

Charles Darwin - Gardener June 2009

On 3 June 2009, in recognition of the centenary year of the birth of Charles Darwin, the Friends of the National Library, in conjunction with the Australian Garden History Society, presented a lecture by Max Bourke AM focusing on Darwin's life as a gardener. Below is an abridged version of this lecture.

As a young trainee scientist, I used to think how difficult it would have been to be Gregor Mendel or Charles Darwin. Both developed models of biology that are hugely important. But they did this without knowing anything about the chemical basis of heredity DNA/RNA, its structural basis (chromosomes) or its mechanics (meiosis and mitosis). Yet they had the vision to imagine what they did.

Mendel's task was readily verifiable through relatively straight forward experiment and observation. Darwin's work was not. It was substantially intuitive with a huge mass of observational data as back-up. There is no doubt that Darwin's ideas of 'transmutation', as he called it, underlie virtually all of contemporary biology. In a sense, Darwin's achievements seemed to me more difficult because of the leap of imagination required. But in another sense it was Darwin's extraordinary ability as an open-minded experimentalist that showed his true genius.

The core of my lecture is that Darwin was a brilliant observer, something all would agree upon. But that this practice of observation began, was nurtured and continued in the garden, the potting shed and the lawns, as well as the fields around the house in which he lived. He may have avoided calling himself a botanist, but there is no doubt we should admit him as a gardener.

I have visited Down House, Darwin's home of 40 years, where I was absolutely taken with the study where he worked and wrote the "Origin of Species". I was equally entranced by the garden, particularly his potager, and the very interesting glass houses and cold frames where he worked. Down House is near the village of Downe, close to Biggin Hill airfield, home of the Spitfires in World War II, that defended London.

Dr Danielle Clode, in her beautiful 2007 book "Voyages to the South Seas", describes the difficulty of scientific historians in writing the past from the present, due to the rapidity of change of scientific paradigms and ideas. She therefore tries to write history from "a contemporary viewpoint". One of the key reasons this is difficult in the history of science, particularly in the case of the largely scientific expeditions she covers, is Charles Darwin. As Dr Clode says:

"It is particularly difficult for the biologist whose path into the past is blocked by the mountainous legacy of Darwin ... To imagine a world without natural selection, without even evolution, is to imagine a world without foundation, without a past, a world in which life is one great amorphous substance".

Charles Robert Darwin was born into a wealthy family that had gardens and gardeners available to it. As a very young child Darwin was fascinated with plants. His studies at school and at his first University, contained little or no botanical subjects. But when he went to Cambridge this changed dramatically. The teaching of Professor John Stevens Henslow was a rigorous introduction to the field. The courses Darwin took with Henslow during, 1829 -31, constituted the longest formal study he undertook in any field. So it is surprising that while he was happy to consider himself a 'Geologist', he never accepted the appellation 'botanist' like his

esteemed friends Joseph Hooker at Kew and Asa Gray at Harvard. Darwin undertook much field collecting with and for Henslow before the *Beagle* voyage. This clearly helped to foster his knowledge of field botany and geology in Britain.



Charles Darwin at age six holding a pot plant.

Of major influence in Darwin's understanding of botany and more particularly of what we, though they did not, call 'ecology' was the work of Alexander von Humboldt, one of the greats of modern science. Mount Chimborazo was at one time thought to be the world's highest mountain. In climbing, almost, to its summit, Humboldt arrived at an idea of the distribution of plants which was highly formative in Darwin's ideas of transmutation (or evolution as we call it). Humboldt placed all of the families of animals and plants in geographies where they occur and noted the similarities between those occurrences, in form for different parts of the world. In other words plants which grow in alpine regions tend to look or have similar characteristics wherever they occur.

Humboldt's works were avidly read by Darwin and his colleagues on the *Beagle*. So when the *Journal of the Voyage of the Beagle* was published in 1839, it was with considerable trepidation that Darwin sent a copy to Humboldt in Potsdam. Happily he was rewarded with the most fulsome praise, and prescience that Darwin was a major naturalist of his era.

Darwin, his wife Emma and their young family moved to Down House in 1842. Darwin's love of the country had encouraged him to escape London, where he was caught up in the whirl of scientific meetings and socialising which he clearly did not like. Among the first things he did was to develop the garden to make the place look more like Emma's Wedgwood family home. He planted large flower beds. His brother Erasmus came down from London to assist Charles with a landscape plan.



