

Resources for ages 7-11

From early 2018 to late 2020 the Natural History Museum's iconic *Diplodocus* cast, Dippy, is on a Natural History Adventure across the UK. We hope that Dippy will inspire you to go on your own adventure, exploring the incredible natural history collections and amazing biodiversity right on your doorstep!

These materials are a collection of lesson outlines and learning resources designed to accompany *Dippy on Tour: A Natural History Adventure*.

The adventure has eight episodes, one for each of Dippy's tour locations. Each episode is linked to that region's star specimen – a key natural history specimen on display – and provides learning opportunities in Natural History, Science, English and more.

Produced in collaboration with KIT Theatre.

www.KITtheatre.org

Dippy on Tour

A Natural History Adventure



In partnership with



Garfield Weston
FOUNDATION



Debbie Powell for NHM

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Episode 1: Jurassic forest (Dorset)

Natural History Adventurers' mission

Use imagination and creative skills to recreate lost worlds.

Episode journey

Children discover the living things that existed in a Jurassic forest and create a Jurassic forest in their classroom. They film a first-person perspective journey through their forest using a tablet or camera, and make and record Jurassic forest sounds to accompany it.

Curriculum learning outcomes

- children will learn the names of more than two living things in their local and wider environment (**Science / The world around us**)
- children will be able to identify and describe the functions of different parts of flowering plants (**Science**)
- children will understand the life cycle of flowering plants (**Science**)
- children will be able to describe the life processes of reproduction in some plants (**Science**)
- children will apply multiplication (**Mathematics**)

The postcard introduces the children to the Jurassic Coast and the fossils found along it, including the dinosaur footprints on the front of the card. It introduces the fossil Jurassic forest discovered in the cliffs of Dorset – a snapshot in stone of the sort of world where the *Diplodocus* Dippy was cast from would have lived.

The children's challenge is to create a Jurassic forest in their classroom. They will explore the animals and, in particular, the plants that lived there. If feasible they will find ferns, conifer twigs and pine cones from a nearby woodland or parkland, to make their own Jurassic forest. The enclosed resources and lesson ideas give further tips on how to transform the classroom, and challenge the children to explore the similarities and differences between ferns and the flowering plants of today.

Possible additional activities

- Children write stories set in the Jurassic forest that they have created.
- Children invite younger years to visit their Jurassic Forest with the lights off, complete with sounds and maybe even children disguised as dinosaurs.
- Children investigate fiction books for younger children with dinosaurs in them. How realistic do they think the dinosaurs are? What do we know about how dinosaurs might have looked? What evidence can we base our ideas on?

Activities

Not all activities will be relevant for all classes. The activities were developed to be broken up and used over a period of time and as is suitable for your particular class.

- Read the **introductory postcard** and discuss it with the class, using the **glossary** as required. Share the **lesson script 1** with the children. Discuss the map showing how the world looked in the Jurassic Period. What are the similarities and differences between how the British Isles looked in the Jurassic Period and today? How was the climate different? Use the picture of the Jurassic forest (**image 1**) to answer the following questions. What creatures lived in the UK at the time? What plants grew there? What plants did not exist then? This could be a class discussion or you could divide the children into groups to research the answers to their additional questions.
- The fact that one type of plant is missing from the Jurassic forest is posed as a puzzle at the end of **lesson script 1**. The answer is revealed in **lesson script 2**, so teachers can build tension by keeping **lesson script 2** hidden until pupils have come up with their answers. Children should understand that:
 - The British Isles did not exist as we now know them, as some of the land was under the sea and some was joined to Europe as a different land mass. It was also much warmer, as we were closer to the Equator.
 - Many different types of dinosaur (and pterosaur) lived back then and we can sometimes find their fossilised remains.
 - Creatures living at the time included reptiles (dinosaurs and pterosaurs), insects, scorpions and early types of birds and mammals.
 - There were no flowering plants in the Jurassic Period.





- Share **lesson script 2** with the children. This reveals that there were no flowering plants in the Jurassic Period. Look at the diagram (or a living example) of a modern flowering plant and compare it with the diagram of a fern. What differences and similarities can they see?
- Discuss how flowering plants reproduce. This may be considered revision or learning for the first time depending on the age of the children. Discuss how ferns reproduce without flowers, using research materials as appropriate.
- What would Dippy have eaten? Point out that Dippy was a herbivore. What sort of plants would he have eaten? How would his long neck have helped him? Ask the children to use the statistics they have been sent (**lesson script 3**) to work out how much food Dippy would have eaten in a year. You could photocopy this sheet for reference for the children, or model equations on the whiteboard for younger Key Stage 2 groups.
- If possible, take the children on an expedition to a nearby woodland, parkland or school grounds to search for ferns and conifers to photograph and collect. If it is not possible to carry out this expedition please skip to **lesson script 4**.
- **lesson script 3.5** introduces the children to the excursion and its rules. Show the children pictures of ferns (**pupil resource 1**) and conifers (**pupil resource 2**) and discuss what they are looking for. Point out that conifers have cones and often have flat, needle-like leaves. Take copies of these images with you to help the children remember what they are looking for.
- Following the excursion ask the children to investigate their finds using the images provided (**pupil resources 1 and 2**). What are the features of the ferns and conifers they have found? They may wish to do close observational drawings of the plants.
- Share **lesson script 4** with the children. Discuss with them how they could transform their classrooms into a Jurassic forest. If it is not feasible to attach or hang large leaves in the classroom, smaller environments could be made in boxes (individually or in groups). Ask the children to make leaves and branches with paper and card to represent a Jurassic forest and build their environment in the classroom or box. Another alternative would be to expand on computer science lessons to create their forest on computers.
- Read **lesson script 5** to the pupils and discuss the sounds that would have been heard in the Jurassic forest. Use the tips to create an authentic soundscape. Divide the children into groups to prepare and rehearse their soundscapes using percussion instruments and their voices. Orchestrate these so that one group's composition merges into the next. Record these, play them back and discuss what is most effective.

