

**17** As you walk down the hill look for common vetch. Darwin observed that it secreted sweet tasting fluid from glands on its stipules (small 'leaflets' where the leaves join the stem) when the sun shone and noted this was eaten by honey bees, a moth, ants and 2 kinds of flies.



Common Vetch with Yellow Meadow Ant

**At the bottom of the field exit via the kissing gate and turn L. Follow track made when the estate was planted with trees to produce timber after World War II.**

**18** On your L is plantation woodland, but on your R is old hazel coppice and beyond, the ancient boundary between Downe and Cudham parishes. Lubbock wrote about the 10 year coppicing cycle and how it contributed to the wildlife of the area. Listen for the drumming of greater spotted woodpeckers in spring. Darwin marvelled at the adaptations of their feet, tail, beak and tongue, writing, 'Can a more striking instance of adaptation be given than that of a woodpecker for climbing trees and for seizing insects in the chinks of the bark?'

Greater Spotted Woodpecker



**19** Turn L onto Beechy walk, planted in 1840 in memory of Sir John Lubbock II, and largely replanted following the 1987 storm. Musk mallow grows in the sunny spots. In damp weather look for Roman snails and toads which eat them, in autumn for some of the brightly coloured fruiting bodies of slime moulds: many feed by engulfing bacteria on dead logs.



Musk Mallow



Toad



Slime mould (Fuligo septica)

**20** Continue straight across golf course on public footpath. In summer look for scarlet pimpernel growing on disturbed ground and wayfaring tree amongst the sun loving shrubs growing on the chalk.

**Turn R just before Clock House. Pass golf clubhouse, turn L and follow R-hand path to the back lawn of the old mansion.** There was a fountain here in Lord Avebury's time and tennis courts. In the top garden behind the mansion, look for the stone shelter built as a gift by Lady Lubbock for her husband's 79th birthday in 1913.

**Return to the Nature Garden.**

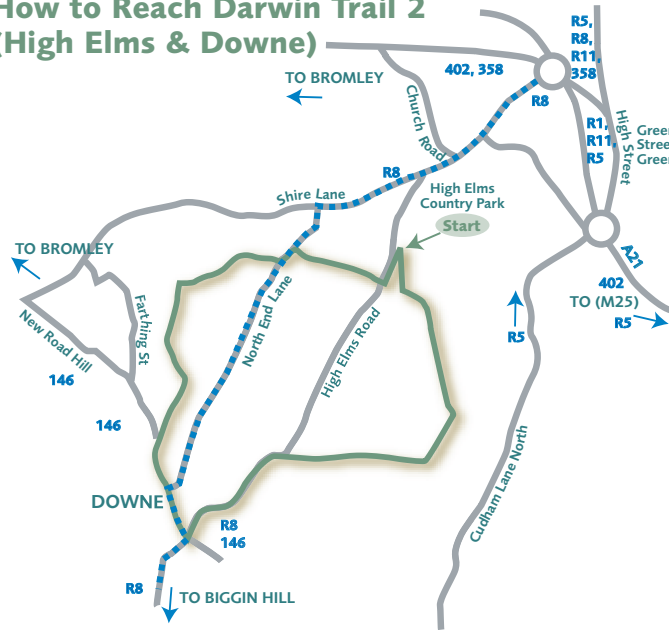


Scarlet Pimpernel



Wayfaring tree

## How to Reach Darwin Trail 2 (High Elms & Downe)



The Trail starts at High Elms but can be begun and ended at different points. Access to the trail is via the following bus routes:-

- R8** (Mon-Sat) Orpington to Biggin Hill via Shire Lane. Hail and ride between Shire Lane and Jail Lane (■■■■)
  - 146** (Mon-Sat) Bromley to Downe via Hayes and Keston
- High Elms can also be reached on foot from Farnborough or Green Street Green as follows:-
- R1** Green St. Green to St. Paul's Cray via Chelsfield, Orpington, and St. Mary Cray
  - R5** (Mon-Sat) Petts Wood Stn to Halstead via Orpington, Green St. Green and Cudham/Pratts Bottom
  - R11** Green St. Green to Sidcup via Orpington, and the Crays
  - 358** Orpington to Crystal Palace via Farnborough, Bromley, Beckenham, and Penge
  - 402** (Mon-Sat) Bromley North to Tunbridge Wells via Farnborough, Sevenoaks, Hildenborough and Tonbridge

Trains: Nearest Station: Orpington.

