(See above for examples of resources) Equipment to measure resources		Plants to grow (also in on-going teaching) Equipment to measure the plants and investigate (microscopes, magnifying glasses)	See Plants topic for habitat investigation	See Plants equipment for rock pool investigation
Proposed Lesson Progression and Justification	**1 & 2** What happens to our bodies as we grow? You may wish to begin with baby photos and related games. You may wish to make a timeline that shows change over time (this could link well with re-establishing chronological understanding from Y1 History). You may also wish to briefly touch upon data (if the children are confident mathematically) to measure heights of children/head span/arm length etc. at different ages across the school – if conducting data summary, this will require two lessons. (COVID-19 alternative: foot size on paper.) All classes should measure but Maths link will depend on cohort. Children should recognise that older =/= taller etc. – you may wish to, at a very simple level, discuss how development can change and that what our parents and their parents are like has an effect. Children should place themselves and compare themselves to others, from family to GCMS/GA etc.	[Close examination of Year 1 books and Year 1 success within materials topic is essential before beginning this topic to ensure progression. This sequence is deliberately more challenging than Year 1 but you may choose to reduce the difficulty initially to bridge it.] **1.** Recap prior Y1 learning as to the different materials of different items. Assess the children's knowledge from Y1 initially as to different materials and their properties. Note the addition of brick, rock, paper and cardboard from Year 1. Have children investigate the properties first-hand. Children should use increasingly more challenging scientific vocabulary to describe the properties (see above), building up to the next lesson. **2&3** Design an experiment to test the properties of different materials.	**1&2** Design and conduct an experiment to measure why different materials can be manipulated in different ways Over two lessons. Recapping L3 and L4 from last term, children should design an experiment that identifies whether thickness affects stretchiness. This experiment is likely to be more teacher-driven because of the tight parameters, but you may wish for higher attaining scientists to work together (with adult support) to formulate a slightly different experiment. Examine how thickness of elastic affects how far can stretch. Ensure children are involved in the risk assessment process (how do we keep ourselves safe?) and explicitly use the term 'risk assessment'. **3&4 DT link – using everyday materials for specific purposes**	Understanding from Year 1 of 2 and ongoing topic learning. There is significant overlap with the Geography and Science topic in Year 1 of 2 – the progression is mainly based around the complexity of experimentation and **in understanding that *different* plants require *different* conditions.** Children in Year 1of 2 will know that water and sunlight is good for plants but it is crucial that they understand the complexity of plant tending by the end of the unit. Closely consider the main experiment and the time that is likely to be needed to see results. Please look carefully at this and Year 1 of 2's plants – Y1's plants topic actually goes into Y2 expectations so I've had to make this harder!! **1.** Consolidate our understanding of what plants need to grow and what they start from By this point, children should have a strong	**1&2** Understand life processes and what makes something 'alive' Show children pictures of different things (include inanimate objects, plants, animals, humans, creatures from the sea etc.), but don't give any direction initially: how are they similar? How are they different? How might they group them? Then, ask what is alive and what is not. Don't immediately address misconceptions at this point: allow them to be unsure and to debate. You may wish to even record this uncertainty in the book (to be revisited later). Introduce children to concept of MRS GREN and split it across two lessons. You may choose to make a long lesson with all the content that is taught one process at a time and then divide the time according to success. See below for list of suggested activities for each step. **3.** Identify what is alive and what is dead.	**1.** Understand the relationship between habitats and food chains Consolidate last term's learning and have children explore the way in which that there must be a careful balance between the conditions of the habitats and the food chain. Have children hypothesise what might happen if, within a simple food chain, one of the species massively increases in number. What would happen if it decreases? What would happen if the plant that is eaten by the herbivore at the bottom of the chain cannot grow due to poor weather conditions? **2.** Identify the relationship between habitats and food chains within the local environment. Children should do the same as above but within the context of the school environment. They should closely consider, initially, what happens as above if the habitat or food chains change, but they should also progress to human