- Read **lesson script 6** to the pupils and discuss how they could film a journey through their forest. Whose viewpoint would it be from? What would make it most evocative (eg lighting and sound effects)? Online films of wildlife documentaries can be used as examples – here's a film of Sir David Attenborough describing the jungle: www.youtube.com/watch?v=H9MV5CgPglQ&.
- Choose roles – eg director, narrator, camera operator, lighting technician and sound effects artist – and use tablets or cameras to film a first-person perspective journey through their Jurassic forest. You could use these Jurassic sound effects: nhm.ac.uk/dippy-sounds.
- Send confirmation to Dippy's team at DippyOnTour@nhm.ac.uk with the subject line **Forests**. This triggers an automated reply acknowledging receipt.

Resources required

Provided in the Natural History Museum package:

- introductory postcard
- glossary
- lesson scripts 1–6
- pupil resources 1–2
- image 1
- sound effects of the Jurassic: nhm.ac.uk/dippy-sounds

Provided by the school:

- photocopying for pupil resources (they do not need one each)
- materials for creating a Jurassic forest (card, paper, shoebox etc)
- filming device (tablet, phone, camera etc)
- percussion instruments

A note on the expedition

If this element is impossible in your case, the episode will still work effectively using only foliage crafted in the classroom.

The expedition can take place in a variety of ways and locations. For schools close to a woodland, this is the perfect opportunity for children to explore using the spotter sheets (**pupil resources 1 and 2**) to look for samples to build their forests with. Some school grounds have patches of woodland or at least a few trees and green patches where bracken might grow.

Lesson script 3.5 from Dippy's team makes it clear to children that while it is okay to select foliage such as ferns from woodlands and public spaces, they should avoid picking flowers or uprooting any plant entirely and only take a few samples.





English curriculum areas covered by Episode 1 (Key Stage 2)

The plant-hunting expedition covers:

Science Year 4: Living things and their habitats

Children should be taught to

- explore and use classification keys to identify and name a variety of living things in their local and wider environment

The comparison between Jurassic ferns and a modern flowering plant covers:

Science Year 3: Plants

Children should be taught to

- identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers
- explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal

(This comparison could go on to explore how ferns reproduce using spores.)

Science Year 5: Living things and their habitats

Children should be taught to

- describe the life processes of reproduction in some plants and animals

The calculation elements relating to Dippy's diet (lesson script 3) covers:

Mathematics

Multiplication and division – the multiplication and division calculations related to Dippy's diet will need to be adapted to offer different versions for Upper and Lower Key Stage 2 children.

The creation of a Jurassic forest soundscape covers:

Music

Pupils should be taught to

- improvise and compose music for a range of purposes using the interrelated dimensions of music

The creation of additional foliage and elements of the Jurassic forest covers:

Art and design

Pupils should be taught:

- to develop their techniques, including their control and their use of materials, with creativity, experimentation and an increasing awareness of different kinds of art, craft and design

- to improve their mastery of art and design techniques, including drawing, painting and sculpture with a range of materials

Northern Irish curriculum areas covered by Episode 1 (Key Stages 1 and 2)

The world around us: Interdependence

Pupils should be enabled to explore:

- how living things rely on each other within the natural world

The world around us: Place

Pupils should be enabled to explore:

- how place influences the nature of life
- ways in which people, plants and animals depend on the features and materials in places and how they adapt to their environment
- features of, and variations in places, including physical, human, climatic, vegetation and animal life
- change over time in places

The world around us: Change over time

Pupils should be enabled to explore:

- ways in which change occurs over both short and long periods of time in the physical and natural world

Mathematics and numeracy

The Arts: Music

Pupils should be enabled to:

- work creatively with sound by creating musical stories, pictures, patterns, conversations, accompaniments and by investigating ways of preserving the music they have created
- sing and perform with simple instruments from memory, by ear or from notation to develop vocal and instrumental skills
- listen and respond to their own and others' music-making, thinking about, talking about and discussing a variety of characteristics within music that they create, perform or listen to

The Arts: Art and design

Pupils should be enabled to:

- engage with observing, investigating, and responding to first hand experiences, memory and imagination
- collect, examine and select resource material to use in the development of ideas
- develop their understanding of the visual elements of colour, tone, line, shape, form, space, texture and pattern to communicate their ideas





- use a range of media, materials, tools and processes such as: drawing, painting, printmaking, malleable materials, textiles and three-dimensional construction, selecting which is appropriate in order to realise personal ideas and intentions

Scottish curriculum areas covered by Episode 1 (First and Second)

Sciences

Planet Earth

Biodiversity and interdependence

I can explore examples of food chains and show an appreciation of how animals and plants depend on each other for food.

