

## Enquire with Darwin: Key Stage 2

### Module topics

**Module 1: Life cycles.** In the relatively controlled environment of his garden Darwin observed his cabbage plants closely. His observations brought the realisation that animal and plant life cycles coincide. Large white butterflies laid their eggs on his cabbages and their caterpillars were attacked by the ichneumon fly which deposited its eggs in their living bodies. Darwin theorised that overlapping life cycles must also be central to the struggle for survival in the natural world.

**Module 2: Understanding the environment.** Darwin spent time walking the local lanes, regularly observing the natural world, his notebook always to hand, his eyes and mind sharp to observe the unexpected. Constantly he thought about the reasons for what he saw and asked questions. This unit will encourage the use of the school grounds and beyond, and focus on Darwin's important ideas regarding species, populations and communities of living organisms.

**Module 3: Struggle for life.** Darwin saw the struggle for existence as ruthless, universal and ceaselessly shifting. His weed experiment makes the ordinary seem extraordinary when a patch of common plants become a cruel land where the struggle to survive is paramount, and competition rife. He brings alive the everyday dramas of our pavements, walls and back gardens.

**Module 4: Interdependence.** His Beagle voyage, the view from his study window and the countryside around Down House all prompted Darwin to consider why there was such visible diversity of plant and animal life. In his garden experiments and on country walks he discovered a constantly evolving world of interdependent life forms. Opportunities to observe nature in all its diversity are still important today, and raise awareness of the threats human interactions pose to the environment.



Above: Pupils walk the Sandwalk during an IntoUniversity Darwin Inspired day at Down House. The pupils are asked to listen, to look and to think about the natural world around them as they walk slowly and silently.

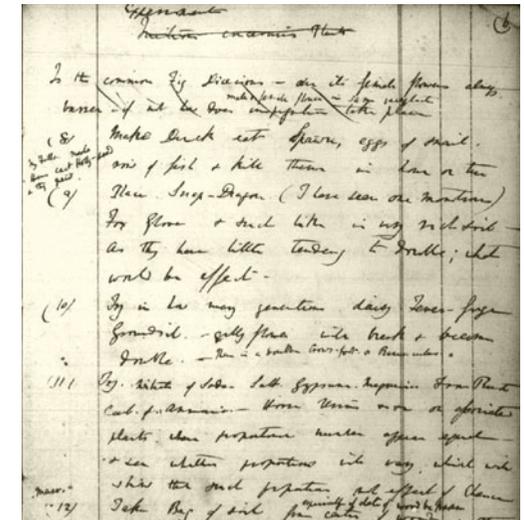
Below: A younger pupil uses his Darwin notebook.

## Usin these modules

Each module is self-contained, but together these Darwin Inspired resources might challenge pupils to think differently about science or the environment in off-timetable events. Darwin was writing for an audience that had a certain level of understanding of natural history. Pupils may not share a similar understanding; accordingly, the resources revolve around a visit to a local garden, nature reserve or park to give all a shared experience of the natural world. Images have been used extensively so that plants and animals Darwin would have seen become familiar.

Darwin walked daily, around his Sandwalk and through species-rich meadows, observing the wildlife around him, listening to bird song and contemplating the struggle for life in hedgerows and fields. Always to hand was his hand lens so that nothing, however small and seemingly insignificant, escaped his attention. The notebook he carried allowed him to record his thoughts and findings for future reference.

The experiments that helped Darwin to understand the environment can be replicated in schools, but most of all, he showed that observation and reflection were vital tools that drove his scientific thinking and enquiry.



Above: Pupils investigate the earth for worm casts.

Below: A page from one of Darwin's own notebooks.

## Using these modules

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### Each module includes a:

#### Lesson plan:

Containing an overview of Darwin's work on the topic, a pertinent quotation, potential lesson outcomes, broad curriculum links, key words, and basic resources needed to complete the activities suggested. Each pupil will need a Darwin notebook for these lessons.