	Sequence baby – toddler – child – teenager – adult – old age – don't get hung up on exact ages. **3** Do other animals grow in the same way as us? Have children answer this question – children will likely think of puppies/kittens but they may also consider animals like frogs. Let the uncertainty be part of the lesson and don't push to correct answer but allow debate. Come back to initial thoughts at the end of the lesson. You may wish to begin by matching offspring to animals. Children should by the end of the lesson understand that all things grow but that they do so in different ways **4** What do we need to live and be healthy? This lesson should be combined with DT (food) – consider doing DT week in the middle of term. This lesson is probably best before DT and focused on more general healthy living, with healthy eating objectives covered through DT link. Children should consider what they need to do to be healthy – this should also include more basic aspects like breathing. Explore different food groups and categorise food accordingly. Consider what makes someone 'healthy' – include balanced diet	Children should recap how they described the properties of different objects in the prior lesson and then consider how they could compare the properties using different measurements. Explore the idea that, for experiments, you keep certain things the same, you change one thing and you measure another (terminology not used until Year 3). You could explore waterproofing, scratch testing, warmth/insulation etc. – ensure that this does not overlap with next term's topic and avoid squashing/bending etc. to avoid repetition with next sequence. **4.** Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. Children should be re-introduced to the materials from L1 and 2 and encouraged to work with them physically. They should consider, using their examination of fair testing in L2, how to scientifically measure how bendy, twisty or stretch-y the substances are. They should begin to consider the utility of these in different contexts. Begin to consider how this affects their utility.		understanding of exactly how plants grow from ongoing teaching and Year 1. This lesson should consolidate this strongly for lower attaining children. Children should be able to identify the lifecycle of a plant, and should be introduced to the idea that some plants grow from seeds and some from bulbs. They should be comfortable with the terms bulb and seed. Children should identify seeds and bulbs that they will know already from everyday life (e.g. pips). **2&3** Create and conduct an experiment about how well a range of plants grow in our school Begin by recapping what plants need to grow. Allow children to simply consider that plants all need sun and water, just like sunflowers, and don't yet delve into the different conditions required. Bring along a wide variety of seeds and bulbs (include some from much hotter climates that will not grow, e.g. avocado stone) and ask them how well they think they will grow if they grow them in school. Ask them how they will grow them and how they plan to water them, where they plan to put them. Children should consider the sunflower experiment in Year 1 where they changed location for the	Apply the knowledge learnt in L1 and 2 in this lesson. If the initial task had been completed in books, you will want to have children correct and comment on this. Children should explain what is 'alive' and what isn't, justifying by linking it to MRS GREN. For higher attaining pupils, you may want to look at more complex lifeforms, like viruses, where there is debate. You will want to simplify the discussion significantly, though! **4.** Understand what a habitat is. Children should explore the concept of a habitat, linked to their ongoing learning. Adaptations and interdependence is next term – if some children begin to independently identify this, then they should be celebrated, but whole-class focus should be on deepening the idea that a habitat is where living things live and that animals are well-suited to their habitat – leave the why for L1 next term. They should look at how habitats suit the living things – for instance, build on the ideas from last term's experiment with plants that grew well and less well. Whilst they were grow artificially by us for an experiment, it was by matching the plants natural habitat that we had most success.	effects: what would happen if the school acted in different ways – e.g. if it got rid of the grass and woodland and made new classrooms. How would that change living conditions? Or what would happen if the whole playground and field had a sunshade? **3&4** Field trip – identifying the food chain and habitat of rock pools Before commencing the trip, ensure children have the ability to name the living things within rock pools initially. Pre-teach this before the trip. Children should be told that they are investigating the habitat of rock pools and that they are doing what scientists do. You may wish to discuss what biologists, botanists etc. do when they investigate an area. On the trip, children should take photographs and collate many of the photographs themselves. They should write as scientists afterwards (showing them examples – consider English link).

	(pre-teaching before DT objectives). There should be some sort of data collection – this could be a food diary, considering which drinks contain the most sugar etc. **5** Understand why it is important to exercise. Children should explore exercise and how different exercise is good for you. Classify different exercises into what makes you strong, fit and flexible (you may wish to explore terminology like 'cardio'). You could measure heart rate with exercise. **6** Why is it important to keep clean? Talk about ways we keep clean (e.g. brushing teeth, washing, etc). (Current link to COVID-19 but make it about more than just that). Importance of washing hands. You could consider taking swabs from various parts of the body. Grow microbes (care!) on agarose gel/Petri dishes.	**5**. Consider why different substances are used in different ways Children should by the end of this lesson be able to explain and give examples of materials being used in different ways (e.g. why brick is used for houses, why soft fabrics are required for clothes etc.) **You may wish to make links with the usual Christmas card production**		same plant, but this time we want to see how well they grow fairly. Get the children to construct an experiment (with increasing independence for higher attaining children) for how we could find out which ones grow well and which ones don't fairly. Children should independently identify that, for the experiment to be fair, conditions must be the same as the thing we're changing are the plants, not the conditions. Ensure children make good predictions. *There is likely going to be a need to a delay to identify growth success. You may also wish to consider a small greenhouse to improve success – if you do this, give children the choice and discuss.* **4.** Evaluate the experiment and understand how different plants need different conditions	**5.** Understand what a food chain is. Children should identify food chains using animals they know well initially. You could get the children to identify a wild animal that they like (e.g. a lion) and get them to initially explore what lions eat, then what does the animal that lions eat eat, and so on and so forth. Children should be able to, at the very least, sort simple food chains and find predators and prey. Higher attaining pupils should be able to find complex, interconnected food chains. In addition to the above if you have time, you could investigate the food origins and chain of a plate of given food. This, however, should be secondary to the above.	

Additional lesson ideas and progression suggestions	Baby photos – game where children guess the person from the photo etc. (including the teacher!) • Do animals grow in the same way as we do? Measure animal growth in different ways over time e.g. length, weight. Tabulate & chart. Use own animals or farm visits (webcam, etc)				• **M**ovement – video dancing/sport; Introduce muscles/bones; Show animals moving; Leaf movement; etc • **R**espiration (breathing) – run on spot (count breathing/pulse rate) • **S**ensitivity – Senses games/quiz; recall 5 senses; Animals senses (woodlice); Cress bend to light • **G**rowth – Order growth stages cards (humans, animals, plants) • **R**eproduction – Link adults to babies (PowerPoint); trip to zoo to see baby animals; look at flowers/seeds • **E**xcretion – Drinking water experiment – link to number of times pupils go to the toilet over a day (tally) • **N**utrition – 'Good' food/'bad' food (why?); Carnivores/herbivores; fertiliser experiments on grass	
Ongoing Science Teaching	**Plants** Use the local environment throughout the year to observe how different plants grow. Be introduces to germination conditions for growth & survival. **Plant seeds in winter and compare it to their Year 1 of 2 experiment. Read the Plants sequence in Spring closely and consider pre-teaching elements, particularly considering those who may struggle with the topic.**		**Plants** Children should build up to their unit by being exposed to a wider variety of plants – as the weather improves, grow a variety of different plants, reiterating what children know about what plants need and having them consider the seasonality of different plants.			
Scientist of the term	**See addendum draft list**	**See addendum draft list**	**See addendum draft list**	**See addendum draft list**	**See addendum draft list**	**See addendum draft list**