SCN 1-02a

I can identify and classify examples of living things, past and present, to help me appreciate their diversity. I can relate physical and behavioural characteristics to their survival or extinction.

SCN 2-01a

Biological systems

Inheritance

By comparing generations of families of humans, plants and animals, I can begin to understand how characteristics are inherited. **SCN 1-14a**

By investigating the lifecycles of plants and animals, I can recognise the different stages of their development. **SCN 2-14a**

By exploring the characteristics offspring inherit when living things reproduce, I can distinguish between inherited and non-inherited characteristics. **SCN 2-14b**

Number, money and measure

Number and number processes

I can use addition, subtraction, multiplication and division when solving problems, making best use of the mental strategies and written skills I have developed. **MNU 1-03a**

Having determined which calculations are needed, I can solve problems involving whole numbers using a range of methods, sharing my approaches and solutions with others. **MNU 2-03a**

Music

Inspired by a range of stimuli, and working on my own and/or with others, I can express and communicate my ideas, thoughts and feelings through musical activities.

EXA 0-18a / EXA 1-18a / EXA 2-18a

Art and design

I can create and present work using the visual elements of line, shape, form, colour, tone, pattern and texture. **EXA 1-03a**

Through observing and recording from my experiences across the curriculum, I can create images and objects which show my awareness and recognition of detail. **EXA 2-04a**

Welsh curriculum areas covered by Episode 1 (Key Stage 2)

Science: Skills

Enquiry

Pupils should be given opportunities to carry out different types of enquiry, eg pattern-seeking, exploring, classifying and identifying, making things, fair testing, using and applying models.

Science: Range

Interdependence of organisms

Pupils should use and develop their skills, knowledge and understanding by investigating how animals and plants are independent yet rely on each other for survival.

4. through fieldwork, the plants and animals found in two contrasting local environments, *eg identification nutrition, life cycles, place in environment*
6. the environmental factors that affect what grows and lives in those two environments, *eg sunlight, water availability, temperature*

Maths (numeracy): Using number skills

Use number facts and relationships

Music: Skills

Composing

Pupils should be given opportunities to:

1. improvise, compose and arrange music

during which they should:

2. explore, use, create, select and organise sounds for a musical purpose
3. develop and refine musical ideas, and evaluate their work in order to improve it
4. communicate ideas and emotions through music





Art and design

Skills

Investigating

Pupils should be given opportunities to:

1. select and record from:

- observation
- experience
- memory
- imagination

2. investigate:

- the natural environment
- the made environment
- the world of imagination

using a variety of materials

3. organise:

- reference materials
- resources

to develop ideas themes and feelings, *eg collect information for a design project from the internet, library or local gallery about endangered species.*

Making

Pupils should be given opportunities to:

1. explore, experiment with and apply the elements of the visual, tactile and sensory language of art, craft and design

2. design and make:

- two-dimensional images
- three-dimensional objects and artefacts using a range of various materials for a variety of purposes

Links to Literacy and Numeracy Framework:

Oracy – developing and presenting information and ideas – listening, speaking, collaboration and discussion.

Reading – responding to what has been read – response and analysis.



Introductory postcard 1



Dinosaur footprints. Owned by and on display at Dorset County Museum.

Hello,

I'm Paul, a Research Scientist at the Natural History Museum in London. I study fossil plants.

Today Dorset's beaches are calm and peaceful places. But 150 million years ago, this was all different. Back then, you might have come face-to-face with a mighty meat-eating dinosaur like the one that made the gigantic footprints on this card. This is because Dorset's beaches were once a steamy Jurassic forest.

But how do scientists know that these beaches were a Jurassic forest? What do you think?
[Hello teacher, please have this discussion now.]

Here's the answer: we know there was a forest there because we found fossilised trees buried deep within the cliffs.

Your Natural History Adventurer challenge is to create a Jurassic forest in your classroom. To become Future Scientists, you need to prove that your imaginations are powerful enough to recreate lost worlds.

Good luck!

