THE BIG JURASSIC CLASSROOM

JURASSIC COAST TRUST

why & how? PRIMARY SCIENCE TEACHING TRUST

TEACHER GUIDE

DEVELOPED BY CAROL SAMPEY WITH THE JURASSIC COAST TRUST AND THE PRIMARY SCIENCE TEACHING TRUST

THE BIG JURASSIC CLASSROOM

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CONTENTS

FOREWORD

The Jurassic Coast – a 95 mile stretch from Exmouth in East Devon to Studland in Dorset – offers an extraordinary opportunity to learn about the Earth's history. This world heritage site is a rich source of prehistoric remains and its geology has revealed evidence about the formation of Earth. The PSTT has worked with the Jurassic Coast Trust to develop an ambitious programme of professional development and classroom resources to enable teachers, wherever they are in the U.K., to bring some of the wealth of the Jurassic Coast to their own classrooms.

The PSTT is delighted that this collaboration was recognised by the Royal Geographical Society who presented the Jurassic Coast Trust with their prestigious Geographical Award for "outstanding collaborative work to foster student and wider public engagement with the Jurassic coastline."

We have continued to develop this initiative, culminating in this excellent book. The Big Jurassic Classroom brings together resources and information to show teachers how they can use their local environments to inspire interest in the U.K.'s geological history, and to provide relevant contexts and exciting activities for learning about rocks, fossils and evolution.

Professor Dudley E. Shallcross, CEO

ACKNOWLEDGEMENTS

The Primary Science Teaching Trust would like to thank the Jurassic Coast Trust for their contribution to this book. Particular thanks go to Anjana Ford who led the original resource development project.

BRINGING THE WONDER OF THE JURASSIC COAST TO YOUR CLASSROOM

Teachers in Dorset and East Devon have the benefit of the coastline known as the Jurassic Coast on their doorstep to help them bring the 'Rocks and Fossils' content of the curriculum alive. Not only is the area breathtakingly beautiful, but it is also an area rich in educational resources.

However, if you do not teach in an area close enough to make a class visit possible, you can still make use of this area to inspire children.

The Jurassic Coast Trust (JCT), together with funding and support from the Primary Science Teaching Trust (PSTT), has produced a set of free online resources entitled 'The Big Jurassic Classroom'. These are aimed at enhancing pupil experiences of Earth Sciences by providing ideas to inspire children and teachers not only to look closely at rocks, fossils and landscape, **wherever** they may live, but also to engage with the stories that rocks can tell and to discover 'pebble personality'!

Rocks tell stories

Rocks, and the minerals they contain, are EVERYWHERE around us: not just in buildings, statues, chalk, pencil 'lead', sandpaper and gravestones, but also in less obvious places like plaster in walls, glass and even soap, cosmetics, mobile phones and televisions! However, unlike fossils, which tend to ignite the imagination more easily, the stories in rocks and pebbles can be difficult to imagine as they are less obvious. Stories are a great way for humans to connect with rocks; without a story, the rock may simply seem to be a dull piece of rock. **So, what are the stories hidden within our rocks?** Plain, spotty, dull, shiny, pink, purple... each has a story to tell.

The Earth History Story

The Scottish Geologist, Charles Lyell, observed that 'the present is the key to the past' and hidden within every piece of rock are clues as to its origin. Geologists have carefully pieced these clues together to tell us the history of the Earth. As you travel along the Jurassic Coast, you can explore 185 million years of the Earth's history in its dramatic cliffs and tumbling landslides; it is a geologist's or fossil hunter's dream. It is unique, in that nowhere else in the world can you see so much of the Earth's history in ONE place. Sedimentary rock types from all three periods in the MESOZOIC era (meaning middle life) are displayed. The Mesozoic era is the second of three parts of the Phanerozoic era, first being the Paleozoic era (ancient life) and third being the Cenozoic (new life). The Mesozoic era comprises three periods of geological time:

GEOLOGICAL TIME PERIODS IN THE MESOZOIC ERA		
Triassic Sandstones (the oldest rocks formed 252 – 201 million years ago)	**Jurassic** Limestones and Mudstones (201 – 145 million years old)	**Cretaceous** Chalk (the youngest rocks formed 145 – 66 million years ago)

Figure 1. Images of the coast line showing the different eras, analysis of these allow geologists to determine Earth movements during these eras.

Earth movements during the Cretaceous period tilted the rocks to the East and subsequent erosion has revealed all three periods. However, the rocks found on this coastline are relevant to the Earth history of ALL of the UK. For example, most of England is made up of the same sedimentary rock types, so you may well be able to link your locality to the Jurassic Coast very easily, even if you cannot visit in person. From the clues left behind, we know that the rocks have a captivating story to tell, encompassing changing climates and environments, rising and falling sea levels, and an explosion of life, ranging from tropical plants to marine reptiles and dinosaurs on land. For example, during the Triassic period, Dorset and East Devon were part of an enormous desert that stretched all the way to the Midlands – a bit like the Namibian Desert today.

At the end of the Triassic period/beginning of the Jurassic period, 200 million years ago, the sea flooded England and the desert was transformed into a tropical sea paradise. During the Cretaceous period, the sea level fell and most of Southern England became covered in swamp and tropical forests, and dinosaurs roamed.

It is through the pioneering work of geologists and palaeontologists that the rock and fossil record has been revealed. For example, we now know that dinosaurs were present in Dorset because a trace fossil of a dinosaur's footprint has been found on the Isle of Portland.

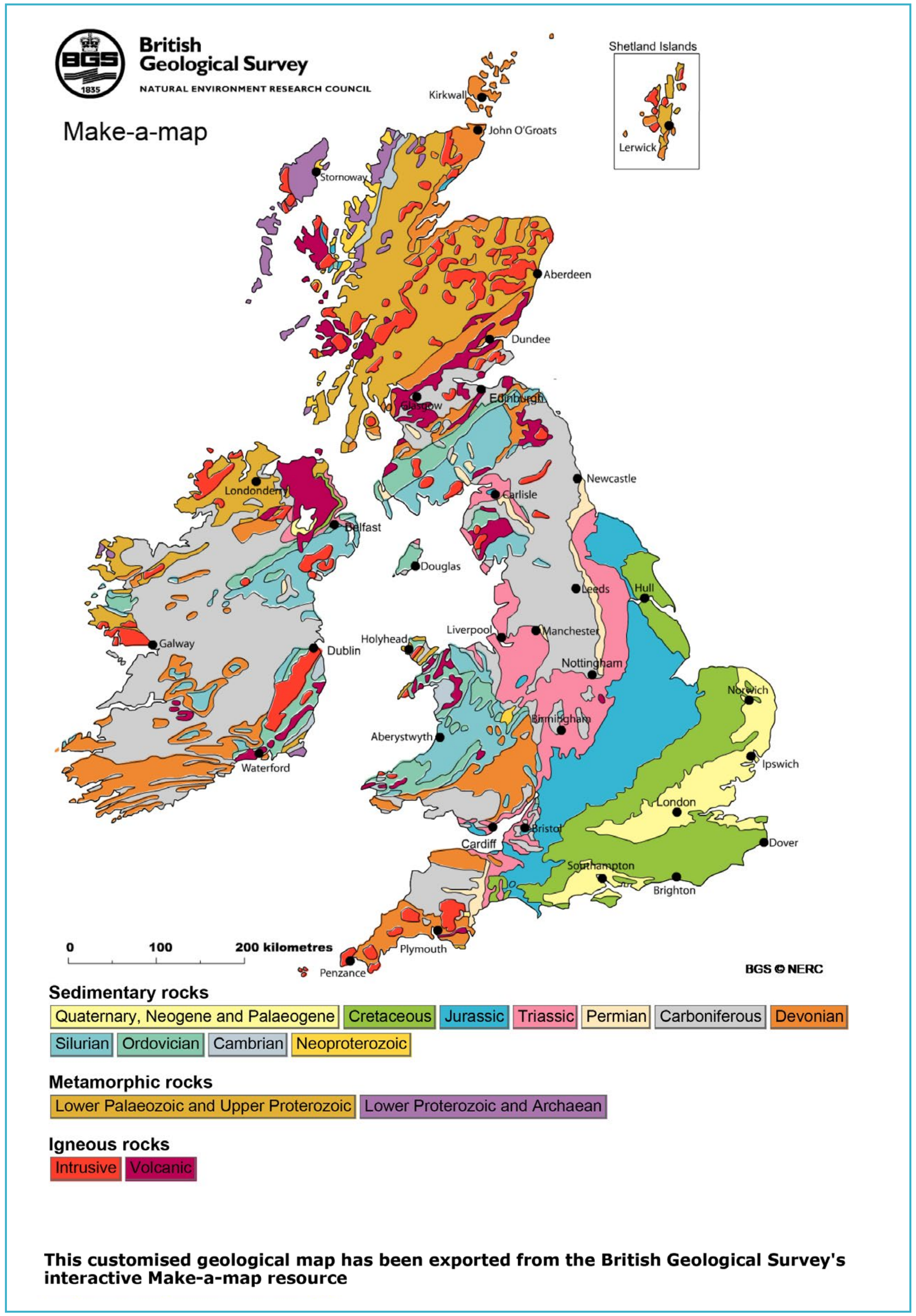

Figure 2. An example of a map that can be generated of the geology of the British Isles, using the British Geological Survey's interactive Make-a-map resource: www.bgs.ac.uk/discoveringGeology/geologyOfBritain/makeamap/map.html.

THE BIG JURASSIC CLASSROOM RESOURCES

pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom

This wide selection of free online resources, covering the full primary age range, uses examples from the Jurassic Coast. These can be readily adapted for use wherever you live. Aimed at the non-specialist teacher, they give the scientific and geological background to the activities, with useful cross-curricular links to literacy, geography, history and art. The activities are designed to be as practical as possible, covering a range of scientific skills. The activities include 'Rock Detectives', containing suggestions of how to 'Make a Sedimentary Cliff' in a glass; 'Making a Model of The Jurassic Coast' using modelling clay, and Chocolate Rocks', in which children use chocolate to explore the rock cycle and demonstrate how the different rock types formed.

