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# Module 4: Interdependence

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Exploring a constantly evolving  
world of interdependent life forms

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# Darwin's tangled bank

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*'It is interesting to contemplate a tangled bank, clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent upon each other in so complex a manner, have all been produced by laws acting around us.'*

Charles Darwin, *On the Origin of Species*, 1859

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# Darwin's tangled bank

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*'...various insects flitting about...'*

In the stillness,  
look for  
movement.

In the quietness,  
what can  
you hear?



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# Darwin's tangled bank

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*'...many plants of many kinds...'*



Toadflax



Bee orchid



Knapweed



Wild marjoram

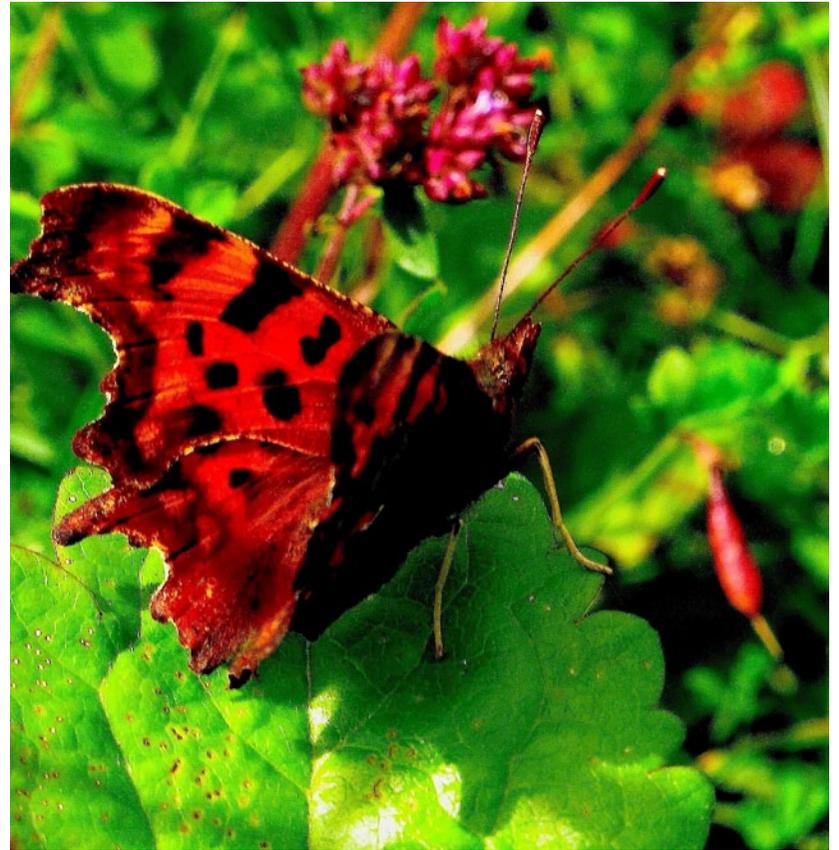
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# Darwin's tangled bank

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*'...endless forms most beautiful and most wonderful have been, and are being, evolved.'*

Last sentence of  
*On the Origin of Species*,  
Charles Darwin, 1859



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# Darwin's ways of working

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- Regular walks in his local area
- Asking questions and developing ideas
- Reflecting on what he had seen
- Using everyday observations
- Designing experiments at home
- Making careful records
- Involving his children in data collecting
- Gardening and keeping bees and pigeons

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# Darwin's ways of working

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Darwin made connections from observations  
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How are red clover, bumblebees, field mice and cats connected?



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# Darwin's ways of working

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## Darwin made connections from observations

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Such connections helped him to theorise about Interdependence



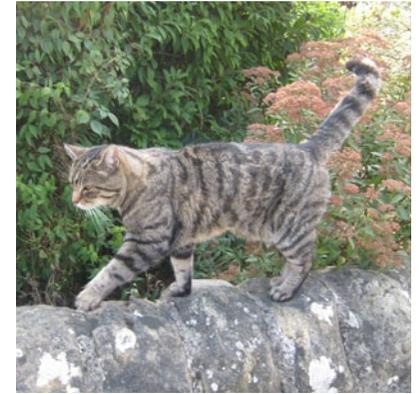
Red clover has nectar so deep in the tube-shaped flower that only a bumblebee can reach it.