Paul

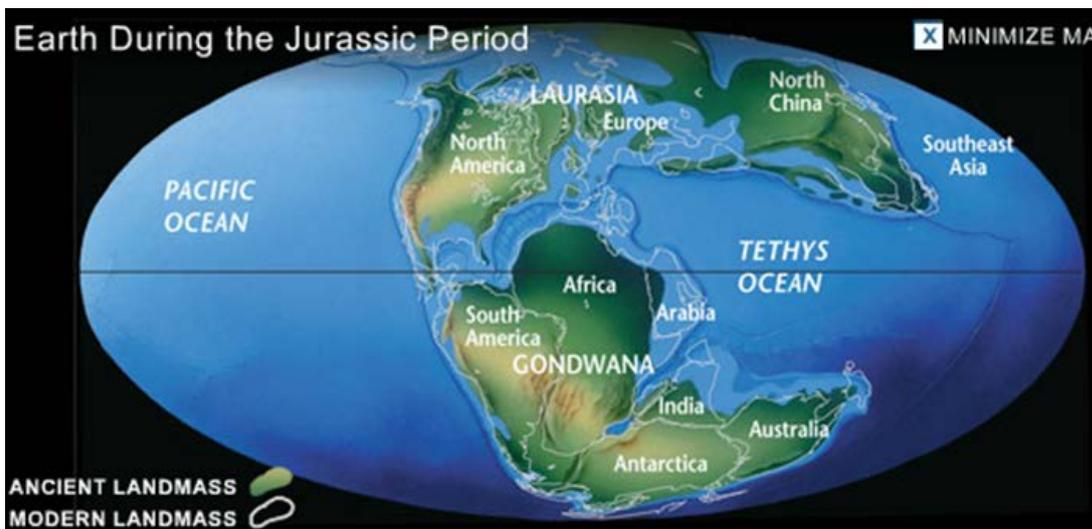


Natural History Adventurers
Dippy on Tour
Future Scientist Training
School
UK

Lesson script 1

Before you create your own Jurassic forest, you'll need to know a little more about what the Jurassic world was like. Here's an image of how the world looked when Dippy was alive, around 150 million years ago. As you can see, it was very different. Can you see how South America, Africa, Antarctica and Australia were all joined together? If you look carefully, you can see the UK, much further south and closer to America than it is today. The fact that the UK is closer to the equator means that the Jurassic forest was much warmer than our forests today.

Compare the image of Earth during the Jurassic Period with this image of how the world looks today. The continents have moved apart and the UK has moved further north. If you look carefully, you can see how the east coast of South America (the right-hand side of South America on the map) still looks as if it would fit into the west coast of Africa (the left-hand side of Africa on the map), like a gigantic jigsaw puzzle. Evidence like this helped scientists understand that the continents were moving.



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Physical Map of the World, April 2004



Now that you know how the world has changed, you can move on to what a Jurassic forest looked like. Take a look at this drawing of a Jurassic forest in Yorkshire. As you can see, there are some things that are similar to a forest today, but other things are very different. One thing a Jurassic forest had that today's forests don't was dinosaurs and pterosaurs. But there's one important form of life that grows in modern forests that didn't grow in the Jurassic forest. Have a look at this picture and see if you can spot what's missing.