If you haven't got access to actual fossils to handle in class, good quality images are free to download, along with suggestions to prompt children to question how the creature lived and to consider similarities with marine life alive today. In the 'Fossil Detectives' section, you will find 'The Story of The Ichthyosaur Who Died'. This is a set of pictures and captions for children to sort, to help explain the process of fossilisation. 'Fossils of the Future' is another engaging activity, in which children are asked to discuss which items will become fossils in the future. Other lesson ideas include a drama based on the work of Mary Anning, and there are many activities related to dinosaurs, such as 'Survival of The Fittest'. There is also a set of prepared 'Dinosaur Top Trump' templates to use as they are, or for children to adapt and follow after carrying out their own research.

These resources support the development of the next generation of geologists and palaeontologists but, just as importantly, they encourage children to look differently at the rocks and landscapes around them. To engage the children, teachers can ask, for example:

- What is the 'Rock Story' behind those rocks found in your local area?
- What is your local building stone?
- Have you any local quarries nearby?

Figure 3. Durdle Door, Lulworth in Dorset

If you are inspired to enrich your teaching of rocks and would like a little more help with this, a useful contact would be your local geological society. Find out more through **www.geologistsassociation.org.uk** or book a visit through the Geological Society STEM ambassadors scheme at **www.geolsoc.org.uk/Education-and-Careers**

And next time YOU pick up a piece of rock, why not take a bit of time to consider its incredible age and the amazing story that it tells?

Carol Sampey
PSTT Area Mentor and Jurassic Coast Champion.

The remainder of this book contains a variety of activities to enrich children's learning about the history of the Earth, rocks and fossils, and evolution. They are designed to be used with any curricula and to be adapted as appropriate for the age of the children.

A printable set of all the resources in this book can be downloaded from: **pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom**

More activities and information about the fossils and their formation can be found at **pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom**

REFERENCES

1. Lyell, Charles. *The Principles of Ecology*, London: 1833.

2. Images taken from the Jurassic Coast Team and Darrell Wakelam from Jurassic Coast Monsters, Coastal Publishing: 2010

STEP BACK IN TIME: THE EARTH'S HISTORY

The Earth is 4.5 billion years old and the Jurassic Coast provides a spectacular record of the changes that have taken place over millions of years, including the creation of rocks and landforms and the evolution of living things. Fossils, many of which have been found at the Jurassic Coast, have been extremely important in charting the origins and evolution of life.

Rocks and life have evolved from the earliest organisms in the sea and from the age of fishes, through to life emerging on land. Geologists have pieced together the story of how the Earth changed by studying the rocks, layer by layer: the younger rocks usually form the top layers and the older rocks are found underneath (unless Earth movements have disturbed the layers). Fossils provide scientific evidence that shows how life changed and adapted across millions of years of time. The 'Time Spiral' (figure 4) represents the geological timescale since the Earth began.

How can the 'Time Spiral' support children's learning?

Understanding the concept of 'Deep Time' can be hard for young children, but the 'Time Spiral' is helpful for visualising the timescale and the relationship between events in the Earth's history.

Things on the Time Spiral' for children to find and discuss:

- The overall length of the 'Time Spiral' and that this represents the geological timescale since the Earth began
- Where there are living things
- The Jurassic Period – when dinosaurs roamed the Earth
- The point at which humans first appeared – this shows the very short time (relatively) that humans have been on Earth. Another way of modelling this to children as a simple timeline is to hold out yourarm: if your shoulder represents the beginning of the Earth, humans do not appear on Earth until the tip of your middle finger nail!

Questions to support discussion

What do you already know about the history of the Earth?

- Have you heard the word 'Jurassic' before? In a film?
- What do you know about dinosaurs?
- what kind of living things do you see on the Time Spiral? Plants? Animals?
- When do lots of plants first appear?
- Are the animals living in the water or on land or both? Does this change with time?

NOTE: The red lines on the 'Time Spiral' mark five huge crises, known as extinction events, when environmental conditions wiped out over 60% of species. Various causes for these extinction events have been put forward, including intense volcanic activity, a fall in sea level and asteroid impacts. In order to flourish, survivors of these extinction events had to adapt to the new conditions and hence life evolved. The idea of these extinction events can cause anxiety in children and it is recommended that, if they are introduced, or the children mention them, they are discussed with sensitivity to this.

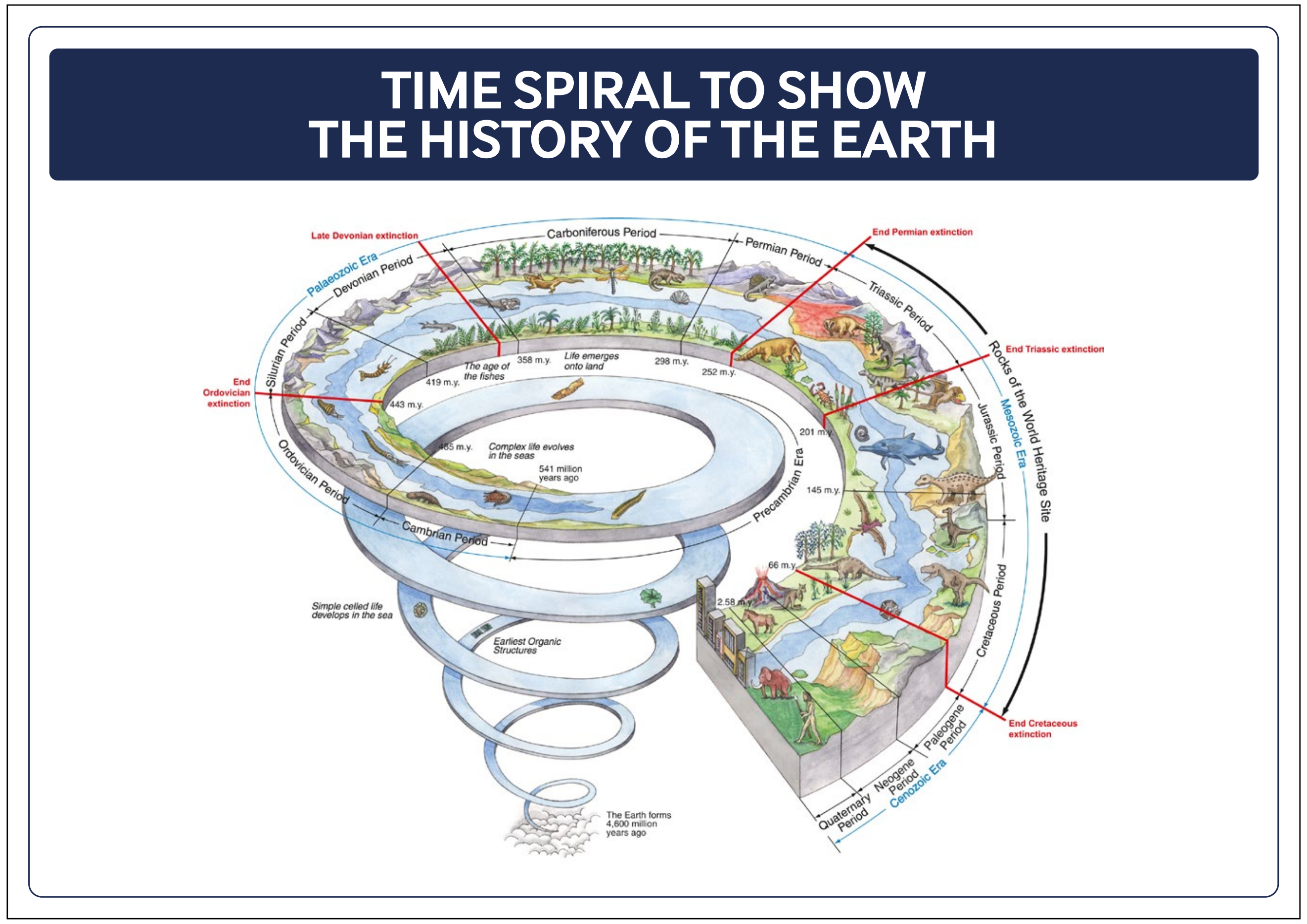

Figure 4. Time spiral

A printable version of this picture can be downloaded from **pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom**

THE MESOZOIC ERA

The Mesozoic era comprises three periods: the Triassic (252 – 201 million years ago), the Jurassic (201 – 145 million years ago) and the Cretaceous (145 – 66 million years ago). With changing sea levels, the environment varied significantly across these periods and this is reflected in the types of living things seen at a particular time.

The three pictures (figures 5a, 5b and 5c) are a representationof what geologists believe that life was like in each of these periods. The pictures can be used to encourage children to look for the variety of life on Earth in each period and to compare one with another.

Things in the pictures for children to find and discuss:

- Living things that they can find – animals and plants
- What the landscape was like in each period, e.g. how much land and water
  - The Triassic period was mostly a desert (a bit like Namibia today)
  - The Jurassic period was mostly a tropical sea – wet, warm and lush (a bit like the Maldives today)
  - The Cretaceous period was mostly a swamp/ tropical forest (a bit like parts of Thailand today)

Questions to support discussion

What do you already know about the history of the Earth?

- What kind of living things can you see in the pictures? Plants? Animals?
- Do any of the plants and animals remind you of any living things that we see today?
- Are the animals living in the water or on land, or both? Does this change with time?
- What similarities can you see in the pictures?
- What differences can you see in the pictures?
- Why do you think that things changed?
- Have you heard the word 'Jurassic' before?
- What do you know about dinosaurs?

