

## LITERARY NOTICES.

THE EFFECTS OF CROSS AND SELF-FERTILIZATION IN THE VEGETABLE KINGDOM. By Charles Darwin, M.A., F.R.S. Murray.

Though confined to the fertilization of plants, and indeed of flowering plants, Mr. Darwin's book is really of the very widest interest, for there can be no question that, making allowance for the differences of circumstances, the same general principles apply in the case of all living creatures. The Social Philosopher, the Statesman, and the Political Economist, will do well therefore to make themselves familiar with the leading results of Mr. Darwin's experiments. It may seem at first sight far-fetched, if not absurd, to bracket together the health, the welfare, and the multiplication of nations and of the human race generally, with such seemingly insignificant questions as the visits of a butterfly to a cabbage-garden, the number of peas in a pea-pod, or the size and vigour of the juvenile seedlings. It admits of no doubt, however, that the same conditions which are of vital consequence to the multiplication of plants and the production of vigorous offspring, are of equal importance in questions affecting the welfare and perpetuation of the human race. From this point of view it must be conceded that Mr. Darwin and his followers are rendering, and have rendered, practical services to humanity, beyond what the metaphysicians have ever been able to accomplish. While much even that the statesman and social reformer do is necessarily only of temporary importance, the work of the natural philosopher will be of advantage throughout all time.

Since the publication of the author's work on the 'Fertilization of Orchids,' it has become widely known, even among those who are not specially botanists, that the ripening of the seed of any particular flower, and the vigour of the seedling, are most perfect when fertilisation is effected by pollen derived from a different flower of the same species. Some flowers, indeed, are absolutely sterile with their own pollen, though fertile when pollen from some other flower, on the same individual plant, is applied to them; and still more so when the farina from a blossom of another plant of the same species is employed.

Mr. Darwin has worked out in detail the peculiarities of the mechanism by means of which these results are necessarily secured. He has made known to us the facts that in some flowers the pollen is ripe at one time, the stigma and the ovules at another, and has hence proved how necessary it is that the pollen from the one should be transported to the other description of flower. He has proved that in many cases the visits to the flowers of insects, or, it may be, of birds, are absolutely requisite to insure the full production of seed. With admirable sagacity and ingenuity he has made manifest the intimate relation between the conformation, colour, perfume, and other attributes of the flowers, and the structure and habits of the various insects which frequent them. He has shown how, in the absence of insects of the required structure, fertilisation does not take place at all; how, if insects are deficient in number, the seed crop is proportionately small. In other instances he has pointed out how, in cases where the action of insects is not necessary, the flowers are wanting in the bright colours and sweet perfumes which serve to allure the winged visitors in other cases. The wind here serves as the pollen carrier, and an entirely different set of structural adaptations is consequently developed.

These adaptations are often widely different in closely allied plants. In other words, the physiological characteristics of plants closely related one to the other in point of structure are often widely diverse. On the other hand, we sometimes see whole orders characterized by the same structural adaptations. The flowers of the great order of Crucifers—the cabbage tribe—require, with few exceptions, the aid of insects to set their seeds. One exception, a very curious one, is that of the Kerguelen Island cabbage (*Pringlea antiscorbutica*). The flowers of this plant it seems are fertilized by wind-wafted pollen, a fact co-related by Mr. Darwin with the remarkable absence of winged insects on the island.

The work before us is the complement and sequel to the author's other researches, and it is full of records of observation and of the results of direct experiments carried out with well-nigh unrivalled patience and skill for the last thirty-seven years. Of all his works, then, this, we venture to say, is the one which, apart from that in which the evolution theory was first propounded, will be longest remembered by scientific readers, and the one upon which the author's fame as a patient and careful investigator of facts will be based. It may be said to have owed its origin to some experiments carried on for another purpose. In the course of these experiments, it was observed that crossed plants of the common toad flax (*Linaria*)—that is, seedling-plants raised by means of the agency of the pollen of one flower on the ovules of a different one of the same species—were taller and more vigorous than those which were the result of self-fertilization, that is, the operation of the pollen on the ovules of the same flower. Starting from this point extremely numerous comparative observations were made with the care necessary to ensure accurate and strictly comparable results. These observations were in many cases followed out through ten successive generations a fact which in itself testifies to the enormous labour and patience of the experimenter. The general results from all these observations are the same. In the great majority of cases the crossed plants yielded seeds in greater profusion, and that seed grew into healthier, more vigorous progeny than in the case of the so-called self-fertilized plants. The means by which this excess of vigour was tested was by simple measurement. The comparative weight, which of course affords a better test, was not tried in all cases, which is to be regretted. It would also be desirable in future to make some experiments as to the comparative amounts of oxygen gas evolved by the two classes of seedlings, because it is evident that the mere measurements do not by any means necessarily give an idea of the whole amount of chemical and physiological work done in the plants.