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#### Lesson sequence:

There are 3 lessons in each unit:

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#### Pre-visit lesson:

This sets Darwin's work in context in conjunction with the PowerPoint presentation. Starter and main activities are followed by a plenary that encourages pupils to raise questions they will answer on the visit. The extension activities suggested can be differentiated.

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#### Visit:

Being out-of-doors and having time to think were pivotal to Darwin's work, and both offer models for stimulating scientific questioning and thinking. Pupils need to know where to look, observe closely and learn to interpret what they see. On their visit, they collect evidence and data in different ways.

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#### Post-visit lesson:

Pupils answer the questions they raised earlier and present their evidence and reasoned arguments using a range of media.



An example of a Darwin notebook and memory sticks.

## Using These Modules

### Notes for teachers

Background information is provided for each part of each lesson. Links are given for relevant websites throughout

### Resource materials

These are provided in the lesson text and on the PowerPoint to make them available for whiteboard use.

Pupils are expected to work like Darwin so that they begin to understand the nature of science; making observations, asking questions, experimenting to investigate the natural world, collaborating with others, reading and researching. The resource materials are a starting point for evidence gathering and making good arguments that pupils explain to others.

It is important that Darwin's scientific work is linked with the decisions that pupils make now and in the future. There are opportunities for everyone to express an opinion. Group work is encouraged both indoors and out-of-doors. How teachers achieve the most effective grouping is a strategic choice, but all activities, however short, should have clear outcomes and a specified time limit.



Pupils investigate the role of earthworms in soil on a Darwin Inspired gardening day.

## Assessment

Ways of revealing gaps in knowledge and misconceptions have been included. Individuals can show what they have learned; writing frames, models, experiments, presentations and poems are all suggested. Peer assessment is encouraged so that pupils show their understanding orally and may help others to a better understanding in the process. It is helpful for each pupil to use a notebook when working with these resources. Used effectively for individual note making (not classwork), they provide teachers with an assessment tool.

From	To
The environment as a place to live	➤ Understanding of competition and survival.
Only individuals seen as important	➤ Understanding populations and interdependence.
Only individual species interacting	➤ Interaction at species, population and community levels.
Sorting and naming of external features	➤ Understanding major groups of plants and animals.
Facts and descriptions	➤ Causes and why things are as they are.
Structural descriptions	➤ Functional descriptions.
Obvious things seen	➤ Hidden aspects reported e.g. internal organs.
Linear explanations e.g. food chain	➤ Cycles, webs and interdependence.

## Assessment

Teachers might also like to consider the extent to which the criteria for Darwin Inspired learning have been fulfilled and pupils have:

- been encouraged to develop a sense of place through direct engagement with the natural world using their own local environments (and perhaps those of Downe and other places Darwin worked);
- developed active learning through seeking experiences, asking questions, solving problems, and learning through dialogue between teachers/ experts and pupils and between peers;
- used their imagination and thoughtful hands-on enquiry as well as learning high quality engaging content;
- engaged in critical, creative thinking about how we know what we know, and how scientists work;
- engaged in interdisciplinary studies, with Darwin as the context, linking science with literature, writing and expression, history, religious studies, geography, horticulture, dance and drama, design and technology, numeracy, music and art.

## Technology

Darwin used simple scientific equipment. Schools should have access to a microscope which is probably as good, or better, than the one he used. Hand lenses are helpful for seeing the things that might be overlooked out-of-doors. Digital cameras are useful if everyone in the class has the opportunity to use them. Website addresses have been included, but pupils may need help in locating specific information. Parents might like to engage in paired science activities taken from the resources, for example, collecting leaves or caterpillars, counting insects or trees and finding relevant information using the internet.

## Health and safety

Teachers need to read the appropriate local authority and school guidelines. Before making a visit they should carry out a risk assessment and a preliminary visit. Where a specific issue has been anticipated, it is highlighted in the Notes for teachers.



Collecting soil samples.

## Acknowledgements

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