

The conclusion is that fleshy albumen is endowed with independent activity in germination, the embryo having only to absorb matter already dissolved; but the embryo of seeds with mealy and horny albumen evolves a fluid rendering the latter soluble.

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### Notices of Books.

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*The Different Forms of Flowers on Plants of the Same Species.* By CHARLES DARWIN, M.A., F.R.S. Murray. London. 1877.

It is usually the fortune of great authors to have their fragments brought together by a not necessarily sedulous or over-wise editor, and by this means it often happens that sufficient justice is not done to them. That there is no danger of this occurring in Mr. Darwin's case is again shown by the volume at present before us, in which the memoirs on dimorphism and trimorphism are rescued from the comparative oblivion of the "Linnean Proceedings." The subject is so bizarre that one cannot wonder at its attracting the notice and experimental energy of several observers; and the results of Scott, Hildebrand, H. Müller, &c., have been worked in with the original material, the details of which they so strikingly confirm. For the whole subject Mr. Darwin prefers Hildebrand's term of Heterostylism; its origin he explains by way of variability in the length of pistils and stamens, with almost simultaneous manifestation of the special reproductive affinity. It is insisted that great care is requisite before heterostylism can be definitely predicated of a species, since this consists not simply in difference in length of styles and stigmas, but also in size and often in colour of the pollen-grains, in size of the anthers and of the stigmatic papillæ, and finally in fertilisation. When, however, we can be certain that a plant is truly heterostyled, Mr. Darwin holds—and this seems to us the *crème de la crème* of the book—that we have before us an arrangement for effecting cross-fertilisation in every way comparable with the other means for ensuring the same end; viz., diœcism, dichogamy, self-sterility, prepotency of foreign pollen and entomophily.

The separation of the sexes in phanerogamous plants which are thought to have descended from hermaphrodite ancestors is a subject which has already brought out the ingenuity of the present author, and we are again indebted to him for some more light on the subject. He suggests that diœcious plants have arisen from the species having been exposed to conditions unfavourable for the production of pollen and ovules by the same individual, it being evident that cross-fertilisation with its benefits is not the object of the modification, because a species must have been adapted to cross-fertilisation before its assumption of diœcism, or otherwise sterility would have resulted. On this view, then, diœcism is a phenomenon of degradation, an opinion which, however it may conflict with current notions derived from the animal kingdom, has our strong support. Mr. Darwin does

not pin his faith definitely to this, however, and shows that some individuals might vary beneficially by maturing larger seeds, and that by compensation the production of pollen would be lessened; but that as soon as this took place, other individuals would vary by producing more pollen to make up for the diminution in the others, and have their ovules reduced in size by compensation; this process might evidently go on until dioecism was arrived at.

On the origin of gyno-dioecism, or production of species consisting of females and hermaphrodites, we feel compelled to differ from Mr. Darwin. H. Müller, struck by the smaller size of the corollas of the female flowers, supposes that some individuals varied by bearing larger flowers which were preferred by insects to the smaller ones, under which circumstances the latter were saved the now superfluous task of producing pollen. The view adopted in the present volume is supported by three isolated experiments (two of which were unfortunately on cultivated plants, and one of the two of very doubtful nature), which showed that the females are more productive in seeds than the hermaphrodites, and would lead to the belief that increased fertility is the cause of the separation of the two forms, the smaller size of the female flower resulting from the spreading of the tendency to abortion from the andræcium to the corolla. For ourselves we cannot help thinking that gyno-dioecism can be better explained on the view of a sufficiency of pollen for the fertilisation of all the individuals of a species being produced by only a few of the flowers, so that instead of some of the anthers of all the flowers becoming abortive—a very common occurrence—we see here abortion of all the anthers of some of the flowers. This simple suggestion is borne out by the result of Mr. Darwin's experiment with *Satureia hortensis*, in which it was found that bees were able to fully fertilise ten female flowers with pollen from a single male, and also by the fact that all known instances of gyno-dioecism relate to species which have the maximum of stamens possessed by the orders to which they respectively belong, and are without any specially complex entomophilous structure. We may also remark on the pauciovulate condition of gyno-dioecious species, and ask why do we not see this form of sexual separation in multiovulate ones, where a much greater effect would undoubtedly be obtained? The result of Mr. Darwin's experiments on fertilisation (such as they were) does not militate against us, for it is easy to understand that at any time it would be advantageous to the species if the anthers were as well provided with pollen as possible, and this might result, by compensation, in somewhat diminished fertility. We think, though, that Mr. Darwin's explanation of the reduction in size of the female corolla is correct.