Correct at time of going to press (2006). For up-to-date information about train and bus times phone Traveline on 020 7222 1234 or see <http://journeyplanner.tfl.gov.uk>

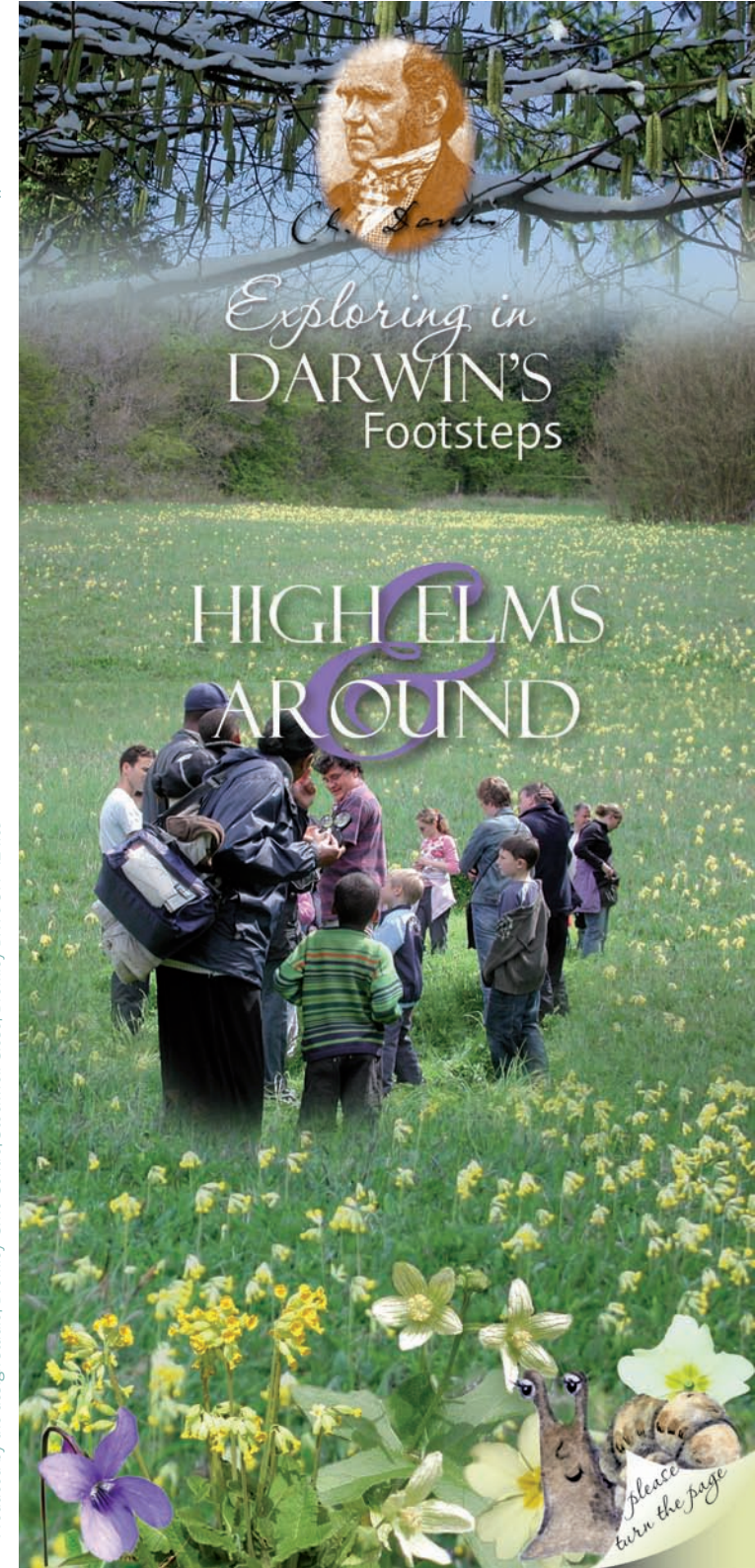
For more information about Darwin's life and work around Downe, including walks and events in the area and how you can become involved, see [www.darwinwildlife.co.uk](http://www.darwinwildlife.co.uk) or [www.darwinatdowne.co.uk](http://www.darwinatdowne.co.uk).