The proofs adduced of the advantages of cross-fertilization are overwhelming, and the evil effects of self-fertilization are shown to be remedied by cross-fertilization or in other words, by the infusion of new blood.

The African Exploration Fund, of which the Prince of Wales is the patron, has now become a constituted Association. The King of the Belgians has been taking much interest in it, and with two such Royal personages to take an active part in its proceedings, we may expect important enterprises and results. The President is to be the President of the Royal Geographical Society for the time being, and Mr. H. W. Bates is appointed Secretary.

Mr. Young is to read a paper before the Royal Geographical Society on the 22nd inst., when he will doubtless give an account of the Scotch Mission, and its highly interesting work on Lake Nyassa. The Tribes of that district give great promise of civilisation, and the Missionaries sent out there to accomplish the task have been chosen with great regard for their skill in handiwork. The workshops and schools they have opened have at present been most successful, and through the exertions of the Missionaries, animosities between Tribes have been subdued.

In all parts of Africa the work of exploration and civilisation seems to be satisfactorily progressing. Some eight or ten distinct expeditions are prosecuting explorations, and ere long the whole Continent will become not only well-known in a geographical point of view, but the formation of roads, and the introduction of Christianity and commerce, must speedily follow. This cannot, however, in these equatorial regions be accomplished without some loss of life, and we regret to learn that Herr E. Mohr succumbed at the very outset of his exploration, and died of fever on the 26th of November, at Malanje, and Baron Barth, who went out charged with a geological expedition to the Portuguese possessions on the West Coast of Africa, died at Loanda, on the 7th December.

The Indian Government are endeavouring to despatch an Overland Expedition from Peking to Lhasa, with the idea of opening up trade between India and Thibet, and for that purpose are in negotiation with the Chinese Government.

Messrs. MARCUS WARD & Co. are preparing an illustrated work upon the recent Arctic Expedition. The illustrations will consist of about sixteen fac-simile chromographs from water colour drawings made by Dr. Edward L. Moss, surgeon of the Alert, who also contributes the descriptive letter-press, in a narrative form, and wood engravings, also from his sketches, will be interspersed. When we consider what difficulties a water colour artist must labour under with the cold many degrees below zero, the amount of clothing the fingers must require in such a temperature to keep off frost bites, and the paint freezing in the brush, it is wonderful that scenery in such latitudes can be portrayed at all.

A new edition of BOSWORTH'S CLERGY DIRECTORY is out. Its generally admitted accuracy, its compact form, and its various branches of information, will assure it universal acceptance.

THE WEATHER, or a new plan of *Forecasting Gales and Floods, &c., &c.*, by W. G. WENLEY, CHELMSFORD; E. DURRANT & Co.—This is a pamphlet, compiled from a series of letters written to a contemporary by Mr. Wenley, of Chelmsford, between March 7th, 1873, to Dec. 4th, 1876. The author is a meteorologist, who for some 23 years has given more or less attention to the action of the barometer, and hopes and believes he has discovered a law which will double the value of the barometer as a guide. There can be no doubt that the science of forecasting the probable weather even for 48 hours is as difficult as it is abstruse; and the thousand causes that affect the weather, be they atmospherical or local, require many years of unwearied attention and study before the student can lay down a few infallible rules for "Forecasting Gales and Floods." To those who make the forecasting of the weather a study rather than a pastime, the letters before us will supply many ideas whereon to work as a basis for an approximate correctness in their "forecasting." Mr. Wenley is not a Lunarist, as is Capt. Sarby; but appears to apply himself more to the theory which Admiral Fitzroy broached some years ago—that the weather is to be judged from the direction taken from time to time, by the "aerial wave" which is passing over any given place. It is well known that the barometer is affected by this "wave;" and Mr. Wenley thus estimates the value of this instrument; at page 4 he writes:—

"I believe it will be found that there is exactly the same amount of dynamic force developed in a given fall and rise of the air (or its exponent mercury); that if we suppose the fall and rise to be one inch, and it be completed in six hours, the result will be a hurricane, if in 12 hours a gale, if in 24 hours a breeze, if in 48 hours a gentle wind only."

We might quote many sentences which contain valuable matter, but we must refer our readers who have a taste to investigate this one of the invisible things of creation, to the little book itself, as we feel satisfied no one can read these letters without gaining instruction in weather lore.