Chestnut Class Year 1 of 2	Autumn Term		Spring Term		Summer Term	
Science Topic Title National Curriculum Coverage (substantive knowledge)	**Light**	**States of matter**	**Sound**	**Plants**	**Rocks**	**Animals, including Humans**
Working Scientifically Skills (procedural knowledge)	asking relevant questions and using different types of scientific enquiries to answer them setting up simple practical enquiries, comparative and fair tests making systematic and careful observations and, where appropriate, taking accurate measurements using standard units gathering, recording, classifying and presenting data in a variety of ways to help in answering questions **Introduction of independent, dependent and control variables as explicit teaching topics**	Sc4/1.1 asking relevant questions and using different types of scientific enquiries to answer them Sc4/1.2 setting up simple practical enquiries, comparative and fair tests Sc4/1.3 making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers	Sc4/1.1 asking relevant questions and using different types of scientific enquiries to answer them Sc4/1.2 setting up simple practical enquiries, comparative and fair tests Sc4/1.3 making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers Sc4/1.4 gathering, recording, classifying and presenting data in a variety of ways to help in answering questions Sc4/1.5 recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables Sc4/1.6 reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions Sc4/1.7 using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions	making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers gathering, recording, classifying and presenting data in a variety of ways to help in answering questions recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions identifying differences, similarities or changes related to simple scientific ideas and processes	asking relevant questions and using different types of scientific enquiries to answer them gathering, recording, classifying and presenting data in a variety of ways to help in answering questions recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions identifying differences, similarities or changes related to simple	Sc4/1.1 asking relevant questions and using different types of scientific enquiries to answer them Sc4/1.2 setting up simple practical enquiries, comparative and fair tests Sc4/1.3 making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers Sc4/1.4 gathering, recording, classifying and presenting data in a variety of ways to help in answering questions Sc4/1.5 recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables Sc4/1.6 reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions Sc4/1.7 using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions Sc4/1.8 identifying differences, similarities or changes related to simple scientific ideas and processes

			Sc4/1.8 identifying differences, similarities or changes related to simple scientific ideas and processes Sc4/1.9 using straightforward scientific evidence to answer questions or to support their findings.		scientific ideas and processes using straightforward scientific evidence to answer questions or to support their findings.	Sc4/1.9 using straightforward scientific evidence to answer questions or to support their findings.
Why this? Why now?	Seasonal influence (Summer – Autumn) Comparison between shadows at beg of Sept to Oct & why. Most straightforward to embed high working scientific objectives through active experimentation.	Fundamental to knowledge of sound and other Science in KS2 Water cycle in Greece	Relies on States of matter understanding	Seasonal influence-	Links with Tyne topic & fieldwork. Precursor to Stone Age knowledge.	Longer term for a more complex topic. Builds upon prior learning.
Resources	Mirrors Torches Lasers? Resources to make room as dark as possible (e.g. covering glass etc.)			Plants – see below for examples Dye (for water experiment)	Examples of different types of rock Microscopes Magnifying glasses Tools to break rocks down (safely, including goggles)	Variety of food packaging (for nutritional information) Resources to burn food by teacher safely
Science vocabulary to teach	Light/dark Reflection Transparent Opaque Translucent Shadow Silhouette Light source **Independent and dependent variables & controls** (see L4)	Solid Liquid Gas State Matter Freeze Melt Evaporate Condensation Water cycle Mountain River Stream Sea temperature	Vibration Volume (Amplitude) Pitch Wave Sound source Distance Decibel	Roots Stem/trunk Leaves Flowers Air Light Water Nutrients from soil Space to grow Life cycle Pollination Seed formation Seed dispersal Fertiliser bulb, (tuber) leaf (petiole) root (root hairs) stem petals sepals stamens ovary pollen fruit germination	Physical properties Appearance Sedimentary Soil Formation Fossil Crystals	Nutrition Skeleton Muscles Diet Carbohydrate Fat Protein Fibre

