

## TWO BOOKS BY DARWIN.

*The Various Contrivances by which Orchids are Fertilised by Insects.* By Charles Darwin, M.A., F.R.S., &c. Second Edition, Revised, with Illustrations. London: John Murray. 1877.

*The Effects of Cross and Self-Fertilisation in the Vegetable Kingdom.* By Charles Darwin, M.A., F.R.S., &c. London: John Murray. 1876.

We never look at any of the works of this great writer without being reminded of Professor Huxley's observation on 'The Origin of Species.' "We do not speak jestingly in saying that it is Mr. Darwin's misfortune to know more about the question he has taken up than any man living."

Every branch of the study of life that Mr. Darwin has touched he has thrown new light on, and has greatly advanced, and this he has done, not only by his clear reasoning and great grasp of mind, but also by his untiring patience and great skill as an observer; indeed, we hardly know what quality to admire most in this great scientific reformer. He has produced the most suggestive biological theory ever propounded; he has written book after book on points of natural history, each one of which is perhaps the best extant; and above all he is perhaps the most modest writer in the ranks of scientific literature. There is no such keen critic of Mr. Darwin's writings as Mr. Darwin himself, as all who read his books know well. The first of the two books now under consideration affords a proof, on the very first page, of the writer's eager desire to correct himself; for in the preface to this second edition he hurries to explain that Fritz Müller has written to him from South Brazil, "calling my attention to some errors."

The work has been so remodelled, and so much new matter has been added, that this second edition is practically a new treatise on the subject, and should therefore be carefully read by all men of science interested in this branch of vegetable physiology. The wonderful mechanical contrivances by which the fertilisation of orchids is effected are so clearly described that this work will fascinate and delight even the most unscientific reader; whilst scientific students who believe in the doctrine of development will find their faith revived by the suggestions thrown out by the author as to how these complex pieces of machinery may have been developed from far simpler forms of vegetable sexual apparatus.

The second book, *i.e.*, that on the effects of cross and self-fertilisation of plants, is not so attractive a work to the non-scientific reader as the last, as it consists, for the greater part, of careful descriptions of experiments and tables of the results obtained from them. But all who take an interest in the subject will find this part of the book most valuable. The methods used for determining the effect of the different modes of fertilisation are simple, and give probably the best results obtainable. They consist in sowing seeds from self-fertilised and cross-fertilised plants side by side and measuring the stalks of the plants produced from each, and in some cases weighing the two crops. By this method, and by noting other smaller particulars of the growth of the plants, such as the time taken before the sprouting of the seed, the date of flowering and the weight and average fertility of the seed produced, Mr. Darwin endeavours to prove that cross-fertilisation—*i.e.*, fertilisation by the pollen of a separate individual—is advantageous to plants wherever such cross-fertilisation is possible, and we think that he has succeeded.

In addition to the proof of the main subject of the work this book contains much valuable information on the general sexual relations and functions of plants, particularly on the points of fertility and prepotency.

There is one incident told in this book of which it is well worth while to give a short account, as it illustrates admirably many points of Mr. Darwin's modes of thought and of the methods by which he often is enabled to get very great results.

It appears that both Mr. Darwin in England and Fritz Müller in Brazil experimented on the relative fertility of *Eschscholtzia Californica*, when self-fertilised and when cross-fertilised. Mr. Darwin found this plant

fairly self-fertile, whilst Fritz Müller found it absolutely self-sterile. Here were materials for a very pretty paper war had either of these observers been disposed to impugn the accuracy of the other's powers of observation, and many a scientific wrangle has been carried on on far smaller grounds. But Mr. Darwin's method of settling the dispute was to send to Fritz Müller for some seed of the Brazilian stock, and experiment upon it himself, with the result that the first generation of plants raised was self-sterile, the next generation slightly self-fertile, and the next more self-fertile, so that, by the result of these experiments, Mr. Darwin obtained a fresh proof of the influence of climate and conditions of life on the sexual functions, a point on which he has insisted in his work on "The Variation of Plants and Animals under Domestication."

There is one other point which ought, perhaps, to be noticed before taking leave of this book. In a note to Chapter X., Mr. Darwin throws out a very bold speculation, which will no doubt arouse a good deal of discussion amongst the leading physiologists of the day. This note is as follows:—"There is a considerable amount of evidence that all the higher animals are the descendants of hermaphrodites, and it is a curious problem whether such hermaphroditism may not have been the result of the conjugation of two slightly different individuals, which represented the two incipient sexes. On this view, the higher animals may now owe their bilateral structure, with all their organs double at an early embryonic period, to the fusion or conjugation of two primordial individuals."

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