The closing chapter deals with cleistogamy, and contains Kuhn's list,\* with a few emendations and additions. This wonderful pheno-

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\* This list contains the two Asclepiadaceous genera *Stapelia* and *Hoya*. It is indeed difficult to conceive cleistogamy in this order, and our suspicions were aroused on first perusing the list. Since then Mr. N. E. Brown, who is making a careful study of *Stapelia*, has informed us that he doubts whether the flowers of this genus are ever cleistogamic. After pollination, he says, the corolla falls off, and the calyx-lobes close over the ovary, the flower remaining in this condition till the next year, when the ovary begins to swell.

menon is thought to owe its origin in part to the liability of the perfect flowers to fail in their fertilisation, owing to stress of weather or absence of the fertilising insects. A self-fertilisable plant may also have been prevented, either at the beginning or at the close of the season, from properly expanding its flowers, but not have lost its capacity for self-fertilisation. Natural selection might then complete the work, and cause strict cleistogamy. This chapter seems to be less satisfactory than the others, for not only does Mr. Darwin appear to us to lay too much stress on the mere morphological peculiarity of reduction in size of the floral parts as a criterion of a phenomenon essentially physiological, but he omits from the list of cleistogamous species all mention of the *Vandææ*, which affords very striking instances when their high entomophilous specialisation is considered. He is also incorrect in saying that in *Epidendrum* the parts of the closed flowers are not reduced in size, for we have ourselves seen a living specimen from Trinidad in which the contrary was plainly the case. *Apropos* of *Leersia*, we would suggest that someone should examine other grasses—such as *Panicum* and *Rottboelliaceæ*—for detection of cleistogamy. Incidentally, too, we may mention that the plant on which Philippi's genus *Heterocarpæa* was founded is nothing more than a *Cardamine* (probably *C. chenopodiifolia*, St. Hil.), and that the strangeness of the pod of the cleistogamic flowers being a silicula is lessened by Dr. Hance's discovery of a species growing in China (*C. paradoxa*, Hance), in which this is the ordinary form of fruit.

S. M.

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## Proceedings of Societies.

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LINNEAN SOCIETY—November 1st, 1877.—Prof. Allman, F.R.S., President in the Chair. Messrs. S. M. Samuel and P. Wyatt Squire were elected Fellows.—The Rev. T. H. Sotheby of Langford, Budville, Somerset, exhibited branches of a shrub, originally obtained by him from Lady Rolles's garden at Bicton. It was described and figured by Dr. Lindley in vol. 5 of the Journ. Hort. Soc., under the name of *Colletia bictonensis*, and then stated to be a seedling raised from *C. spinosa*. It had, however, been described in the Botanical Miscellany by Sir W. J. Hooker, twenty years before, under the name of *Colletia cruciata*, from dried specimens collected by Dr. Gillies, near Maldonado, Rio

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Mr. Brown thinks it probable that this calyx-closed state has been taken for a cleistogamic one, and this probability is strengthened by the presence of five glands looking like aborted petals between the calyx and the ovary. Is it not possible that a similar mistake may have been made with *Hoya*? It is a pity that Mr. Darwin should have trusted to Maximowicz's earlier description of *Kascheninikowia* (he appears not to have seen the recent revision), so as to eliminate it from the cleistogamic list, and, in so doing, to broach a most unfortunate suggestion concerning its fertilisation. There is not the slightest doubt but that the genus is truly cleistogamic.