A printable set of these pictures can be downloaded from
pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom

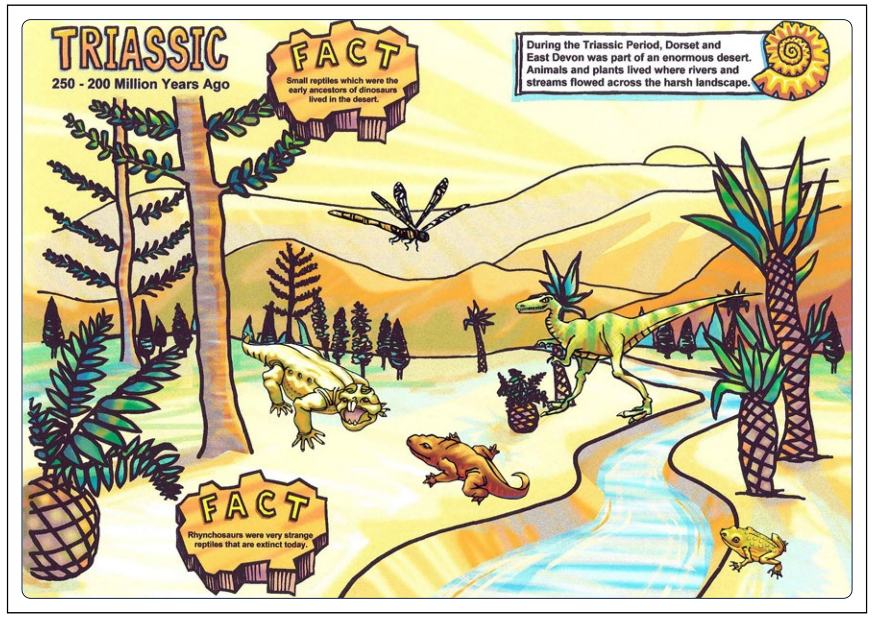

Figure 5a. The Triassic Period

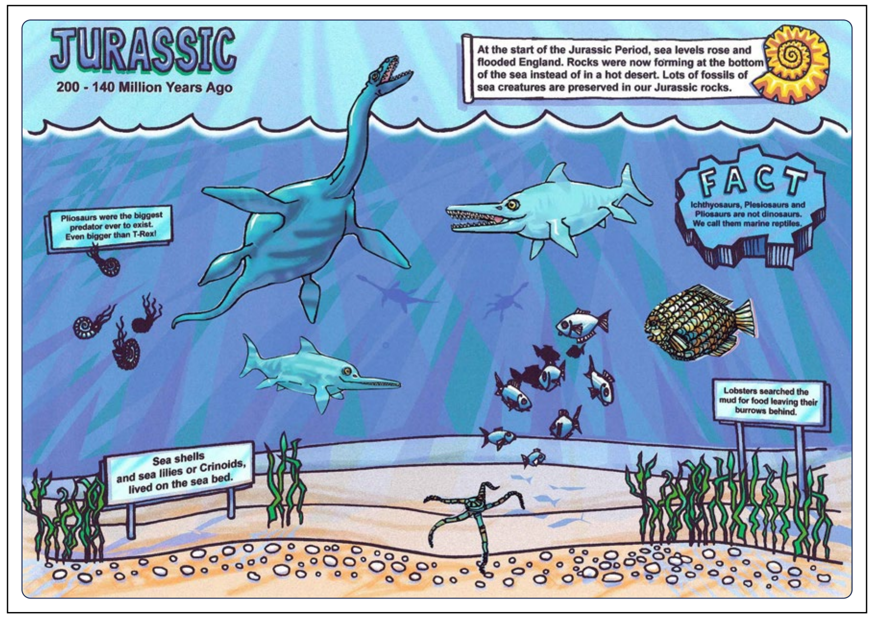

Figure 5b. The Jurassic Period

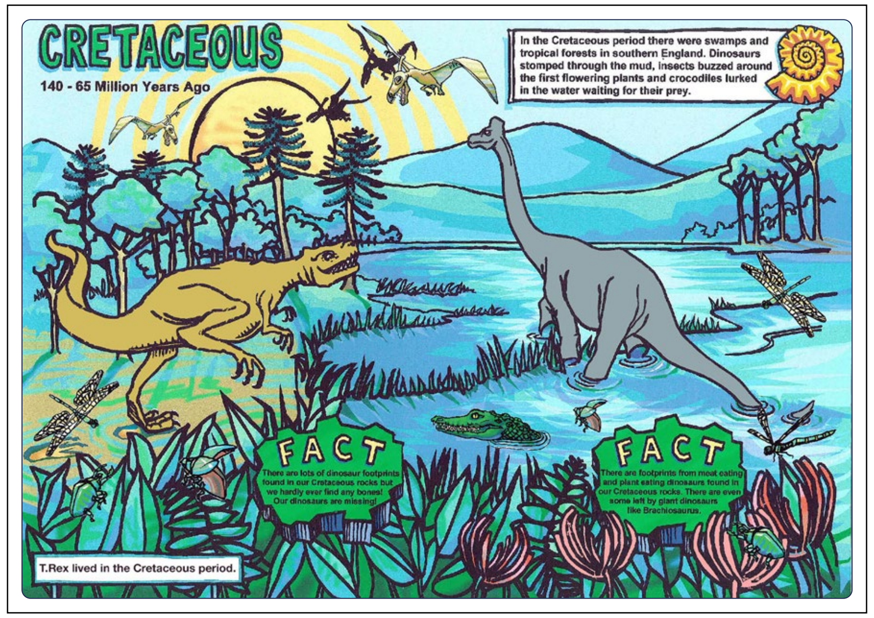

Figure 5c. The Cretaceous Period

PALAEOLANDSCAPES – ARTISTS' IMPRESSIONS OF THE JURASSIC PERIOD

Duria Antiquior (which means 'a more ancient Dorset') is a watercolour painted in 1830 by the geologist Henry De la Beche to represent what Dorset might have looked like in the Jurassic era. He based the picture on knowledge developed from the study of fossils found by Mary Anning. This painting was the first pictorial representation of a scene from deep time based on fossil evidence.

In 2007, the artist Richard Bizley replicated *Duria Antiquior*. His picture is also based on the available scientific evidence, which in 2007 was considerably greater than in 1830. Bizley's painting is therefore a more accurate representation of Dorset in the Jurassic era.

Using the pictures with the children

Display both pictures (figures 6a and 6b) on a whiteboard or give children printed copies. Ask the children to work in discussion groups of three.

Questions to prompt thinking and explaining

- What do you think these pictures show? Where might they be?
- What period in history do you think the pictures represent?
- What similarities do you notice about the pictures?
- What differences do you notice about the pictures?
- Which picture do you think was painted first? Why do you think this?
- Which picture do you think is more scientifically accurate? Why do you think this?
- What do you think scientists had found out when the first picture was painted?
- What new knowledge did scientists have by the time the second picture was painted?

Further questions (which could be used with each picture separately, or with both together)

The animals and plants painted here would have been alive hundreds of millions of years ago. What evidence do you think the artist must have used to be able to draw them?

- Where might the evidence have been found?
- Why might these animals (or their descendants) no longer be seen today?
- What similarities are there to animals that you might see today? Are there any differences?
- How many different animals can you see? Can you sort them into groups?
- What other living things are in the picture?
- Can you create a possible food chain from animals in the picture?
- What do the animals need to stay alive?

Figure 6a. *Duria Antiquior* by Henry de la Beche – painted in 1830

Figure 6b. *Duria Antiquior* by Richard Bizley – painted in 2007 (www.bizleyart.com)

A printable set of these pictures can be downloaded from pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom

ROCK AND FOSSIL DETECTIVES
A POSSIBLE LEARNING JOURNEY

Children will need time to explore, compare and group different kinds of rocks and fossils over a number of lessons to ensure that they develop a secure knowledge and understanding of their physical properties. Table 1 offers a suggestion of how this might be done.

	Learning Focus	
1.	**Exploration time** to build curiosity and interest, and to generate questions. Encourage children to ask When? Why? How? Where? What? Who? questions about different rocks. Use a wide range of magnifying equipment to observe rocks closely and use senses, noting the colour, size of grains and crystals, texture layers and lines, and design tests to investigate rock hardness and permeability. **Focused observation of the features and properties of different rocks** • Feel the rock – crumbly/hard/rough/smooth/slippery/heavy or light (for size) • Look at the rock – colour(s)/layers/lines/sparkles/size of the grains/shiny/dull • Smell the rock	**Testing the rocks for different properties** • Scratch test – can the rock be scratched to leave a mark? What will scratch the different rocks? How do you know if one rock is harder than another? (Harder materials will leave a scratch mark on less hard materials.) • Permeability test – drip water onto the rock surface – what happens to the water? Is it absorbed by the rock? Partially absorbed by the rock? • Acid test – drip vinegar (a weak acid) onto the rock surface. What happens? Does it fizz? A lot or a little? The fizzing is due to bubbles of carbon dioxide gas. Carbon dioxide is a product of the chemical reaction between the acid vinegar and the alkaline calcium carbonate that is contained in chalk/limestone. Limestone will fizz in contact with other acids – you could try lemon or orange juice
2.	**Identifying, sorting and classifying** Use the rock identity cards that the children created from the observations and testing to engage in further activities to support learning about rocks and their properties. The fact cards on pages 20 and 21 can also be used. The children can: • Create Venn diagrams and Carroll diagrams based on the properties of rocks	• Make a set of cards to play top trumps (see also dinosaur top trumps at pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom) • Play 'guess my rock' • Create a sorting tree to identify rocks • Make a 'pet rock' – children select their own rock (adding stick-on googly eyes and a smile if they wish) and create an identity card for it
3.	**How are rocks made?** • Carry out 'The Story of a Pebble' activity on page 19. This introduces the rock cycle and the terms 'sedimentary', 'igneous' and 'metamorphic'	The children can match up their actual rock samples to the references on the diagram. NB This is covered in more detail after the primary phase of education.
4.	**How old are the rocks? Landscape changes over deep time** • Look at the palaeolandscapes activities on page 14	• Make a 'sedimentary cliff' to show the story of changing sea climate and sea levels (see also rock detectives at pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom)
5.	**How are fossils formed?** • Carry out the 'Story of the Ichthyosaur who Died' activity on page 25	• Find out more about Mary Anning and her life as a scientist. See PSTT resource Standing on the Shoulders of Giants at pstt.org.uk/resources/curriculum-materials/sotsog (see also the Mary Anning activity pack at pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom)
6.	**Rocks all around me:** • Go on a rocks trail in the local area to identify where rocks are found in the natural environment and how they are used in the built environment • Carry out the 'What makes the best paving stones?' investigation (see Rocks Reporting TAPS focused assessment task in Year 3 section of pstt.org.uk/resources/curriculum-materials/assessment)	• Carry out the 'Three Little Pigs on The Jurassic Coast' activity (see 'What Makes the Best Building Stone?' at pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom)

Table 1. Learning Focus

EXPLORATION OF ROCKS
IDENTITY CARDS

Children can use the rock identity cards to record their observations and findings from the tests, they carry out on the rocks. The cards have spaces for the children to add their own questions.