To read Darwin's publications on line see, 'The Writings of Charles Darwin on the Web' at <http://pages.britishlibrary.net/charles.darwin> or <http://darwinlibrary.amnh.org>. More information can also be found in the World Heritage Site Nomination Document (2006) at your local library.

EMERGENCY PHONE: 020 8464 4848



Produced by the design studio, Bromley Civic Centre, Stockwell Close, Bromley BR1 3UH 424.05



## About the trail

This trail leads you around places familiar and important to the work of Charles Darwin and his neighbour, Sir John Lubbock, who as a child, learnt much about natural history from Darwin and grew up to be an important scientist in his own right, whose work Darwin referred to in many of his publications. Lubbock, later Lord Avebury, was also an anthropologist and became a politician in 1870. He remained a lifelong friend and supporter of Darwin who wrote about Lubbock's decision to go into politics, 'any fair man can be a politician but so few can work in science like him'. Some of the species they studied locally are indicated as you follow the trail, others are more difficult to spot or may be anywhere along the route and are shown in the pictures opposite. Tick the circles and see how many you can find.

## Places you'll pass

The trail begins and ends at High Elms, the home of the Lubbock family from 1808-1938 and where Sir John Lubbock investigated springtails and bristletails. These primitive little insects are closely related to crustaceans and when Lubbock started working on them only one species was known in Britain. By 1869 Lubbock had recorded nearly 60 species in Britain, many from High Elms and nearby, of which 18 appeared new to science (some since combined into other species). Lubbock also investigated ants, bees and wasps, keeping ants nests between sheets of plate glass so he could more easily examine their social organisation. Some of his queen ants lived 13-15 years. He showed that bees could see in colour and preferred the colour blue, and he kept a wasp for 9 months which would feed from his hand and allow him to stroke it. When it died the wasp was mentioned in 'The Times' and its body was donated to the Natural History Museum.

The trail also passes the Rookery, in Darwin's time the home of George Turnbull a racehorse trainer whose head gardener, John Horwood, kept tropical orchids in his greenhouse for Darwin and gave him advice on the building of greenhouses at Down House.

## How to get around

The complete trail (shown on the map inside in black) is 4½ miles (6.7 kms) long, but can be shortened using the footpaths shown on the map. The golf club near the end of the trail has a public bar and serves food. There are 2 pubs and a café in Downe and a café at High Elm's new centre. The trail involves a small amount of road walking: please take great care and face oncoming traffic. Paths may be muddy and slippery at times with some gradients of >20%. There are 6 kissing gates as shown on the map. Please follow the Country Code, keep to the footpaths and remove your dog waste.

## Some of the Minibeasts important to Lubbock

### A Lubbock

**Springtails (Collembola)** Mostly 0.5-6mm long these tiny creatures may live in densities of 20,000 per square metre, and are important for nutrient recycling, most of them eating fungal hyphae and dead plant and animal material.

**B Tomocerus longicornis:** about 6mm long, it is one of the largest common springtails at High Elms.

**C Orchesella cincta:** (4-6mm long) a springtail found by Lubbock 'under logs of wood'.

### D Mayfly nymph:

Mayflies live under water as nymphs for 6 months or more (varying according to species) but the flying adult only lives one day. Lubbock investigated how in *Cloeon*, a genus of small species, it takes at least 20 moults before the larvae emerge as adults.