				seedling reproduction		
Application of Core Subjects/Progression						
Enrichments (visits/visitors)					Visiting a quarry or seeing bricks being produced Geography fieldwork	You may wish to visit a farm or zoo – the focus should be on how animals are cared for, ideally with workers there, rather than simply observing animals
Proposed Lesson Progression and Justification	Before teaching this sequence, ensure you are comfortable with the idea of light as energy. Consider the National Curriculum objectives for Year 6 light and how these sequences are building blocks for then. The main misconception will be that light is simply 'there' – this sequence is a good way for children to consolidate the consequentialist nature of Science (i.e. this happens, then this happens). *Energy transfer model* **1.** What is light and where does it come from? This lesson may need to be done across two due to the complexity of it. Pose the challenging questions initially: how do we see? What happens? What is light? What is darkness? Take initial ideas and come back to it. Show children light in a dark room. Observe that light comes *from* the light source and shines on a surface. Build the idea that light is energy and	1. Solids, liquids and gases Begin by exploring what solids, liquids and gases the children can think of. Allow for misconceptions at this stage. You may wish to assess children's pre-knowledge by examining something like a balloon or football and popping/deflating it. You could also explore liquid by dropping food colouring in water (potentially comparing difference between hot and cold). Children should do some basic sorting into gas, liquid and solid but bulk of lesson should be on the particle model. Children should model different particle types first practically (bunched together etc.) and then using blocks. Take time to get children to understand that, as per model: - Particles are in constant motion	Recap states of matter before teaching as the association is essential to understand. 1&2 Understand what sound is Explore how sounds are made with range of instruments. group into those hit, pluck, bang, blow, scrape, etc · Demo: Sand grains on a drum, plucked string on a guitar (folded paper), twanging ruler, balloon / candle held in front of loud high base music from speaker, voice box, tuning fork on ear lobe, non-Newtonian liquid (Corn Flour/water) on a speaker; fingers on throat etc. Observe/feel vibration. · Model using ripples on water/slinky spring. Develop energy transfer model. Link to vibrations / particles. Fair test – what happens to the sound as we increase the length of the wire (homemade guitar) / width of the drum /volume of the bottle / etc? · Fair test – What happens to vibrations (balloon) when we move away from a	There should be some on-going plants work from Autumn. Review what children learn in Years 2 and 1 – they should be comfortable with labelling flowering plants and understanding the very basics of what makes a plant grow. You may also want to recap what makes something living. 1. Name the parts of a plant Children should be able to use increasingly scientific language (see vocabulary list) to name parts of plants. They should be introduced to the idea that there are male and female parts of the plants and this is essential for the reproduction of plants. 2. Recap the conditions plants need to grow and focus on the role of soil nutrition In Years 1 and 2, children grew plants extensively. Soil nutrition, however, was largely left out: after recapping what children	Note the quite basic requirements of the curriculum: children do not *need* to be introduced to igneous, metamorphic and sedimentary but sedimentary rocks are likely to be a focus so it is worth using that term. You may wish to, in later lessons as a UYH, explore more igneous and metamorphic and you should be comfortable with these terms before teaching, but note that it is not necessary until KS3. Children who have played Minecraft (most likely the majority of the class!) will have an excellent foundational knowledge – it is worth clueing up on how Minecraft works as there will inevitably be questions and comparisons made. 2. Begin to identify basic understanding of different types of rock Children should be given a variety of rocks and investigate them. Initially, begin by exploring how the	This topic should deepen understanding around nutrition from both previous DT topics as well as Year 2's Science. There should be considerable focus on experimentation and using wide skills – for instance, calculating the nutritional values of meals (using a calculator!). There are a very wide variety of misconceptions that many adults, never mind children (!), have around nutrition, so a very good understanding of the complexity of the term 'balanced diet' and the changing and varying conclusions around what constitutes 'healthy' is essential. Children should be aware that there is a vast amount of debate and research and that conclusions are not always straightforward within the scientific process – you may wish to, later on in the unit, show children different newspaper headlines which say certain foods are 'bad' or 'good' and the problems with these. 1. Understand what animals eat

	that more light is more energy and vice versa. You may wish to sequence sources of light into brightest/dimmest and reiterate the idea of more or less energy. Alternatively or alongside, you may wish to look into manmade versus natural light. Use the energy transfer model closely through blocks to show how light travels. **2.** Which materials reflect light best? Reiterate energy transfer model by showing a torch through a pin hole and a mirror onto the screen. This will be a good point to re-explore misconceptions from L1. You may wish to discuss why reflection changes as the angle of mirror is changed – be wary of stepping into Year 6 (straight lines), however. Investigate the best mirror you can make. Start with a range of materials and have children consider how it may work – for instance, will tin foil be good to reflect light? What about crumpled tin foil? Have children order materials in terms of reflectiveness. If time, you could turn this into an investigation over two lessons with planned experimentation, but, given the frequent experimentation in this unit, you may not wish to do this.	- They move because they have energy - If a particle is given more energy (heating), it will move faster and less energy (cooling) it will move slower. Children should, by the end of the lesson, be able to draw the particles (understanding that they're miniscule!) and to think of basic examples. 2 and 3: Understand what happens when substances change state This lesson is about measuring and observing the process. For safety, the teacher should demo this. Take ice and heat it – discuss the degrees with which water changes state and link it back to the particles model. When boiling, notice the physical changes (e.g. vibrating, steam) and keep linking back to the particles model. Children should use all appropriate vocabulary. Then, have children consider how to make an experiment using chocolate. 4. Understand evaporation and	sound source? · Fair test – What happens to vibrations (balloon) when we vibrate the air at different speeds (swing nut on a string at different speeds close to the balloon)? · Fair test – vary volume of sound from speaker; measure height of rice bounces. Graph results. 3&4 Understand how sound travels to the ear Demo: Tie guitar string to slinky; sounds can be heard if held to the ear; metal can with spring attached (twang spring and listen/feel vibrations); Make a stethoscope (funnel attached to tubing)/ paper banger/ sound gun/ hydrophone/ model ear · Link to ear drum vibrating due to sound energy. · Make a model with hanging beads from a stick to show how particles can transfer sound energy. · Listen for sounds in the classroom/playground. Identify / record sounds. Suggest 'route' that sound takes to get to ear · Shake 'mystery sound tubes' containing different materials /objects (identify) or 'Where is sound coming from' game. Fair test – How does the length/type of the string (string telephone) effect the volume of sound we hear? Use decibel meter perhaps to create	know about what plants need, introduce children to the idea that there are nutrients in the soil and grow plants with different soil conditions. 3. Understand how water is transported around a plant After recapping the role of roots (consider using the term 'tube' interchangeably so children are confident with the idea of roots as water transport), conduct a test with dyed water, for instance with white-flowered carnations which will show the water being transported to the flowers. Have the children consider how water may be lost in the process. If the children have significant gaps, you could conduct an experiment around differing levels of water for a plant, but this is likely to have been conducted in Years 1 and 2 – only do this if a significant proportion of the class have issues and/or they were not exposed to Year 1 and Year 2 experiments. 4. Understand the role of flowers on plants You may wish to combine this with their increasing knowledge of different plants to see the role of flowers. This lesson will introduce children to the basics of pollination which will be built upon on the next lesson.	earth is made of rock and the idea that as we dig we hit more and more rock. Show a variety of different rocks and have children investigate their properties. They should be given the opportunity to break some rocks down (e.g. sandstone to see how it eventually becomes sand) safely. They should be told that they are acting as geologists and understand the role of geologists. You may wish to conduct a longer investigation of different rocks as a dedicated lesson before explicit teaching with the children coming up with their own qualities to investigate (using many of the skills from investigating materials in KS1). 3. Understand the different uses of rocks Children should gain an understanding of how rock is used by people, including how it is captured and its many, varied uses. They should identify some of the rocks studied in L1 and why particular properties are useful for particular roles. They should gain a stronger understanding of what geologists do, also. 4. Recognise fossils and how they are formed Children must have a solid understanding of the chronology of periods long	This focus should be less on humans, but there should be recognition that we are are animals too. Food chains from Year 2 should be reiterated and potential links to reared animals should be considered. Children must understand the energy transfer model – that energy is transferred along food chains (with much being lost). If you go down this route, you may wish to explore the increased energy loss from eating meat and the links to climate-focused flexitarianism/ vegetarianism/veganism. Children must understand that animals do not produce their own energy – this concept should be easy enough to understand but it is a NC objective. 2. Understand how energy comes in different forms within food Perhaps the best way to demonstrate this is to take calorie-rich food and demonstrate burning times and how this is used by scientists to calculate calorie count. Children will initially assume that higher calorie food = bad – children should be introduced to the terms carbohydrate, fat and protein and understand the very basics of these terms. You may wish to extend some with the difference between 'complex' and 'simple' carbohydrates. Children should be able to associate meat as being higher in protein, sugary substances as being higher in carbohydrates,