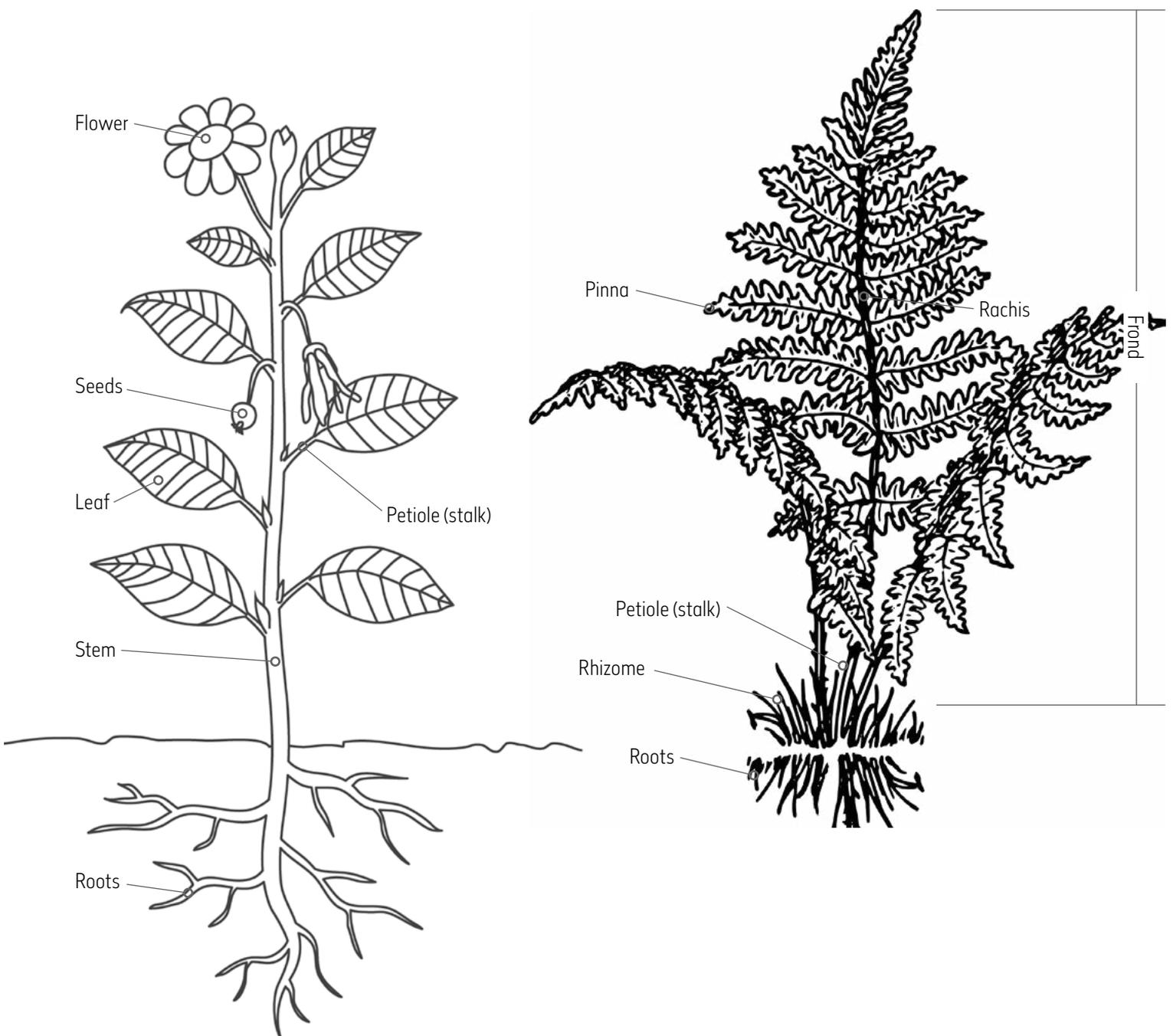
Image 1: Jurassic forest

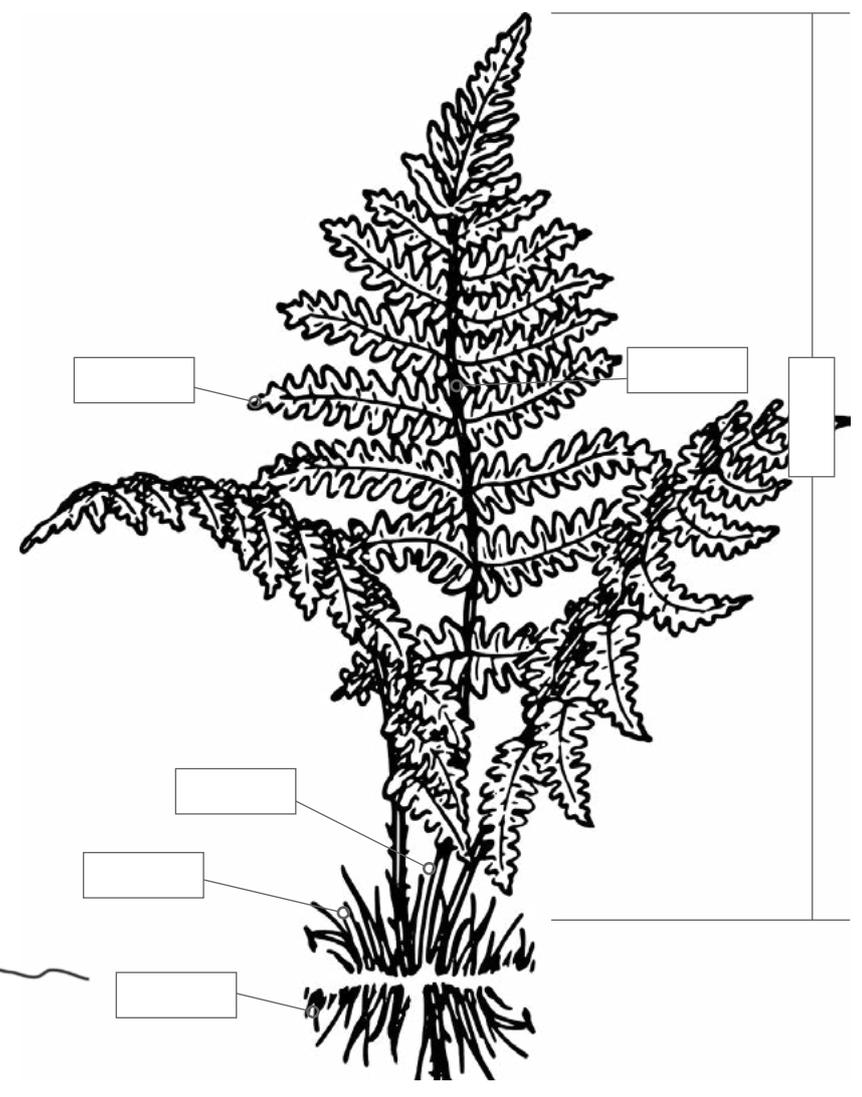
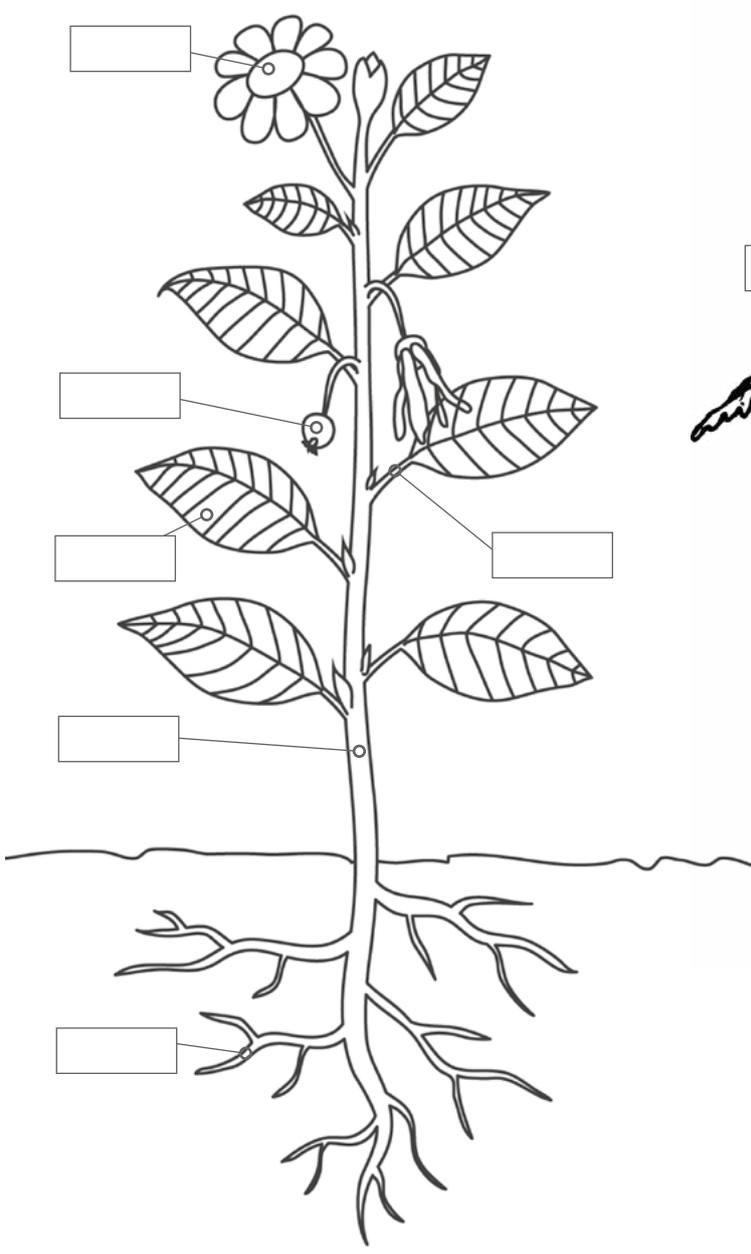