### E Black wood ant:

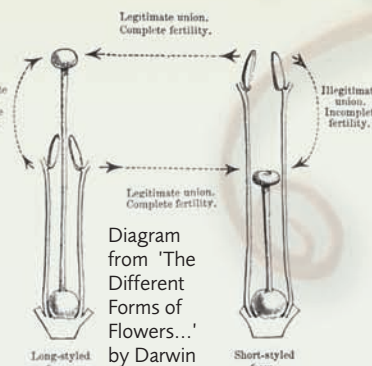
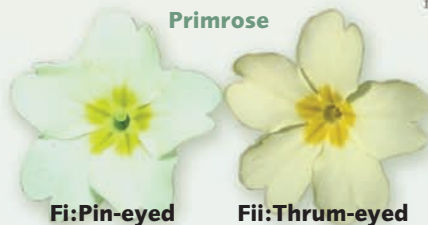
kept and studied by Lubbock at High Elms. Illustration from 'Ants, Bees and Wasps, by John Lubbock

## Some of the Species important to Darwin

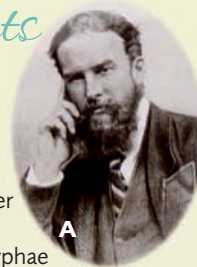
## Spring

### F Primroses and cowslips:

Darwin investigated why their flowers were of 2 types, called pin and thrum-eyed, and found that the most viable seed was produced when cross pollination occurred between the 2 different flower types.

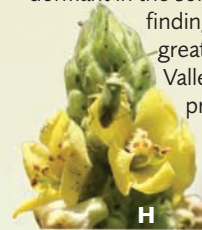


Note how in pin-eyed flowers, the stigma (female part) shows above the stamens, while in thrum-eyed flowers, the pollen bearing stamens (male) show above the stigma



## Summer:

**Mulleins:** 3 species of mullein can be found near the trail and hybrids between them. Early colonizers of disturbed ground, their seeds can remain dormant in the soil for many years. Darwin reported finding 33 hybrids between white and great mullein in a field in the Cudham Valley and noted how the hybrids produced little or no seeds.



**G White Mullein**  
**H Great Mullein**



**I Roman snails with eggs:** first brought to this area by the Romans, Charles Darwin found that when hibernating they could be immersed in sea-water for 20 days and completely recover; he calculated that in this time they could be transported 660 miles on an ocean current.

## Autumn:

As plants lose their leaves, look for birds feeding on the ripening fruits in hedgerows, laying down stores of fat to help them survive the winter. In 'The Origin of Species,' Darwin estimated, 'chiefly from the greatly reduced numbers of nests in the spring, that the winter of 1854-5 destroyed four-fifths of the birds in my own grounds': evidence of the way evolution worked since the implication from this is that only the fittest are able to survive and breed.

**J Goldcrest:** during hard winters numbers can fall dramatically.



## Winter:

**K Mistletoe:** Darwin marvelled at the co-adaptations of this plant and the animals it relies on. For these to occur he realised how features occur randomly, but if they aid survival (or do not inhibit it) they may be inherited by offspring and passed on. A semi-parasite, it relies on a host tree (often apple, sometimes lime, hawthorn or poplar) for water and mineral salts, needs birds to disperse its seeds and has flowers in February and March with separate sexes on separate plants and therefore needs insects to pollinate it very early in the year.



**Start at High Elms Nature Garden**

**1** You are in the kitchen garden of the mansion which belonged to the Lubbocks, and where John Lubbock IV found many species of springtails. In July look for dark mullein here.



Dark Mullein

**Leave garden via the double wooden gates, turn left (L) and walk up the tarmac path, past the Eton 5s Court on the left put in by Sir John William Lubbock III for his son. Continue for about 300m to the site of the old mansion which had a view across the valley.**



Yew

**2** Walk down through the yew walk planted by John Lubbock IV, Lord Avebury, which originally led from the dining room to ponds, in one of which he kept water fleas which he studied.

