

Charles Darwin: an inspiring plant biologist and author

'From my early youth I have had the strongest desire to understand or explain whatever I observed' (Darwin 1881).

Charles Darwin's seminal book *On the Origin of Species by Means of Natural Selection* was published when he was 50 years old, in November 1859. The year 2009 marks the 150th anniversary of its publication. In commemoration of his enormous influence on the study of biology and on scientific thinking, *Functional Plant Biology* will publish over the coming year a series of papers on the evolution of important plant functions.

Darwin had published many articles and books before he was 50 years old, but none on his theory on the evolution of species by natural selection. When he received the letter from Alfred Wallace with an essay on the same theory of evolution, he had a 'publish or perish' moment. He immediately ramped up work on his *Origin of Species* and published it a year later.

The publication of his *Origin of Species* and the events leading up to it are well known. Less known is the extensive experimentation on plants that he started in earnest afterwards. This botanical research is summarised in the first paper in this issue (Purdie 2009). He extended his earlier work on cross-fertilisation, incompatibility and 'the good effects of intercrossing' leading to the stability of species. Rosemary Purdie describes from her botanical perspective the rigour and invention with which he conducted a series of experiments on additional topics including pollination of orchids by insects, how insectivorous plants worked, movements of various plant organs on a diurnal basis and the biomechanics of twining plants. He demonstrated the circling movement ('circumnutation') of all leaves and stems, and showed that roots circumnuted as well as responded to gravity. He found that leaf movement in plants whose leaves folded at night was controlled by the degree of hydration of the pulvinus. He studied the movement of various plant parts towards light, away from light, the effects of gravity, and proposed that in the coleoptiles of *Phalaris* the effects of light were transmitted by a substance from the tip to the lower part. These growth substances were much later identified as hormones.

Darwin published seven books on his experiments and theories on plant growth and reproduction. He described all experiments he carried in a lively and vivid writing style. They are written in minute detail, but a delight to read.

Not only the number of books is an inspiration, but also the way in which he structured them before starting to write. He did not start at the beginning and continue writing until he came to the end, a method that can prove fatal for inexperienced writers. In his autobiography he describes his method:

'With my large books I spend a good deal of time over the general arrangement of the matter. I first make the rudest outline in two or three pages, and then a larger one in several pages, a few words or one word standing for a whole discussion or series of facts. Each

one of these headings is again enlarged and often transferred before I begin to write in extenso' (Darwin 1881).

Functional Plant Biology will commemorate Darwin's work in a Collection of papers on *The Evolution of Plant Functions*. The reviews will be published in forthcoming issues of *Functional Plant Biology* (Volumes 36 and 37) and will be flagged as feature papers on the website. Up to thirty topics will be covered in this series. The articles start with an introduction assuming little or no prior knowledge of the topic so that they can be used in undergraduate and postgraduate teaching.

This issue of *Functional Plant Biology* contains three papers in the series. Rosemary Purdie's paper on Darwin's botanical studies forms an introduction to the series. The evolution of apomixis (non-sexual reproduction through seeds) in angiosperms is an appropriate accompaniment to Darwin's extensive work on hybridisation and incompatibility (Tucker and Koltunow 2009). The evolution of photosynthetic pigments in algae is illustrated with special reference to the rhodopsins (Raven 2009). Two recently published articles will be attached to this virtual special issue: on the co-evolution of host-pathogen responses featuring flax-rust resistance (Dodds and Thrall 2009) and on the evolution of alternative oxidase (McDonald 2008).

The titles of forthcoming papers in the series are listed on the *Functional Plant Biology* page of the Australian Society of Plant Scientists' website: www.asps.org.au. Further contributions are welcome.

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