	3. Understand the difference between opaque, transparent and translucent. Reiterate light energy concept. HA children should understand by the end of this lesson that opaque surfaces work by **absorbing** light energy. You may also want to begin to explore colour and light with HA – this is going beyond Year 3 so have children hypothesise rather than explicitly teach this. Children should test different materials for their opacity – **consider lux-meter app for iPads**. Children should categorise them into opaque, translucent and transparent. **4.** Understand shadows and how and why their shape changes. This lesson will likely need to be done over two. You could do a Connect Starter of shadow puppets. Begin by producing shadows as a demonstration and whole-class. What do children notice? Children should identify the relationship between the shadow shape and the original shape. They should link it to the idea of blocking light. They should consider what happens if the shadow moves or if the light moves. You may wish to show a sundial. Children should explore these ideas whole-class	condensation in different contexts Children will have seen evaporation and condensation in effect in L2. Conduct an experiment where children predict what happens when a cooled metal/glass sheet is placed over boiling water, collecting water as run-off. Label it and link back to changing states. Children should then move from this to understanding different forms of evaporation and condensation, including sweating, drying clothes, breathing on glass etc. 5. Understand the water cycle Children should understand the concept of evaporation and condensation very well before exploring the water cycle. Explain each process of the water cycle slowly – you may wish to extend this lesson over two to ensure solid understanding.	measured variable. · Fair test – what is the best material for muffling sounds? · Explore – Do we hear sounds differently in air and water? Visit a swimming pool to explore. · Explore – stretch plastic bag over large can and secure with elastic band. Put salt on plastic. Tap small can close to the salt and watch salt bounce. Explore making the salt jump higher. · Fair test – Through which type of solid does sound travel best? (wood, glass, concrete, plastic, paper, etc) 5.Understand volume Link volume to size of vibrations. · Demo: play sounds at different volume. Feel effect on balloon / decibel meter. · Discuss hearing & safety (traffic, alarms, sirens, etc). Loud sounds can be harmful. Why do some animals have big ears? Fair test – What happens when we get further away (walk backwards with a sound/decibel meter) from a sound source (vary volume, base, etc)? Graph results. · Fair test – What happens to the height of rice bouncing on a speaker when we change the volume? Graph · Explore – how do I make my voice louder? Cones, etc	5. Understand the role of pollination Children should build upon the prior lesson and their understanding of plant parts to understand how pollination exactly occurs. Consider as UYH what happens when cross-pollinating plants. You could also examine pollen under a microscope as well as why people get hayfever. You may, if time, wish to explore wind vs insect pollination in this lesson prior to the next lesson, but this lesson should largely focus on where pollen has to get to to pollinate a plant, less so how. 6. Understand how plants spread their seed Build upon the prior lesson and ensure children understand the difference between insect and wind pollination confidently. They should be able to name a variety of plants that do either as well as be able to reasonable estimate given plants how they pollinate based on their appearance. You should also explore the role of fruit, although this will have been partially explored in Year 2.	in the past – ensure this is well-understood at the beginning of the lesson. Contrast periods 50 million years ago to the Bronze Age (next term's History) to other historical periods studied so that they get a sense of scale. You may wish to begin the lesson by examining how long ago the earth was formed. Then, investigate a variety of fossils and understand how they are formed and what they are used for. Children should understand the roles of palaeontologists (see Scientist of the Term). 5. Understand the relationship between soils and rock Children should build upon their understanding of the complexity of soil types from their plants topic. They should understand how soil is formed and how different soils serve different purposes. 6. Fieldwork link	and the various roles of fat and where it can be found. **3&4** What is healthy food? Children should now be able to identify different food groups and places where they may find them. They should now closer consider the nature of given foods. This is a good time to investigate food types and encourage children to read food packets to identify what is healthy food. You may wish to begin the lesson with the aforementioned newspaper examples to encourage cognitive conflict about 'healthiness'. Children should construct various 'healthy' foods whilst acknowledging that all food is possible in moderation and the role of calorie-dense food in particular situations – e.g. Kendal mint cake and mountain climbers, or 'carb loading' by elite athletes. Children should be made aware of the role of 'nutritional scientists' and that they are acting in this role. It may be useful to construct different meals for different purposes so children understand the role of food in different situations for human beings. 5&6 **Understand the purpose of skeletons** Children should explore skeletons both in humans and invertebrates/vertebrates. The order in which this is undertaken is up to the teacher: the human skeleton may link better with the previous lesson or you may