Lesson script 2

Did you guess correctly? The things that grow in our forests today but were missing from a Jurassic forest are flowering plants. Instead of plants with flowers, Jurassic forests were filled with ferns and conifer trees. This meant that life cycles in a Jurassic forest were very different from today.

Observe this diagram of a flowering plant and a fern and make a list of all the things that are the same and all the things that are different from each other. With your teacher, can you uncover the role that flowers play in the life cycle of flowering plants?





Lesson script 3

As Dippy was 26 metres long, you can imagine that he had to eat quite a lot of food.

But how much? Future Scientists need to prove that they are good with numbers too.

We estimate that Dippy was so huge he needed to eat 20 kilogrammes of vegetation every hour. That's the same weight as a two-year-old human child!

So if we know that Dippy ate 20 kilogrammes of food per hour:

- How many kilogrammes did Dippy eat in one day?
- How many kilogrammes did Dippy eat in one week?
- How many kilogrammes did Dippy eat in one year?

Lesson script 3.5

It looks like you're going on an expedition to discover ferns and conifers in your woods – your own forest adventure!

Important: Woodland adventuring is really fun, but when you go collecting it's important that you always keep to the Country Code. The Country Code is a set of rules to protect the countryside so that everyone can keep enjoying it. There are some things you can collect from woodlands, and some things you cannot.

Here is what you can collect:

- leaves, sticks and pine cones that have already fallen off of a plant or a tree
- pick only one leaf from each plant, supplement this with photographs and drawings
- if you are out in a group take one example from each type back to the classroom as a collective, not one each

As for what you cannot collect, remember:

- in some protected areas (eg Sites of Special Scientific Interest) you cannot pick anything
- some species are protected by law and cannot be picked – as a general rule if something looks unusual or there isn't very much of it, don't pick it
- you must never pull the whole plant out of the ground because it will die
- you must not pick wild flowers
- some mushrooms and other fungi are poisonous so it's safest not to touch any of them and take photographs instead

Other things to remember in the woods:

- the woods are the home of the plants and animals and you are visitors, so if you meet any animals, do not disturb or frighten them
- don't trample on any plants
- when on expeditions, Natural History Adventurers should always work in pairs to make sure they stay safe

For further guidelines please download the Botanical Society of Britain & Ireland's [Code of Conduct 2017](#).

Your teacher has pictures of common ferns and conifers to help you find modern plants that look like those in a Jurassic forest. Before you set off, take a moment to look at these pictures so you know exactly what you're looking for.

*Hello teacher, please hand out **pupil resource 1** and **2** now.*

Good luck on your woodland expedition. Dippy's team can't wait to see how your Jurassic forests turn out.