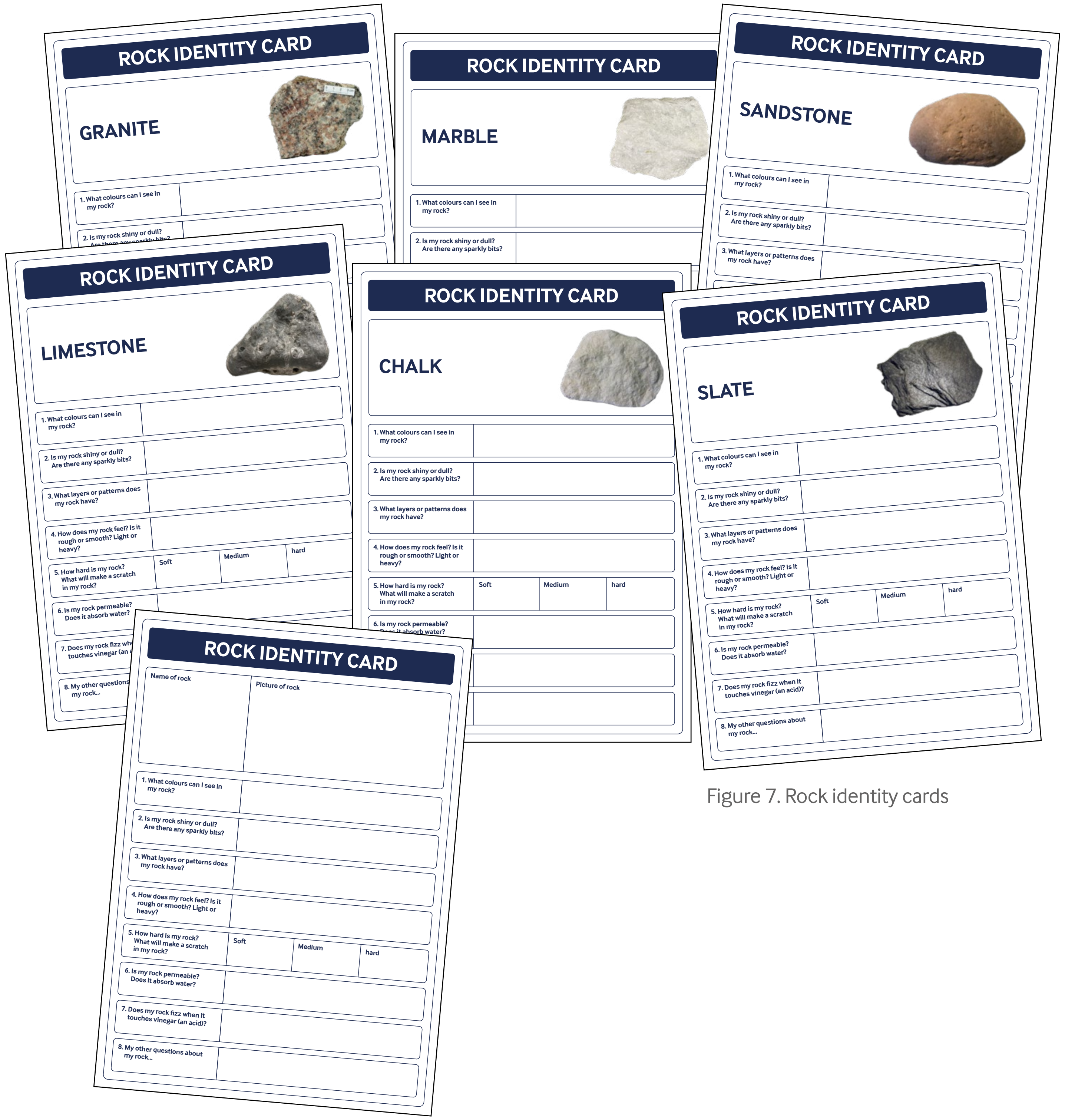

Figure 7. Rock identity cards

A printable set of these cards (including a blank version) can be downloaded from pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom

SORTING AND CLASSIFYING ROCKS

Choose ways to group and classify the rocks based on criteria for appearance and their simple physical properties.

Play the 'Guess My Sorting Criteria' game or 'Guess My Rock?' linking to the 'My Pet Rock,' activity to reinforce properties and vocabulary. Working in small groups, lay out a selection of rocks on the table. Each child chooses a rock, describes it as scientifically as possible and others guess which rock it is.

Use the sorting trees (figures x and y) to identify and classify different rocks. The children can use the version with the pictures included, or the one without. They can also make their own sorting tree to include a wider range of rocks.

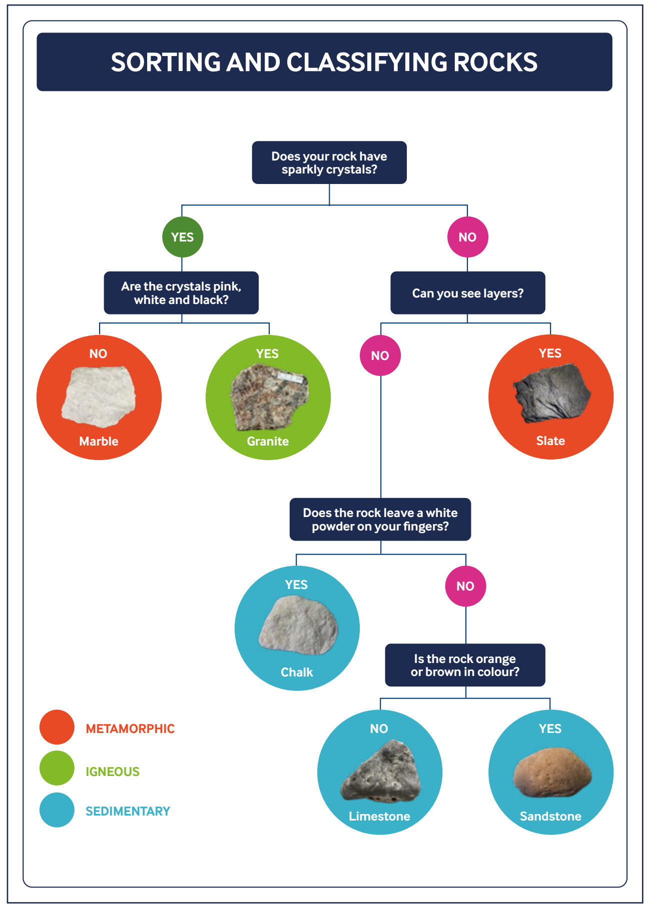

Figure x. Sorting and classifying rocks. Pictures included

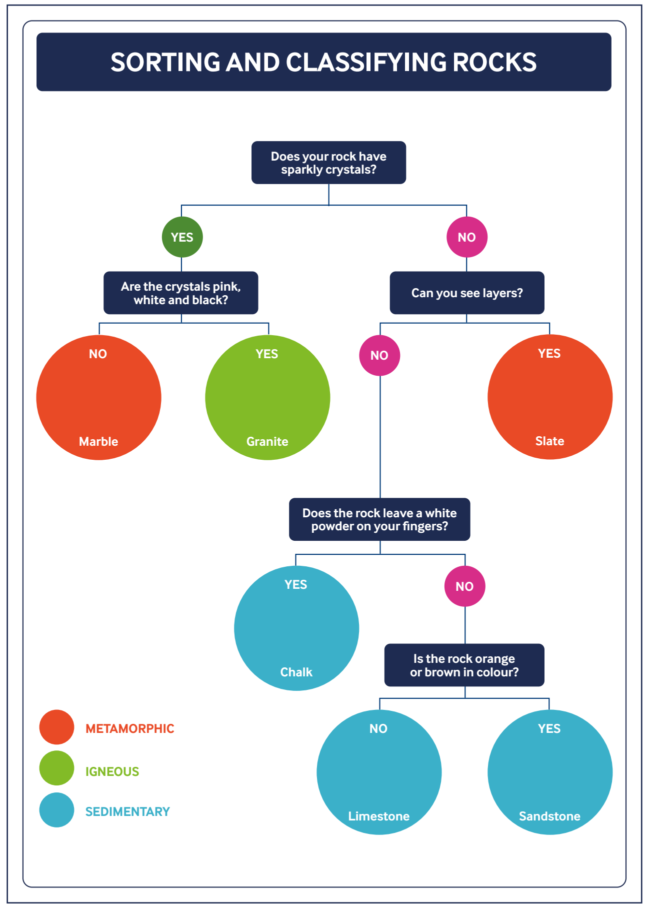

Figure y. Sorting and classifying rocks. Pictures not included

A printable set of these cards can be downloaded from
pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom

THE STORY OF A PEBBLE

THE ROCK CYCLE

Use the 'Rock Cycle' diagram (figure z) to make the link between a pebble on the beach and the cliff face, or its origins high in the mountains. Discuss how weathering and erosion break off parts of the cliff or mountainside and then streams and rivers transport the rocks to the sea, and how, over many, many years, this makes them into the smooth round pebbles that we find on the beach.