	and potentially write them down *before* considering how to test it. It is important that children are not 'given' the answers or that shadows are explained to them in the whole-class showing, but it is likely that they will come to the correct conclusions. Incorrect hypotheses should be addressed through the experiment (show, don't tell!) The experiment should consider closely what makes a test fair. It should begin with testing a hypothesis to do with shadow shape. **Introduce independent and dependent variables as well as controls** – what are we keeping the same? Why? Why is this important? e.g. Distance between object and light source This will form a crucial assessment point to see if children understand the key curriculum objectives of light. **5.** Understand why strong light can be dangerous Begin by showing what happens when you shine strong lights into eyes (pupil dilation). (Ensure this is done safely and with very weak light!!) Why do we think this happens? Then, explain about the dangers of looking at the sun too much. Discuss UV light and sunscreen – have children link how sunburn is related to the		1. Understand pitch Link pitch to frequency of vibrations · Demo: Ruler on desk; Straw reed instrument with hole (pitch depends upon amount of air, hole shortens column) · Make home-made guitar to vary pitch/volume · Vary the volume of water in a pop bottle to change the pitch when you blow across/ bang it. Make music. Vary pitch of sound from speaker. Note changes in the frequency of vibrations. · Fair test - how does the tension/thickness/length of elastic band (hang weights) effect the pitch of sound?			wish to focus on different animals first and then focus in on humans as an example of vertebrates. They should be able to identify major bones within the human body and spot similarities and differences between humans and other vertebrates. You may wish to explore how movement is different e.g. a worm. You should, within the human lesson, explore the changing nature of the skeleton in human development briefly. **7.**Understand how human beings move Children should recognise the combined role of skeletons and muscles in the movement of human beings and the variety of different joints. This should be linked with healthy eating and exercise and encouraging the children to understand more complex relationships e.g. the importance of core strength which is not always evident.

	dangers of staring at the sun, and then link back to the energy transfer model (light = energy – lots of light = lots of energy = dangerous). You could, if time, potentially make your own sunglasses using different materials, but given the length of this topic, this form of investigation is unlikely and not strictly necessary.					
Possible lesson progression/ activities	Difference between a shadow & silhouette Produce a sundial		Phil Watkins model	Plant food to eat in Summer Observe- Cut carnation in coloured water Plant life cycles Patterns in structure of fruits Compare effect of different factors on plant growth	Rock & soil samples from different stages of the Tyne	Research food groups & design meals (DT link) Support/protection/movement
Ongoing Science Teaching	**Plants** Read Spring 2's Plants, as well as the Year 2 curriculum for Plants. Use a wider range of plants and have children tend to them, working more independently than in Key Stage 1 (accept that some plants may die which is fine – review what goes wrong with the children). Begin to introduce some of the more complex terminology for the parts of plants.		**Plants** Continue working on Plants and pre-teach elements as required for Spring 2. Consider the water dye experiment and whether it is worth doing this over a longer period of time as part of the on-going teaching.			
Scientist of the term	**See addendum draft list**	**See addendum draft list**	**See addendum draft list**	**See addendum draft list**	**See addendum draft list**	**See addendum draft list**

Chestnut class Year 2 of 2	**Autumn Term**		**Spring Term**		**Summer Term**	
Science Topic Title National Curriculum Coverage (substantive knowledge)	**Magnets**	**Forces**	**Living things in their habitats (wider environment)**	**Animals, including humans**	**Electricity** Knowledge	**Electricity** Application
Working Scientifically Skills (procedural knowledge)	asking relevant questions and using different types of scientific enquiries to answer them setting up simple practical enquiries, comparative and fair tests	recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions identifying differences, similarities or changes related to simple	Sc4/1.1 asking relevant questions and using different types of scientific enquiries to answer them Sc4/1.2 setting up simple practical enquiries, comparative and fair tests Sc4/1.3 making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers Sc4/1.4 gathering, recording, classifying and presenting data in a variety of	Sc4/1.1 asking relevant questions and using different types of scientific enquiries to answer them Sc4/1.2 setting up simple practical enquiries, comparative and fair tests Sc4/1.3 making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers Sc4/1.4 gathering, recording, classifying and presenting data in a variety	Sc4/1.1 asking relevant questions and using different types of scientific enquiries to answer them Sc4/1.2 setting up simple practical enquiries, comparative and fair tests Sc4/1.3 making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers Sc4/1.4 gathering, recording, classifying and	Sc4/1.1 asking relevant questions and using different types of scientific enquiries to answer them Sc4/1.2 setting up simple practical enquiries, comparative and fair tests Sc4/1.3 making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers Sc4/1.4 gathering, recording, classifying and presenting data in a variety