Pupil resource 1

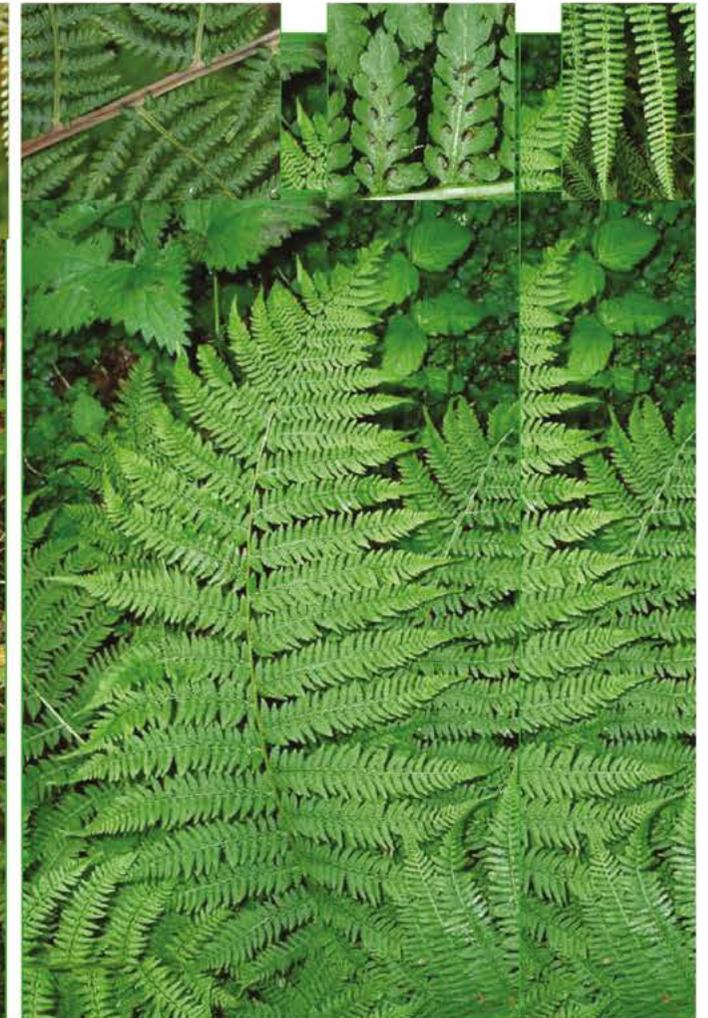
Golden-scaled male fern



Male fern



Lady fern

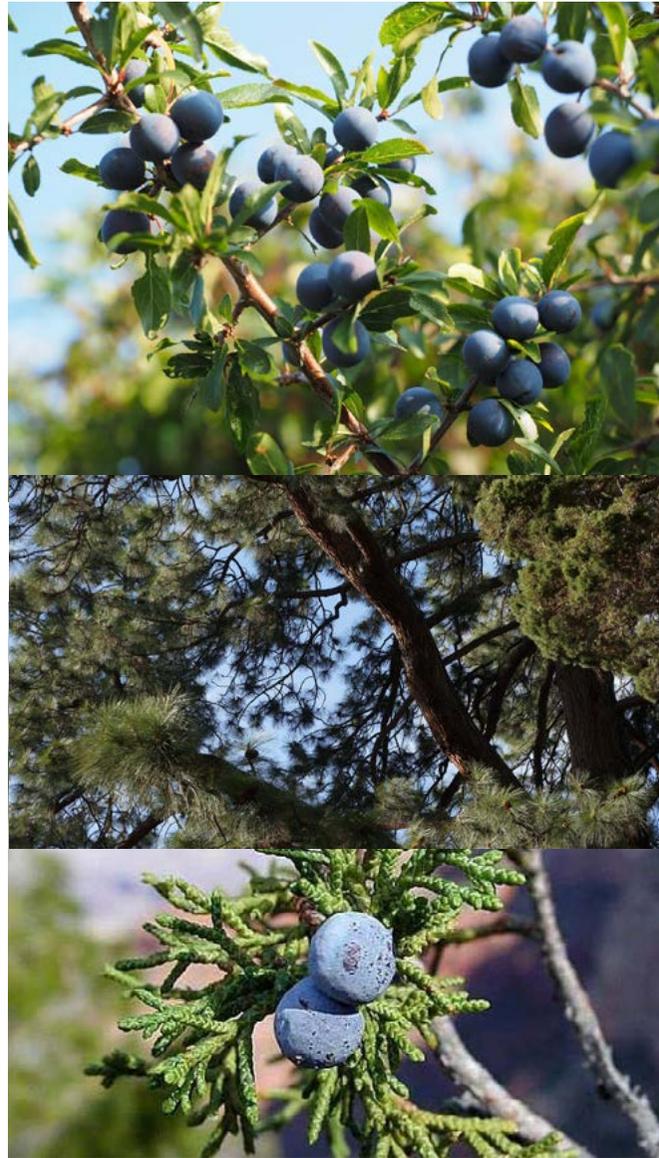


Pupil resource 2

Scots pine



Juniper



Yew



Lesson script 4

Now that you understand a little about the Jurassic world, you're ready to create your own Jurassic forest. Here are some pictures of ferns and conifers similar to those in a Jurassic forest. Your job is to create your own ferns and conifers from paper, card and other things that you and your teacher can find. Take a look at the images and use them as inspiration for making your forest.

This is a ginkgo. It is a relative of the conifer trees that were common in Jurassic forests. Its leaves were shaped like fans. Can you make your own ginkgo leaves for your classroom forest?



Ginkgo tree



Ginkgo's fan-shaped leaves

Here are some ferns called *Dicranopteris* that grew in Jurassic forests. What sort of materials could you use to create your own ferns for your classroom forest?