**Cross the Golf Course car park with care, cross High Elms Road and turn L through Clockhouse Orchard.**

**3** In the 19th century there were orchards at High Elms. In summer this is a good place to look for butterflies sunning themselves. You may see comma butterflies which are brightly coloured when their wings are open but Darwin remarked how when these butterflies rest, their wings are closed together and the underside which then shows resembles a dead leaf. Look for an ash tree covered in ivy on your right. He examined ash flowers and found some trees had only male flowers, some only females, and some trees had flowers with both male and female parts.



Ash flowers (male)



Comma butterfly drinking nectar from ivy flowers (closed wings)



Comma butterfly (open wings)

**Opposite The Clock House, turn right (R) by nature trail post 5**

**4** See if you can spot guelder rose in the hedge. Darwin noted how the outer flowers were sterile but made the flower head easily visible for insects.



Guelder Rose flowers

**Thick-legged flower beetle (Oedemera nobilis): the males have large 'thighs'. Larvae feed and develop within plant stems**



Spider (Neosco adianta) makes webs to catch small flies

**5** The chalk grassland supports a great variety of wild flowers and therefore many different small animals which rely on them for food and shelter. Lubbock wrote popular books about natural history and was particularly interested in the interactions between plants and insects. Keep to the path but on a warm summer day see how many different plants and minibeasts you can spot on this sunny chalk bank.



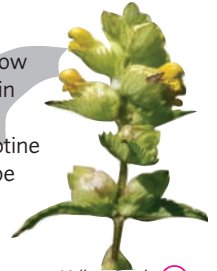
Meadow Brown butterfly on Marjoram

**Cross fairway and continue on London LOOP footpath.**



Cowslip

**6** On your left, the meadow is yellow with cowslips in spring and yellow rattle in summer. On summer's evenings the locally rare serotine bat, one of Britain's biggest bats, may be seen flying along the woodland edge.



Yellow Rattle

**7** As you walk through the woodland, look for hart's tongue fern and a dead tree on your left. The holes in the tree have been made by emerging adult beetles whose larvae have eaten their way through the wood. In the UK there are over 4000 beetle species and while a student at Cambridge University, Darwin became fascinated by their variety.



Hart's Tongue Fern



Tanner Beetle

**Cross Path**

**8** As you approach the road look for violets on the right. In spring they have purple flowers which attract insects for cross pollination. In summer and autumn, look for cleistogamous flowers. These are very small flowers which look like buds but never open. Inside them the petals are tiny scales and only the 2 lower stamens have anthers, which produce few pollen grains. Darwin noted how tubes grew from the pollen grains down into the stigma to fertilise the ova and produce seeds. This mechanism helps the violets survive and spread when cold spring weather means there are less bees for cross pollination.



Common Dog Violet spring flowers



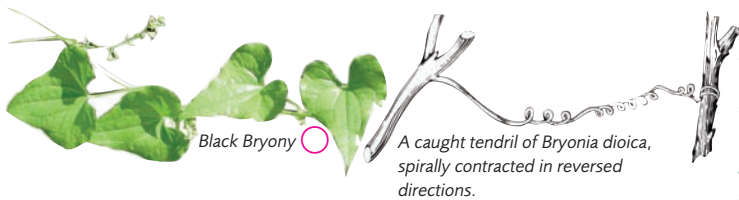
Dog Violet: cleistogamous flowers

**When you reach road, cross and turn L. Turn R up Bogey Lane: pass steps on the left which lead down to the site of the old wash house for High Elms Estate.**

**9** Look for Traveller's Joy, an indicator of chalk soil; Darwin reported that he had 'seen many proofs that the petioles (leaf stalks)...are excited to movement by very slight pressure'.



Traveller's Joy leaf stalk



Black Bryony

A caught tendril of *Bryonia dioica*, spirally contracted in reversed directions.