		scientific ideas and processes using straightforward scientific evidence to answer questions or to support their findings.	ways to help in answering questions Sc4/1.5 recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables Sc4/1.6 reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions Sc4/1.7 using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions Sc4/1.8 identifying differences, similarities or changes related to simple scientific ideas and processes Sc4/1.9 using straightforward scientific evidence to answer questions or to support their findings.	of ways to help in answering questions Sc4/1.5 recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables Sc4/1.6 reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions Sc4/1.7 using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions Sc4/1.8 identifying differences, similarities or changes related to simple scientific ideas and processes Sc4/1.9 using straightforward scientific evidence to answer questions or to support their findings.	presenting data in a variety of ways to help in answering questions Sc4/1.5 recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables Sc4/1.6 reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions Sc4/1.7 using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions Sc4/1.8 identifying differences, similarities or changes related to simple scientific ideas and processes Sc4/1.9 using straightforward scientific evidence to answer questions or to support their findings.	of ways to help in answering questions Sc4/1.5 recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables Sc4/1.6 reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions Sc4/1.7 using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions Sc4/1.8 identifying differences, similarities or changes related to simple scientific ideas and processes Sc4/1.9 using straightforward scientific evidence to answer questions or to support their findings.
Why this? Why now?	Introduction to forces through concept of magnets	Building upon Magnet learning	Amazon context (wider environment) builds on knowledge of local habitats from Autumn	Links to prev Science topic. Dental hygiene and how this has changed over time.	Dense topic, long term. Use Science labs at HMS (support transition) if possible.	
Resources	Magnets Iron filings	Newton meters Force arrows of different sizes				
Science vocabulary to teach	Magnetic force Attract Repel Material Direct contact At a distance pole	Force Push Pull Direct contact properties	Habitat Vertebrate Fish Amphibian Bird mammals Invertebrate	Food chain Producer Predator Prey Consumer Mouth Tongue Teeth	Appliance Series electrical circuit Cells	

			Snails, slugs, worms, insects Deforestation Classification Classification key	Oesophagus Stomach Small intestine Large intestine Anus Incisor Canine Molar Wisdom Premolar		
Application of Core Subjects/Progression						
Enrichments (visits/visitors)						
Proposed Lesson Progression and Justification	Children should begin to use force arrows as part of this sequence of lessons and into next topic. 1. Begin to understand how magnets behave. Children should begin by experimenting with given magnets in as small groups as possible (ideally pairs). What do they notice? Why? They should be encouraged to begin to use the terms 'attract' and 'repel'. Ideally, children should have different strengths of magnets to see what happens. Children to begin to show how magnets are attracted and repel using arrows. Exploration of poles is not strictly necessary at this point but may be explored here or next lesson. They should begin to use the term 'magnetic force' and understand that a force acts on something. Further exploration of	Examine the Year 5 NC objectives for forces prior to teaching. There will inevitably be a small amount of overlap and the role of gravity is briefly explored. The main concept here is to understand the very, very basics of Newtonian principles i.e. that forces have opposing forces and it is when one force is greater than another that something moves. 1. Understand what a 'force' is In the previous sequence, children will have been increasingly using the term 'magnetic force'. Begin with recapping this and using a force model. Begin to describe magnetic force as 'invisible'. Give children a variety of materials, as they will have had in Year 2 when examining everyday materials, and encourage them to manipulate them, squash them etc. Encourage them to think about what is	Link with geography topic closely 1. Group living things in different ways 2. Use a classification key. 3&4 Identifying living things within different habitats Identify living things with the school grounds. 5&6 (Geography link) Understand the way in which habitats can change.	1. Understand different types of teeth Humans and non-humans 2. Understand how to care for teeth 3. Recognise the role of digestion Link to food groups. 4. Identify the parts of the human digestive system 5&6 Identify a range of food chains	1. Recognise the wide uses of electricity Briefly explore the concept of electricity and what it actually *is*. 2. Create a series circuit 3. Understand how switches work 4. Understand the role of conductors and insulators	[DT links – two longer experiments of creating systems with electrical control for particular purpose. Consider linking to Computing, Microbits etc.]