Bumblebees nest in holes and may even take over an abandoned mouse hole.



Field mice wreck bumblebee nests and eat their larvae and honey.



Cats kill field mice.

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# Darwin's ways of working

.....  
Darwin made connections from observations

.....  
Which insect pollinates this orchid?



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# Darwin's ways of working

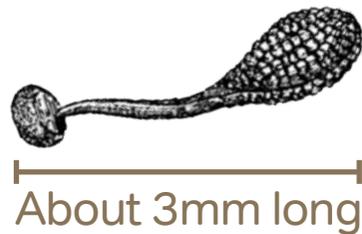
## Darwin made connections from observations

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### A fly orchid

Fly orchids' scent attracts a few species of solitary wasp. A male attempts to mate with the flower. In doing so he picks up a pollinium. When he finally leaves the flower, he moves on to another flower and thus transfers the pollinium from one plant to another.

Pollinium from Darwin's diagram of an orchid



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# Darwin's ways of working

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## Observing closely

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*'When you have seen one ant, one bird, one tree - you have not seen them all'* - E.O.Wilson, Interview in *Time Magazine*, 1986



Leaf  
cutter ant



Red  
bull ant



Yellow  
meadow ant



The type of microscope  
Darwin would have used

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# Resource materials

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## Darwin's ways of working: close observation

**Observations and sketches:**

**Notes and questions**

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# Resource materials

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## Darwin inspired thinking: feeding relationships

*'... worms crawling through the damp earth...'*

What animals eat worms?

What could happen if the worms die out locally or become extinct?

Why could some animals struggle if one plant took over in the chalk grassland?

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# Resource materials

*'Nature red in tooth and claw'*  
Alfred, Lord Tennyson, *In Memoriam*, 1850

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# Resource materials

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## Playing field mystery

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A grey animal with a big furry tail, eats or buries hazel nuts from the hedge

Where the grass is short there are small piles of earth that look as though they have been squeezed out of a tiny tube.

In the field, a brown spotty breasted bird flies away from a flat stone covered with pieces of snail shell.

In summer, night-flying insects attract, small flying animals that swoop over honeysuckle in the hedge.

A bird with a pink breast and blue head searches under the hedge for fallen seeds.

There are silver trails on stones and brown striped shells on plants with tall stalks.

In summer, birds that are arrow shaped fly low over the field to catch insects.

Red insects with black spots live on nettles and their larvae eat hundreds of green aphids.

A reddish-brown furry animal with a bushy tail makes large holes under the hedge, a musky smell and howls on spring nights.

A very rare flower that looks like a bee grows on the edge of the field furthest from the path.

A bird with a yellow beak and black feathers collects worms to feed its young in the spring but eats fruits and berries the rest of the year.

Families bring an animal to the field. Off the lead it chases rabbits.

A prickly animal snuffles around on summer nights looking for worms and slugs. It has no tail and little black feet.

Birds with a red patch on the eye and golden feathers cling to thistles in the winter and eat their seeds.

In the hedge, a prickly plant with black berries attracts wasps, flies and butterflies in late summer.

Four dome-shaped piles of earth appear in the grass and earth is flung out of one of them.

A reddish-brown furry animal with a long tail has made a tiny hole under the hedge.

Some days a brown bird hovers over the field and swoops down to pick up a mouse or vole.

Lots of little hard-shelled creatures scuttle around the dead wood under the hedge.

An evergreen climber in the hedge has triangular leaves, late flowers and black berries. There are spiders' webs here.

Red clover in the grass attracts flying insects that are black and yellow with white/ buff tails.

Marmalade, grey- or black-coloured furry creatures prowl the field and catch small birds or mice to kill later.

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