Fiction books, e.g. 'The Pebble in My Pocket' by Meredith Hooper, or 'If You Find A Rock' (Christian, 2008), are also useful in helping children to visualise this process.

Encourage the children to write their own story of a pebble using personification and imagining themselves in the role of the rock on its journey to the sea.

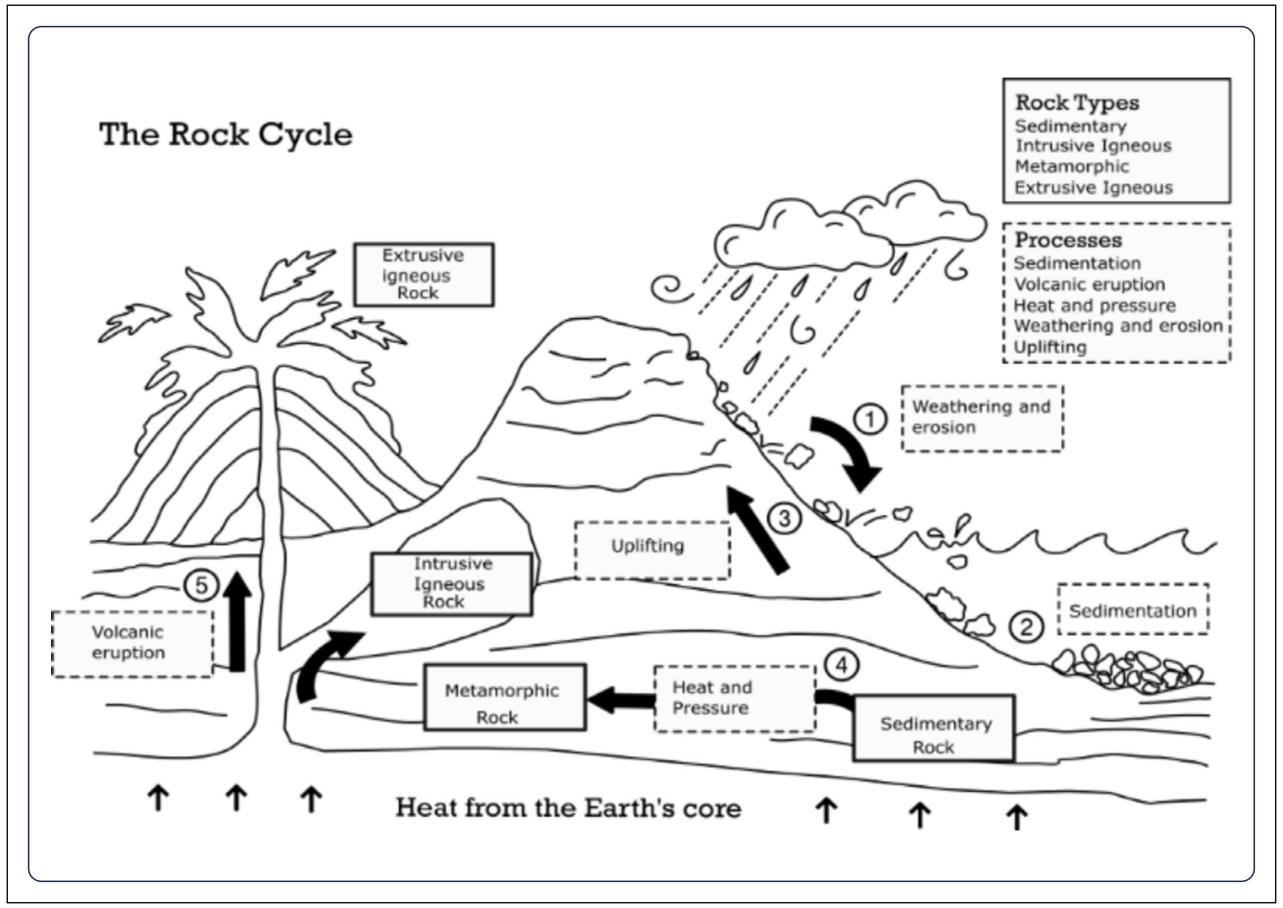

Figure z. Rock Cycle diagram.

A printable version of this diagram can be downloaded from
pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom

FORMATION OF ROCKS
FACT CARDS

The rock fact cards here can be used to support learning in a number of ways:

- Comparing the information on these cards with the children's own observations of rocks. They can record these using the 'rock identity cards' (figure 7) on page 17
- Playing games, e.g. 'Guess My Rock' – working in pairs, one child chooses a card that only they look at, and the other asks Yes/No questions about the features and properties of the rock in order to work out which rock is on the card
- Using as a template for the children to create versions for other rocks that they find interesting or unusual. A collection of a good number of cards could be made into a 'Rock Top Trumps' game
- Developing understanding of the formation of the rocks themselves. The cutaway landscape pictures at the bottom of the cards show where the rocks actually formed, which can help to make sense of the different properties of sedimentary, igneous and metamorphic rocks

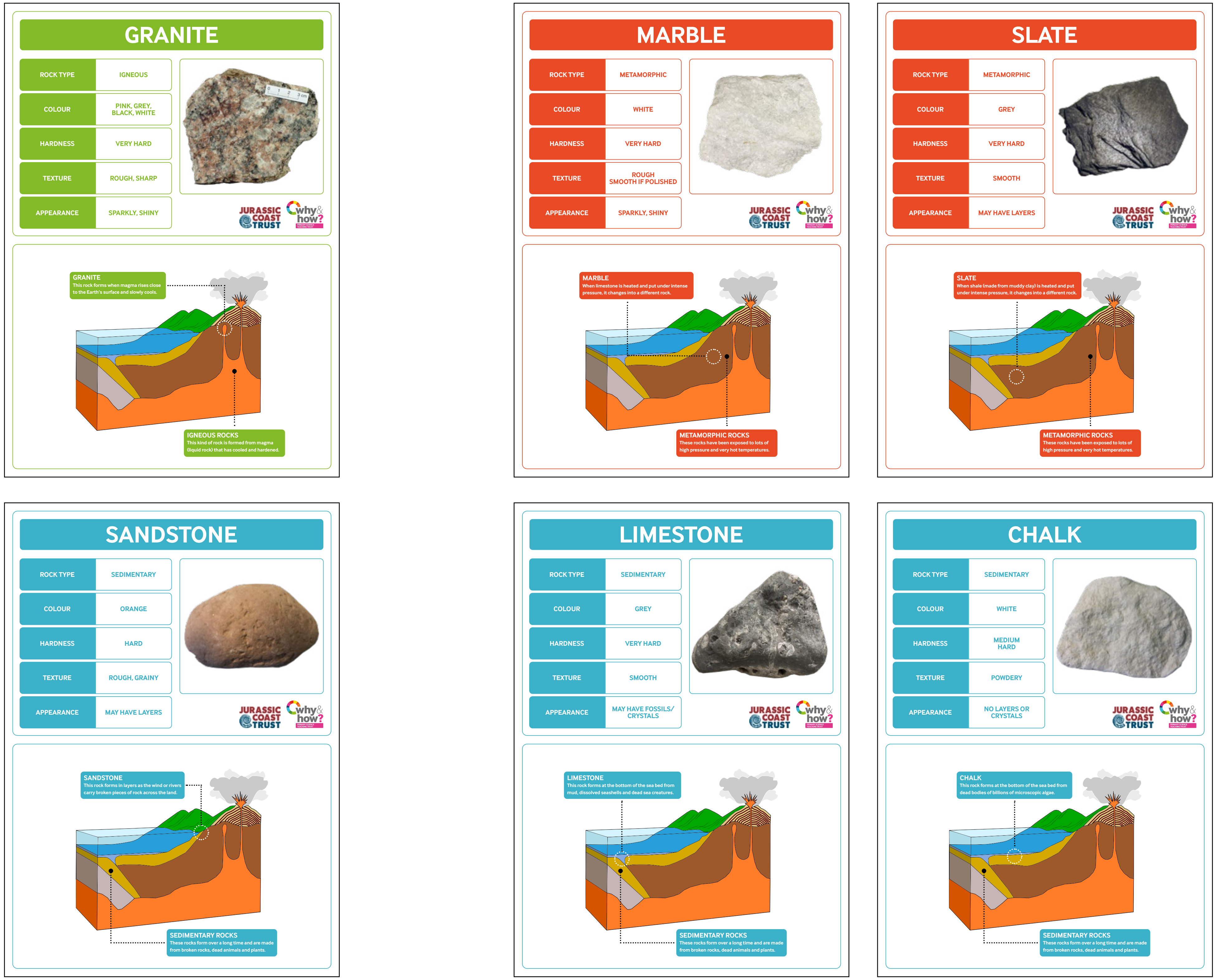

Figure 8. Rock fact cards

More information and activities about the formation of rocks can be found at **pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom**

A printable set of these cards can be downloaded from pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom

FASCINATING FACTS ABOUT FOSSILS

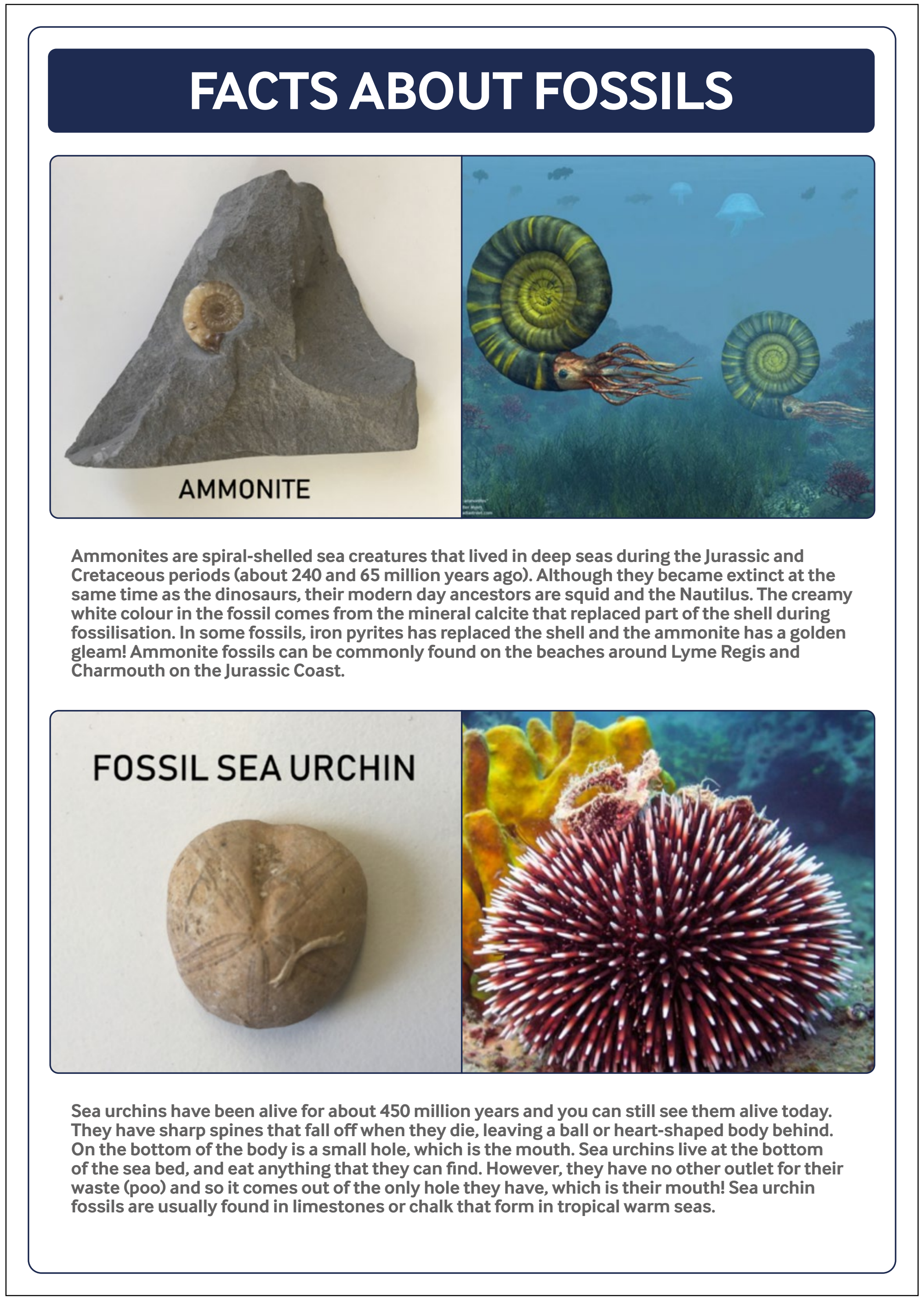

Figure 9a. Facts about fossils

Figure 9b. Facts about fossils

More information and activities about the fossils and their formation can be found at **pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom**

A printable set of these cards can be downloaded from pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom

FOSSIL THINKING FRAME

The fossil thinking frame can help children to focus on observing a particular fossil and to think about what they would like to find out about it. Putting their chosen fossil in the central box encourages the children to study the fossil in detail (using a hand lens is helpful) and to take time to think of questions. Their questions can be recorded in the thought bubbles around the fossil and used as the basis for some independent research.

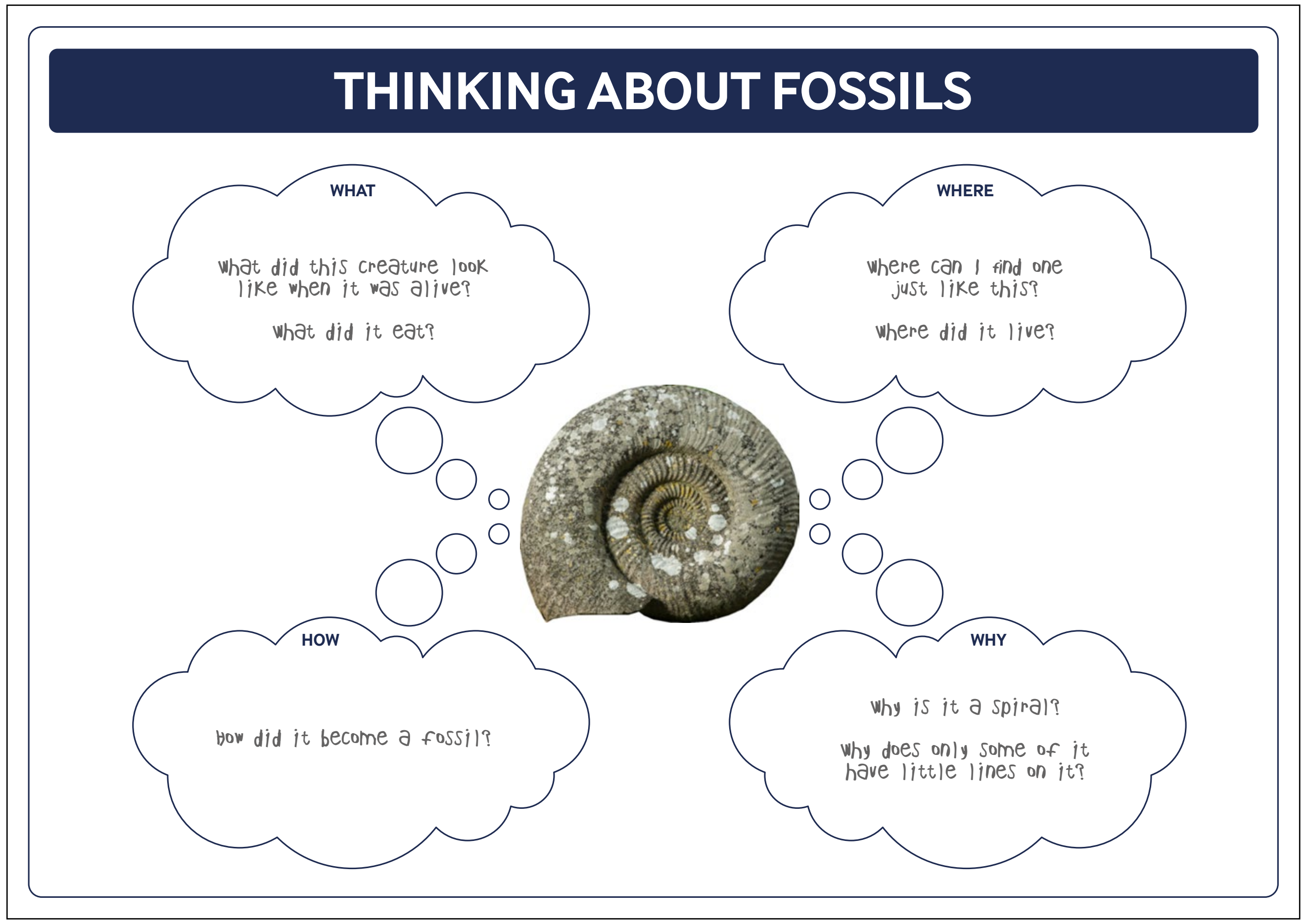

Figure 10a. An example of how a child might use the frame to think of questions about an ammonite

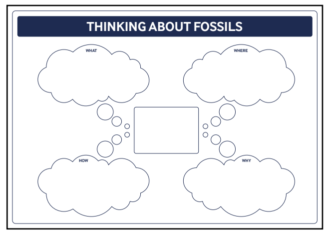

Figure 10b. Blank template

A printable version of a blank frame can be downloaded from
pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom

THE STORY OF THE ICHTHYOSAUR WHO DIED

This activity helps to develop understanding about how a fossil forms. The ichthyosaur was a large marine reptile that looked a little bit like a dolphin today. The first ichthyosaur fossil was found in 1811 by Mary Anning, who was twelve years old at the time. She found the remains of its skull and vertebrae on the Dorset coast.

The activity (figure 11a) challenges the children to put the cards in an order that shows what they think is happening. Ask them to imagine what the ichthyosaur might have been saying or thinking and to match the speech bubbles to the picture cards. The children can either cut out the speech and thought bubbles, or they can be printed on acetate and overlaid onto the pictures.

Ask them how much time they think passed between when the ichthyosaur died and when it appeared as a fossil on the beach. Answer: about 180 million years.

An extension to this activity might be a creative story writing exercise or to create a short play using the cartoons as a storyboard.

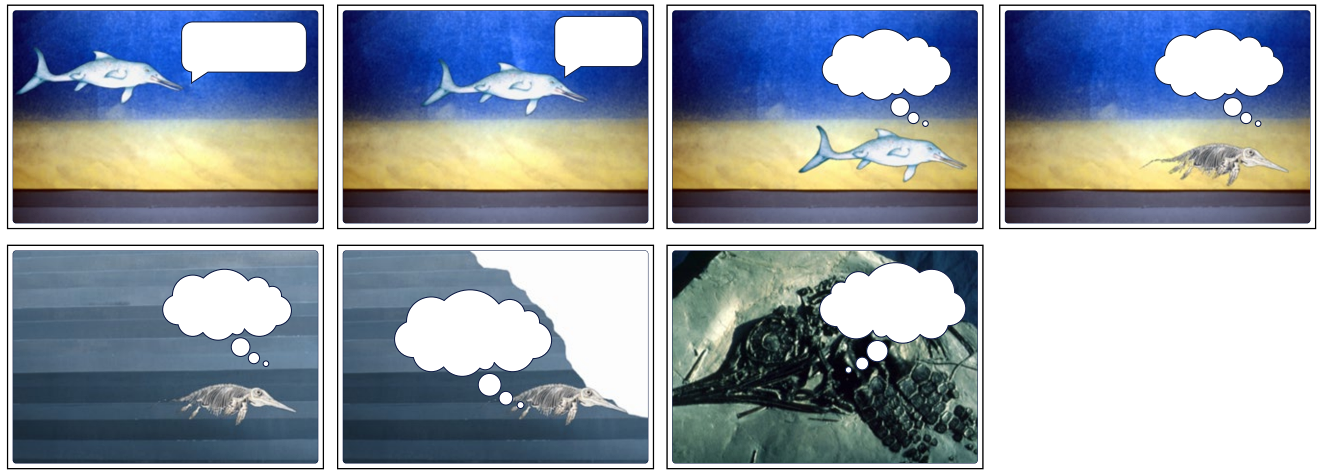

Figure 11a.