	forces in the general sense comes next term. 2. Explain how magnets work using appropriate vocabulary. Any misconceptions from L1 should be rapidly addressed here. By the end of this lesson, should be able to illustrate how magnets work, how they have different poles and their connection to one another, and confidently use the force model diagram alongside 'attract' and 'repel'. Children should be introduced some of the very basic concepts of magnets and how this is used, like magnets for compasses. (For children struggling from L1, ensure they are comfortable with poles and attract and repel; compass work and ideas of magnetic fields can be left). 3. Understand which materials are magnetic By this point, children will have simply worked with magnets rather than magnetic materials. They should be encouraged to use a wide range of materials in this lesson. They should note what is magnetic and what is not and do so practically. They may begin to understand the principles of the next lesson that magnets can have different strengths, although this is not a priority for this lesson. 4. Understand that not all magnets are the same	happening. They may draw an association and begin to use the word force – if they don't, prompt so they do. Bring children back together and discuss an object that returns to its original shape after squashing it (e.g. foam ball) – what is happening when it is squashed? What is happening when it returns to its original shape? Children's task(s) should be based around showing the force model (arrows) when manipulating objects and beginning to see that there are opposite reactions. They should begin to also see parallels with the invisible force of magnets and the visible force of squashing an object. Children should finish this lesson feeling increasingly confident identifying between balanced and unbalanced forces. 2. Understand how contact forces work Children should build upon previous lesson and continue to use force arrows to show balanced and unbalanced forces on more objects. You could begin by having two children learn into each other and ask what stops them falling over. You should then begin to explore friction – what stops a toy car from not just going on forever and ever? Begin to examine friction in this lesson. 3. Understand and apply				

	and what their uses are This lesson should be focused on understanding that magnets have different strengths. There should be some exploration of the dangerous of magnets e.g. very high strength ones, or the potential damage that can be caused to computers. Wider exploration of the utility of magnets should also be made here.	the concept of balanced and unbalanced forces Examine friction in the form of experimentation– different surfaces for objects and how this affects objects. Depending on time in the curriculum, you could allow children to build their own experiment from the ground up with less teacher interference and discuss the fairness of experiments across the class (this would need to be over two lessons). Alternatively, you may prompt more towards a fair test. 4. Measure forces using a newton meter This lesson goes slightly beyond Year 3 towards preparation for Year 5 forces but is designed to have children understand that forces, like everything in Science, can be measured. It is introduced to avoid potential misconceptions – specifically, that forces can vary significantly by many orders of magnitude. Children should be re-introduced to balanced and unbalanced forces and measure how varying amounts of forces have different effects using Newton meters. They should be introduced to the idea of significantly different forces (e.g. a Lamborghini Huracan's peak torque is 600nm for a car that weighs 1600kg – compare this to the effect of pulling something very light very hard.) 5. DT Link ? (They could				

		do a one-off combined Science/DT lesson to do with friction?)				
Possible lesson progression/ activities	Phil Watkins models Water Cycle	Phil Watkins model	Group amazon creatures in a variety of ways Use classification keys in wider environment Explore positive and negative effects of humans on the environment (Rising Sun/Deforestation) Visit Sunderland Winter Gardens & Rising Sun Country Park Computer programme for classification	Food chains Digestive system – practical create with tights Teeth	Phil Watkins models	
Ongoing Science Teaching	**Living things in their habitats (local environment)** Use the local environment throughout the year to raise & answer Qs that help them to identify and study plants and animals in their habitat. **Classify what they see.**		**Living things in their habitats (local environment)** Use the local environment throughout the year to raise & answer Qs that help them to identify and study plants and animals in their habitat. **Look at how habitat changes throughout the year.**		***Lessons at HMS*** Liaise with HMS Science Lead and Head of Year 5 for transition lessons in lieu of dedicated on-going science teaching.	
Scientist of the term	**See addendum draft list**	**See addendum draft list**	**See addendum draft list**	**See addendum draft list**	**See addendum draft list**	**See addendum draft list**

Scientists of the Term	Maple Y1 of 2	Maple Y2 of 2	Chestnut Y1 of 2	Chestnut Y2 of 2
Autumn 1	Alfred Nobel, TNT then dedicated his life to peace	Copernicus and the way that science can disrupt the way people think (heliocentrism)	Albert Einstein, including being a Jew and links to the atom bomb	Archimedes *Ancient Greece*
Autumn 2	Alexander Fleming and Louis Pasteur, vaccinations and antibiotics	Charles Mackintosh and John Dunlop *Everyday Materials*	**Stephen Hawking**, including his life with motor neurone disease	Hippocrates, father of modern medicine including Hippocratic Oath *Greece topic continued* Elizabeth Garrett Anderson, first female doctor, suffragette (links to Hippocrates)
Spring 1	**Katherine Johnson**, NASA Mathematician (and other lesser known female mathematicians, such as Annie Easley, Dorothy Vaughan) *Neil Armstrong, History*	**Gladys Mae West**, inventor of GPS *Pole to Pole in Geography*	Marie Curie, work on radioactivity and giving her life to her science *(Forces)*	**Jane Goodall**, conservation work *Living things and their habitat*
Spring 2	Alexander Graham Bell and Elisha Gray: the fight over who invented the telephone (link to chronological change)	George Washington Carver, former slave turned expert botanist *Plants*	Alan Turing and **Tim-Berners Lee**, computer scientists *(In History, class studies Swan, Armstrong and Stephenson)*	Charles Darwin *Animals including humans*
Summer 1	Thomas Edison and his copious inventions	Rosalind Franklin, worked with Watson and Crick to discover DNA but was not credited with Nobel	Mary Anning, palaeontologist, advances made ignored at time due to gender *Rocks*	Ada Lovelace, early computer scientist (and daughter of Byron) *Electricity and coding link*
Summer 2	**Bill Nye**, TV scientist who popularised and still popularises science for many children and adults.	Isaac Newton, sequence of physicists (see next two)	Rachel Carson, marine biologist and conservationist *Animals including humans*	Nikola Tesla *Electricity continued*

Key: Purple box – female
Yellow highlight – BAME
Bold – Very modern scientist (alive today or only recently deceased) to demonstrate that science is an on-going pursuit