**Cross Orange Court Lane and follow path across field waymarked 'Cudham Circular Walk'. Turn R, with hedge on right then pass via a narrow path onto Rookery Road. You are opposite a house well known to Darwin, called, 'The Rookery'. Turn R, cross road to face oncoming traffic and take great care as you walk towards Downe village. When you reach North End Lane cross road to walk on the pavement.**

**10** Continue along sunken lane looking for climbing plants. Darwin described how young shoots of black bryony followed the sun, taking an average 2 hours 48 minutes to make 1 complete circle, while tendrils of the unrelated white bryony are stimulated by touch to twine, first in one direction, then the same number of turns in the opposite direction. The resulting spirals attached to hedge plants act as shock absorbers. Darwin wrote, 'I have more than once gone on purpose during a gale to watch a *Bryony* growing in an exposed hedge, with its tendrils attached to the surrounding bushes; and as the thick and thin branches were tossed to and fro by the wind, the tendrils, had they not been excessively elastic, would instantly have been torn off and the plant thrown prostrate'.



White Bryony (with tendrils)

**14** At this spot look for toadflax in summer. Darwin found that when he grew self-pollinated and crossed seedlings of this wild plant in the experimental bed in his garden, 'the crossed plants when fully grown were plainly taller and more vigorous than the self-fertilised ones...'

Bees incessantly visit the flowers... and carry pollen from one to the other; and if insects are excluded, the flowers produce extremely few seeds'. As you continue, in spring, look over the railings to see Goldilocks (wood buttercup) growing in the Churchyard.



Toadflax



Goldilocks buttercup

**15** Continue past Downe Church into High Elms Road. Pass school and take bridleway parallel to road all the way to Cuckoo Lodge. Notice the thick hedgerows, rich in species. Some have been laid. This traditional method of maintaining a stockproof barrier has been practised for hundreds of years. Look at hedge bases to see if you can tell which are the most ancient.



Lords & Ladies flower

**11** In the hedge bases look for Lords and Ladies; When Darwin placed its berries in salt water, he found that they could survive for a month, which he calculated could allow for a journey of more than 924 miles on an Atlantic current. He also carried out experiments to show that although some flies which crawl into the flowers (attracted by the smell of rotting meat) become trapped, many manage to escape and fertilise other flowers.



Lords & Ladies berries

**When a path crosses the lane, turn L and continue between the hedges.**

**12** Look for hazel amongst the hedgeplants and listen for linnets calling 'tsoo-eet' as they fly away with a bounding flight. In discussing what made male birds successful in winning a female, Darwin noted how the crimson forehead and breast of the male are displayed only during the summer in England and how, when courting a female, 'The common linnet distends his rosy breast slightly expands his brown wings and tail, so as to make the best of them by exhibiting their white edgings'.



Male Linnet



Hazel leaves and nuts

**13** As the hedge on your R becomes lower notice bracken on field edge: you are now on the more acid soil derived from clay-with flints which forms the flat high land between the chalk of the Cudham and Downe valleys. Darwin wrote how his son Francis discovered that there were large glands at the base of the bracken fronds which when young 'excrete much sweetish fluid, which is eagerly sought by innumerable ants'.



Bracken

**16** Cross road at Cuckoo Lodge, once the Gamekeeper's cottage at the entrance to High Elms Estate, and follow track which leads down into the Cudham Valley. Changes in vegetation show where the underlying geology changes from clay-with-flints of the plateau to the chalky slope of the valley side. Look for bluebells on the more acid soils, pink campion where there is more chalk. Pink campion has separate male and female flowers which need insects with long tongues for pollination. Darwin observed the long-tongued hoverfly (*Rhingia rostrata*) pollinating it and noted how some species of flies, 'keep to the flowers of the same species with almost as much regularity as do bees'.



Pink Campion: flower



Long-tongued Hoverfly



Pink Campion: section female flower



Pink Campion: section male flower

**A footpath comes in from R, just past here fork R then turn R through a kissing gate into a field called Burnt Gorse on the 1841 tithe map.**



KEY

- Grassland
- Woodland
- Trail
- Refreshments
- Public or Permissive footpath
- Kissing Gate
- Public or Permissive Bridlepath