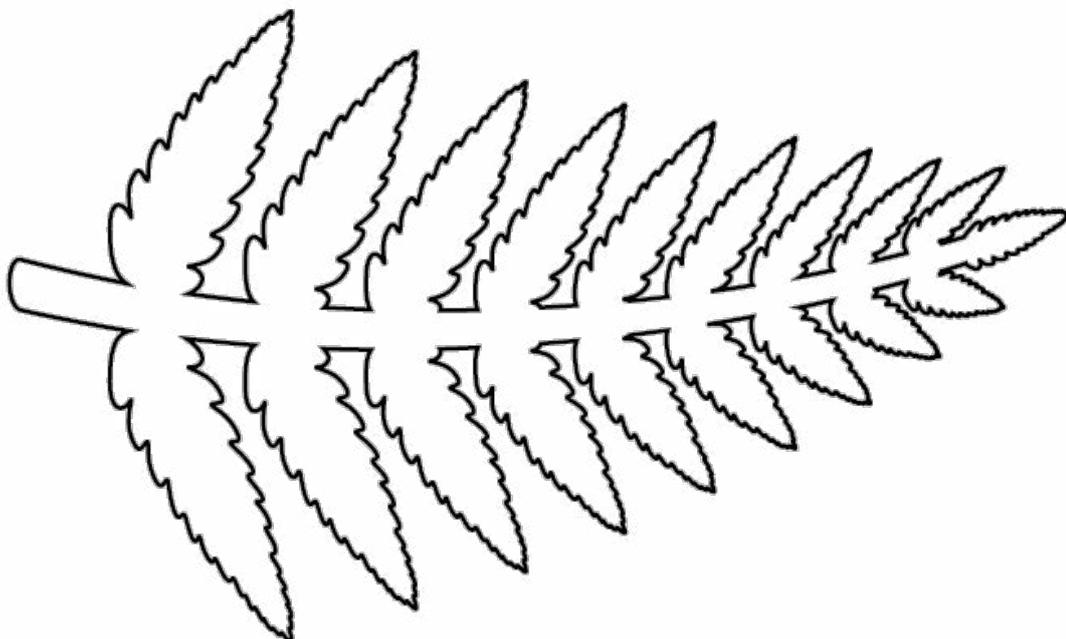


Dicranopteris, a type of fern

Here is a simple outline of a conifer tree branch and a pine cone. Perhaps you can make something that looks like this. You can also colour it in.



Here's a simple outline of a fern. You could make one that looks like this and colour it in.



Lesson script 5

If you're reading this, it must mean that you have created your amazing Jurassic forest. Dippy's team can't wait to see how it looks – and sounds. All forests today are pretty noisy places, as were Jurassic forests. Of course, we don't know exactly what noises dinosaurs made, but we have some theories. Some noises we know a *Diplodocus* would have made are the thunderous, crashing sounds as it walked through the forest.

Your next challenge is to bring your forest to life by recreating the sounds in it. Your teacher has links to sounds that scientists think would have filled a Jurassic forest. You could listen to some of these now.

We've started a list of creatures who lived in the Jurassic forest and the sounds we think they might have made...

Creature	Sound
<i>Diplodocus</i>	Crashing footsteps

Your next challenge is to work out how to bring these sounds to life.

One musical instrument that humans have is their voice. Your teacher may be able to find other things to help you make your sounds. Once you have experimented with your soundscape, your teacher can record it.

Once you've done this, you're ready to put together your own Jurassic forest movie.

Lesson script 6

The final step is to film a journey through the Jurassic forest you've made.

Your movie should take us back in time to a Jurassic forest, complete with trees, plants and the sounds of distant dinosaurs.

Using a tablet or video camera, please film a first-person journey through the world. A first-person perspective is when we see the world from the point of view of one character. We see what the character in the film is seeing. Computer games like *Minecraft* use a first-person point of view – we play a character and see what they see.

Some of you can be the narrators for the journey, telling the story of what happens. Here's a film of Sir David Attenborough, one of the greatest Natural History Adventurers of them all, talking about life in the rainforest. He's the master of narration, so use him for inspiration!

www.youtube.com/watch?v=H9MV5CgPglQ&t=30s

We also need at least one of you to be the camera operator. Who has the steadiest hands?

Finally, some of you can take turns to be directors. A director makes sure that everyone knows what they are doing and when they should do it. The director also says 'action' to tell the camera operator to start filming.

Here are some tips for creating the best films:

- once the director has said 'action' make sure that the only noises made are by the person narrating and the people making the sounds of the forest
- try and keep the camera or tablet as steady as possible
- write a short script to practice your narration
- remember to have some rehearsals before filming the final version

When you have finished, your teacher can email images and films to DippyOnTour@nhm.ac.uk with the subject line **Forests** so Dippy's team can see what you have made.

Episode 1 glossary

Conifer

A tree (or sometimes a bush) that has cones and needle-like or scale-like leaves. It is generally evergreen, meaning it keeps its leaves in winter.

Continent

One of Earth's seven major areas of land. The continents are Africa, Antarctica, Asia, Australia, Europe, North America and South America.

Dinosaurs

A group of reptiles that lived on land. Dinosaurs lived on Earth from around 231 million years ago to 66 million years ago. Most dinosaur groups are now extinct.

Diplodocus

Diplodocus was a dinosaur that lived about 150 million years ago during the Late Jurassic Period. It grew up to 30 metres long and weighed up to 20 tonnes. It ate plants and had four legs, a long neck and a long tail.

Dippy

Dippy is the name given to the Natural History Museum's cast of a *Diplodocus* skeleton. He was cast from original fossil bones discovered in the USA in 1898. He came to the Natural History Museum in 1905.

Expedition

A journey or trip that people go on for a particular reason. For example, some scientists go on an expedition to find rare fish.

Fern

A common plant that has feathery leaves called fronds and does not produce flowers.

Flowering plant

A plant that produces flowers that are used for reproduction.

Fossil

The remains or impression of a prehistoric plant or animal embedded and preserved in rock. Fossils can be the actual remains of a once living thing, such as bones or seeds, or traces of past events, such as dinosaur footprints.

Herbivore

An animal that feeds on plants.

Jurassic

The Jurassic Period was a geologic period that lasted 56 million years from the end of the Triassic Period (201.3 million years ago) to the beginning of the Cretaceous Period (145 million years ago). It is sometimes known as the Age of Reptiles.

Life cycle

The stages a living thing goes through during its life.

Pterosaurs

A group of large, flying reptiles that lived from around 228 million years ago to 66 million years ago.