Darwin's study at Down House

Later Charles developed a small orchard, then a kitchen garden and developed a composting pit for cow manure for his garden. In those days of somewhat more flexible local planning, Darwin arbitrarily moved the front public lane further away from his house and built an embankment for privacy. Along with all of this he added a number of rooms to the house itself.

Of course Darwin was writing, reading and researching at a time of enormous interest in plant and animal improvement. As Janet Browne writes in her monumental biography of Darwin:

"His notebooks took much of their special tenor from the generalised explosion of interest in animal and plant breeding in Britain during the period (mid-nineteenth century), an interest that married commercial acumen with radical improvements and diversification through a wide range of livestock, fruit and vegetables, in addition to garden flowers and domestic pets. One of the essential footings of Darwin's work was data taken from the developers of new strains of pears and potatoes, of pigs and dahlias."

The garden had a seminal effect on Darwin's thinking as demonstrated in a comment he made by the time he came to use the expression "natural selection", when he said "Who seeing how plants vary in a garden (and) what blind foolish man has done in a few years, will deny (what) an all-seeing being in thousands of years could effect, either by his own direct foresight or by intermediate means".

In his *Experiment Book* of 1856 Darwin details the work undertaken in his garden. He created what he called a 'weed garden'. He fenced off an area of turf from his orchard and completely cleared it. He then studied it meticulously with the help of his children and nanny to see what grew back and in what order. What occupied the space gave him some idea of how species might make new niches for themselves.

In addition to his best known published works, between 1862 and 1880 Darwin also wrote six botanical books of great importance: *Fertilisation of Orchids* (1862), *Climbing Plants* (1865), *Insectivorous Plants* (1875), *Cross and SelfFertilisation* (1876), *Forms of Flowers* (1875) and *Power of Movement* (1880).

Working in the fields around his home, as well as in his garden and greenhouse, he employed the assistance of his gardener, his children and their nanny in some quite extraordinary observational experiments. He was working with plants we find familiar in our gardens, Plumbago, Dipladenia, Clematis, Primula, Hoyas, Hibbertias and Clerodendrons, to name a small selection. He did meticulous studies on their germination, growth, form and habits, their reproduction and responses to all manner of light and temperature regimes.

Darwin's botanical work on the sexual reproduction of plants was crucial, not only to his development of the theory of natural selection but to the huge body of scientific work that flowed from his discoveries in how plants work. Though Linnaeus showed 100 years before the basis of sexual reproduction in plants. his work tended to support self-fertilisation in plants. For Darwin's theory to work, outcrossing was essential



Darwin's greenhouse at Down House

While he was himself a poor botanical draughtsman, he used the talents of his son George to assist him in his anatomical dissections and in developing a better understanding of how flowers worked. To Darwin, the flower, its adaptations to its environment and more particularly its adaptations to forms of fertilisation by insects, became a pillar supporting evolution.

Many examples can be given of discoveries made by Darwin in and in the fields around his garden. When Darwin's children gathered armloads of primroses in 1860, he noticed two types of flowers, one with a long style and one with a short style occurred in a 50:50 ratio. In experimental crossings in his garden shed, he showed that maximum fertility came from hybridisation, whereas the self fertilised flowers had reduced fertility. Just incidentally his discovery of what is called "heterostyly" was part of an extraordinary 3 month period in May to July 1860 when he made 3 outstanding observations that changed our understanding of evolutionary biology. The other two were the mechanism of pollination in orchids and the functions of insectivorous plants.

While picnicking, Charles and Emma observed the *Orchis mascula*, a beautiful little native of Kent. Darwin imitated, using a pencil, the proboscis of an insect to show how they picked up the pollen mass and transferred it to another flower. All of this was part of his building the case for co-evolution between orchids and insects.

In the last chapter of the *Origin of Species* Darwin sums up those questions I imagined him as a gardener to be asking in the field or in his home:

" ... when we regard every production of nature as one which has had a history; when we contemplate every complex structure and instinct as the summing up of many contrivances, each useful to the possessor, nearly in the same way as when we look at any great mechanical invention as the summing up of the labour, the experience, the reason, and even the blunders of numerous workmen; when we thus view each organic being, how far more interesting, I speak from experience, will the study of natural history become."