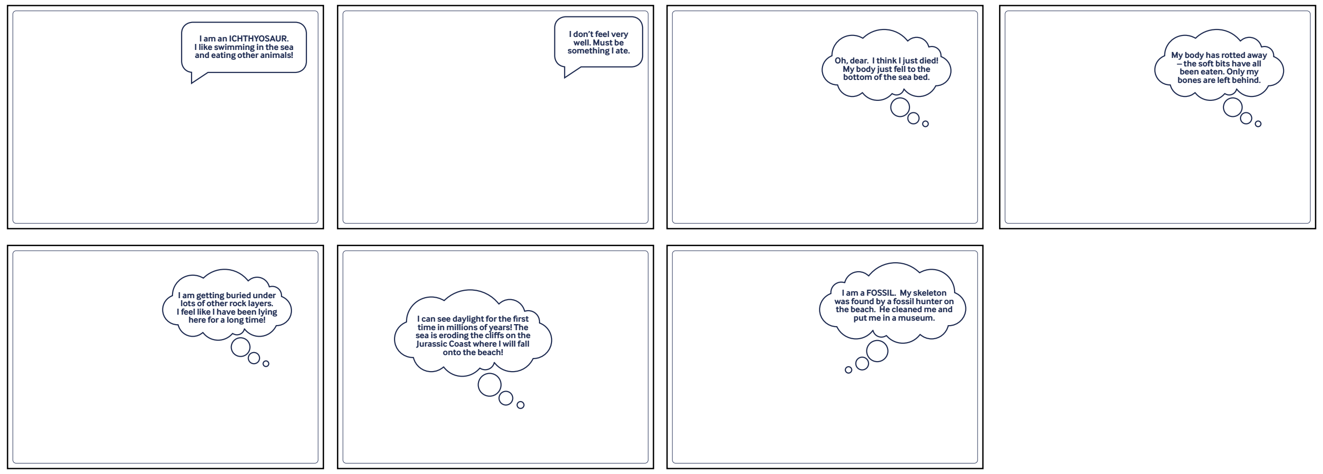

Figure 11b.

A printable set of these cards can be downloaded from
pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom

ROCKS CAN TELL A STORY:
THE PORTLAND ROCK STORY

Geologists are people who study the Earth and its processes. They are able to tell incredibly detailed stories about rocks by just looking at their properties and the fossils found within them.

Sedimentary rocks form in layers; each layer can tell a story of the changing climates and environmental conditions in the past. Geologists 'read' these layers of rock like pages in a book. On the south coast of the UK, this starts in the west on the East Devon coast with the oldest Triassic sediments, and finishes with the youngest sediments, the Cretaceous, in the east on the Purbeck coast in Dorset.

Through the type of rocks present and the fossils seen within them, Portland on the Jurassic Coast depicts a fascinating story of a changing environment. The Portland rock story activity gets children to be geologists as they work out the geological history of the sedimentary rocks at Portland.

Interesting points to discuss with the children:

- The rocks chart a fall in sea level as they get younger. The clay forms in deep water, the sandstone forms in shallower water, the roach forms on a beach rich in shells, and the dinosaur footprints are left behind in forest muds. Sea levels have been changing for hundreds of millions of years on Earth. What do the children know about sea levels today?
- The creatures that lived in the deep sea and in the forests in these past environments are now all extinct. Dinosaurs, ichthyosaurs, ammonites and belemnites all died out, although they have modern day relatives alive today such as squid and birds

The children need the following:

- A copy of the 'Portland rock story' grid
- Images and text to cut up and stick into the grid
- Scissors and glue

Using the picture clues in the grid, the children work out which fossils would be found in each sedimentary layer, where the layer formed, and what the rock and the creatures looked like.

Printable versions of the grid and the images and text can be downloaded from pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom

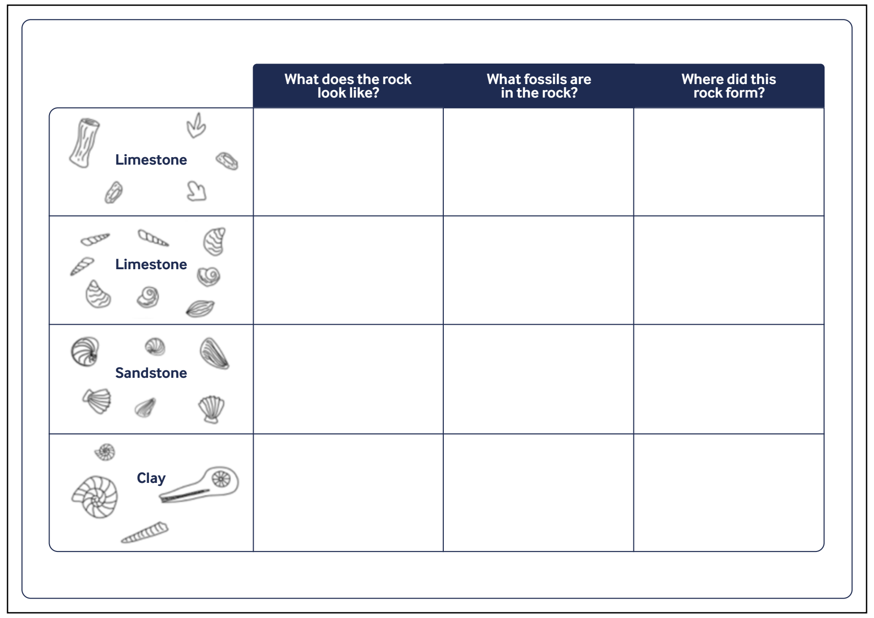

Figure 12a. 'Portland rock story' grid

Figure 12b. Images and text to cut up and stick into the grid

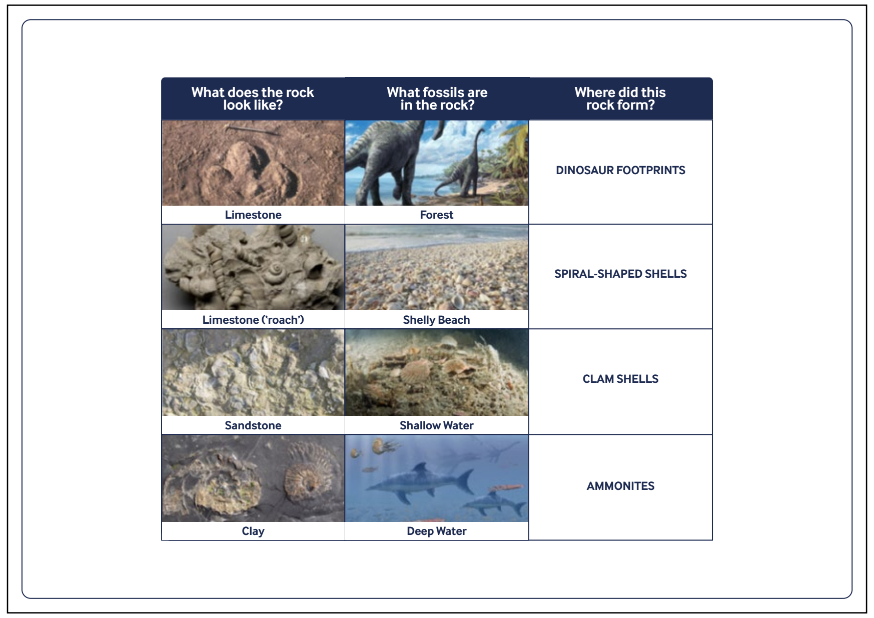

Figure 12c. The answers!

THE STORY OF ROCKS WHERE YOU ARE

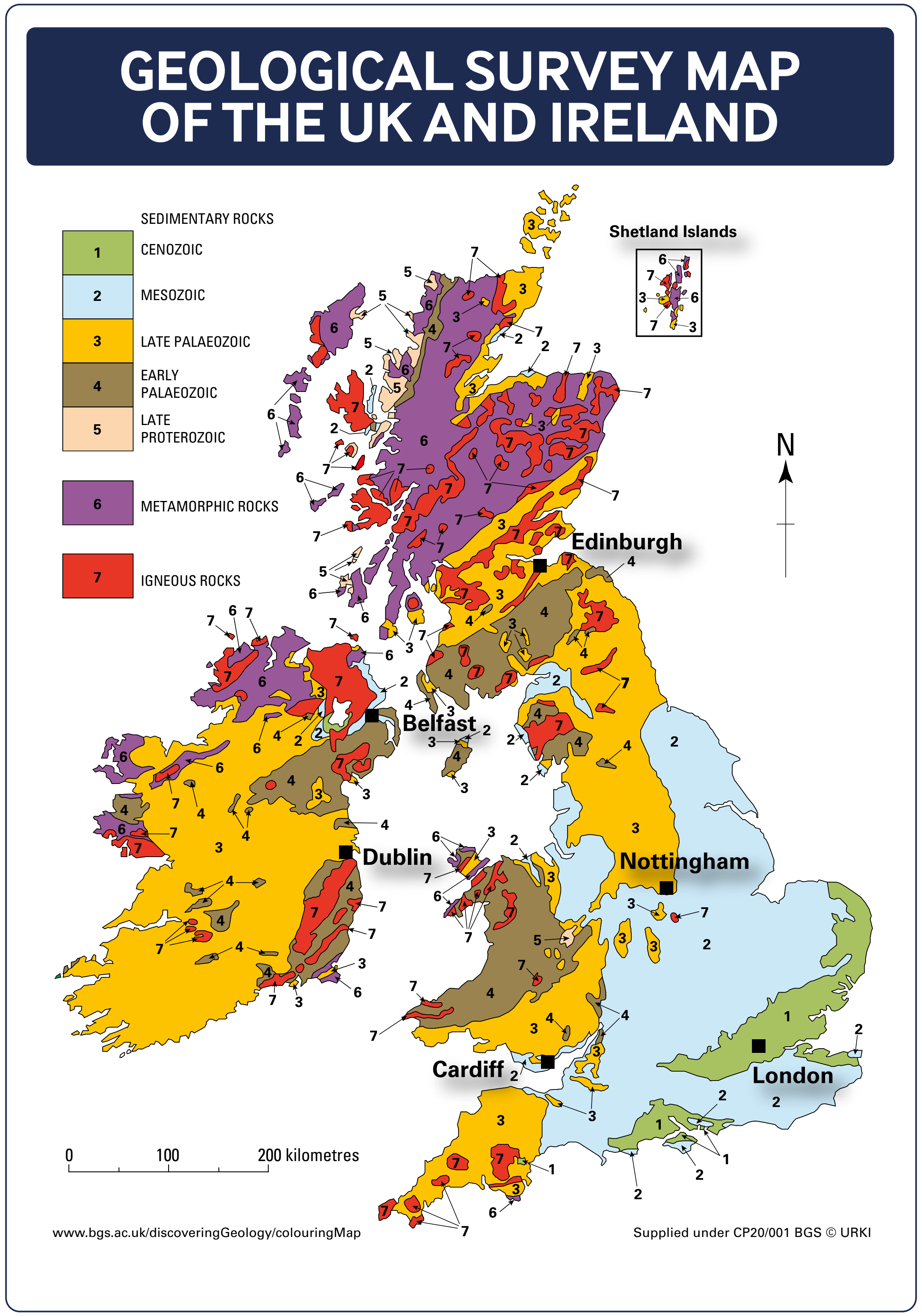

Figure 13. Geological survey map of the UK and Ireland

ROCKS IN YOUR AREA

Geological Society: Regional summaries can be found at
www.bgs.ac.uk/research/ukgeology/regionalgeology/home.html

Region	Rock Summary
South West	**Very rich in different rocks** Devonian Red Sandstone – buildings in Exeter Slates/shales – Dalebole Slate Quarry Volcanic (granite on Dartmoor) and metamorphic rocks Copper and tin mines/quarries
Bristol and Gloucester Region, incl. Somerset and Bath	**One of the most geologically varied parts of the country, with almost every geological time period represented** Limestone – Cheddar Gorge/Avon Gorge Mines – lead, zinc, coal, limestone Geo-thermal springs – Bath Cotswold Limestone (Oolitic) – honey-coloured buildings
Hampshire Basin, incl. Isle of Wight, Wiltshire, Dorset and West Sussex	**This low-lying region forms the western part of a deep basin filled with sediments laid down in ancient seas (muddy, lagoon environment)** • Well known for chalk – Isle of Wight/Salisbury Plain/Marlborough Downs • Many deep boreholes in chalk – aquifers providing drinking water • Beneath chalk are sedimentary rocks deposited between 145 and 100 million years ago in shallow sea and lagoon environments (Lower Cretaceous sediments). The layers include limestones, mudstones – Vale of Pewsey, Devizes, Warminster • Next layer comprising thick mudstones containing thin limestones and sandstones overlain by shelly and sandy limestones – west of Yeovil, Wincanton, Frome and Trowbridge to Chippenham • Dorset – Jurassic Coast story • Around Solent area – many clays, silts, peats, sands and gravels on surface – laid down 2-3 million years ago in Ice Age and Interglacial periods • Boreholes in mudstones – potential source of gas and oil
Wealden District (Kent, East Sussex, Surrey)	**Mainly formed of rocks laid down in warm, clear seas that covered the area. Relatively flat landscape – typical of areas underlain by sandstones, clays and limestones** • Famous chalk on East. Sussex coast and Dover flint buildings • Mineral wealth: Coal – Kent + Some oil and gas exploration • Gypsum in East Sussex – used to make fertiliser and plaster
London and Thames Valley, incl. Hertfordshire and Bedfordshire and into Oxfordshire)	**Sedimentary rocks of Jurassic origin laid down in seas** • Relatively flat landscape – typical of areas underlain by these sandstones, clays, mudstones and limestones/ chalk • Chalk downlands and Chiltern Hills • Chalk – porous – good source of groundwater • London Basin: mainly clay, gravels, sands. Soft and easily eroded. Most extensively found along the River Thames and its tributaries – commonly dug for sand and gravel

Figure 14. Rocks in your area

A printable version of this table can be downloaded from
pstt.org.uk/resources/curriculum-materials/big-jurassic-classroom

ROCKS IN YOUR AREA

Region	Rock Summary
East Anglia and adjoining areas	**Flat, rolling landscape** • Soft rocks, easily eroded • Sands, clays and peat (Fenlands and The Broads) laid down by former ice sheets in rivers, swamps and marshes and along margins of North Sea • Central East. Anglia formed of boulder clays and sands – full of fossils
Central England	**Varied scenery** • Many industrial areas based on underlying rocks – The Black Country • Coal Measures (Carboniferous period) – South Staffs coalfield – Iron ore • Jurassic sedimentary rocks: shales/sandstones/mudstones • Triassic Red Sandstones: formed 240 – 200 million years ago in a low-lying desert and, at times, the sea encroached into this area – periodic evaporation of the sea water led to the precipitation of layers of rock salt up to 50 m thick – extensively mined in Cheshire
Welsh Borderlands	**Sedimentary sandstones rich in pebbles – deposited in an ancient desert approximately 280 million years ago** • Coal Measures, around Telford, formed when vast quantities of sand and mud gradually built up to form large river deltas. When the tops of these deltas were exposed, massive swampy forests grew up and the vegetation from these forests was later buried and compressed to produce layers of coal Also much older rocks: • Much Wenlock Limestone – about 425 million years old • Long Mynd rocks – 450 million years old and include mudstones, sandstones, limestones and volcanic tuffs – a rock formed from the compaction of erupted volcanic ash – very hard, and the reason that Long Mynd forms such a prominent upland area
Wales, incl. island of Anglesey.	**Diverse landscape** • Newer rocks: gravelly clays and sand and gravel laid down during the last Ice Age; sand, silt and gravel deposited by rivers along valley floors over the last 10,000 years; and peat bogs in upland areas • Jurassic sedimentary rocks in South Wales, including Coal Measures Below are much older rocks: • Quite hard rocks, which were deposited up to 415 million years ago • Strongly folded and faulted grey mudstones, siltstones and old red sandstones, volcanic rocks or formed from the solidification of molten rock deep below the surface (igneous intrusive rocks) and metamorphic rocks in parts of Anglesey • North West Wales and mountains of Snowdonia – deeply eroded by glaciers
Eastern England (Tees to the Wash)	**Low-lying plains, steep ridges and upland areas** • Low-lying ground – laid down by former ice sheets, lakes, rivers and along the coast (in last 2-3 million years) • Sedimentary rocks – mudstones, sandstones, limestones and ironstones – lots of fossils found on coast • Famous for Whitby Jet • North Yorkshire Moors – Jurassic – shallow sea • Lincolnshire and Humberside – Cretaceous rocks – chalk formed in shallow seas

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Region	Rock Summary
Pennines and adjacent areas	**Great ice sheets have sculpted the scenery** • Pennines – carboniferous limestone + seams of coal – formed in swampy rain forest (305 – 360 million years old) • Derbyshire Peak District – Millstone Grit (lead, zinc and copper mineral deposits were mined) and hard carboniferous limestone • Yorkshire Dales – famous for its limestone scenery. Limestone mined – used for cement and aggregates • Cheshire – rock salt deposits (Northwich)
Northern England and Scottish Borders, incl. Lake District and Northumberland National Parks	**Outstanding scenery** • Very high mountains, including. Scafell (England's highest mountain)/Helvellyn/ Langdale Pikes • Volcanic rocks formed from very hard lavas and ashes – 500 – 450 million years old • Youngest rocks in area – red sandstones and mudstones, (250 million years old) form undulating lowlands to the west of the Lake District and south of Whitehaven • Northern Pennines and Northumberland – Durham coal field: Coal Measures and carboniferous limestone , deposited in warm, clear seas
Scotland	Scotland's complex story goes back to the early history of the Earth, with its oldest rocks formed 3 billion years ago. Series of plate tectonic movements and volcanic eruptions have resulted in huge geological diversity reflected in Scotland's scenery. Climate changed from tropical to glacial and everything in between! • Western Isles – metamorphic (gneiss) buried under sandstones and limestones • Cairngorms – Highland metamorphic rocks and granite • Central Lowlands – granite hill ranges (e.g. Dumbarton Rock, Arthur's Seat) – result of volcanic activity during Carboniferous period and surrounded by Lowlands – sedimentary rocks and Coal Measures • Southern Scotland – more 'rounded' scenery – sedimentary rocks formed in deep sea – contain fossil remains of ancient sea creatures that lived in the ocean over 400 million years ago
Northern Ireland	**Varied landscape – much of it glacial and volcanic** • Glacial sediments, made of mixtures of clay, silt, sand and gravel that were laid down by the repeated growth and decay of former ice sheets during the last 2-3 million years • Antrim, Down and Armagh drumlins – glacial deposits shaped into ridges and swarms of whale-back hills • Northern Ireland area affected by geological movement and uplift. Sperrin Mountains are oldest rocks: 650 – 570 million years old (metamorphic schists) • Mourne Mountains – granite • The Antrim Plateau – unique geological area of the UK. It contains an almost continuous sequence of flat-lying layers, from 420 – 30 million years old. On the coast, north of the Antrim Plateau, stretches another area of great geological significance known as the Giant's Causeway. This consists of 6km of around 40,000 basalt columns that form stepping stones from the cliff foot into the sea

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