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## PLANTS AND THEIR ENVIRONMENT.

*Les Végétaux et les Milieux Cosmiques (Adaptation-Evolution)*. Par J. Constantin. Pp. 292. Avec 171 gravures dans le text. (Paris: Félix Alcan, 1898.)

THIS little book has some admirable points which can be urged in its favour, and it also exhibits lacunæ which are a source of irritation to the reader. Chief amongst its more obvious defects is the entire lack of reference to literature. In a book of this sort such references are particularly desirable, as it will be read by many who may have no special first-hand acquaintance with the sources whence M. Constantin draws his facts.

The book is well conceived and clearly written, though of course it makes no claims to be considered as an exhaustive treatise.

The various kinds of surroundings in which different plants live, and the nature of the corresponding response on the part of the plant organism forms the main thesis of the book. An example will serve to illustrate the author's method.

The cold temperate climate on the whole tends to favour the production of dwarf plants, whereas the colder seas, as is well known, are the home of the largest algæ. Ultimately both of these apparently contradictory effects are to be explained on nutritional grounds, the short period of terrestrial vegetation, during which alone assimilation can proceed, is to be contrasted with the more equable temperature of the sea, and especially with the fact that nutrition is favoured, in the case of aquatics, by lower temperatures, since gases are more soluble, and hence more abundantly at the disposal of the organism, than would be the case in warmer water.

Similarly, the effects of light, gravity and aquatic surroundings upon the structure and form of plants are discussed, and the reader will find much to interest him in the pages which deal with these topics. At the same time it must be confessed that the treatment strikes one as somewhat superficial at times, especially when the author wanders into the paths of theoretical interpretation.

M. Constantin shares the belief, emphatically held by some German botanists, in the direct influence of the environment not only as modifying the form in the individual but also as impressing, without the aid of natural selection, that form on the species as part of its inherited stock; and one chapter is devoted to an attempt to establish the thesis that acquired characters are inherited. As usual, however, in such cases, the meaning of "acquired characters" is not rigidly defined, nor separated from latent possibilities in the organism which the environment is able to emphasise simply by providing that stimulus which ensures their positive appearance.

Some of these variations, responsive to the external requirements, are certainly very difficult of explanation on the doctrine of selection, but the opponents of this

theory sometimes seem to overlook the fact that, in the first place, it is not in the least necessary to assume that variations will be *slight*; they are often, on the contrary, in the case of specially plastic individuals, very extensive when these are subjected to a change of environment. And, in the second place, it is not necessary to suppose that any given species, and far less any individual, will vary equally in different directions round its average or mean. A very slight acquaintance with horticultural operations is enough to convince any one that certain races are specially plastic as regards one organ, whilst in others modification is most easily provoked in a different one. And selection, acting as it essentially does by eliminating those which conform less readily to the requirements of the environment, can hardly be dismissed, as M. Constantin dismisses it, as of relatively small importance in the evolution of species. But the difficulty really does exist if we only assume the possibility of slight variation ranged equally round a mean. In this case, of course, it is difficult (apart from isolation, physical or physiological) to see how a new species could be evolved at all when the chances of intercrossing are considered. But, as has been indicated, such a restriction is entirely gratuitous, and, furthermore, is contradicted by experience.

The facts adduced by the author, drawn from the studies of Schübeler and Bonnier, on the sudden evolution of spring- from autumn-wheat, hardly seem to help the case of the inheritable influence of the surroundings at all. For it is conceded that if autumn-wheat be sown in spring, a large percentage of the plants do not ripen fruit. Those that do succeed may, however, be supposed so to develop because their latent possibilities in this direction were greater than those possessed by their unsuccessful comrades. Next year, of course, the sowings obtained from the survivors will possess the same character for speedy growth and early maturity in a far larger average number, since the parents *all* had clearly a trend in the required direction. But it is misleading to speak of this as an inherited effect due to the impressed action of the environment, *i.e.* the inheritance of an acquired character, for it is clearly nothing more than the encouragement of possibilities which were latent before, and, but for the changed conditions, might never have been raised to the position of criteria of existence at all.

But this confusion between an outside moulding influence (*e.g.* mutilation) and the *evoking* from the plastic organism of a suitable response to the environment imposed by new conditions, is very wide-spread; and although the difference is in reality one altogether of kind, it is often in practice overlooked.

A good summary is given of some of the interesting results obtained by French investigators on crossing races and species, but some of the other chapters strike one as rather weak, *e.g.* those dealing with the action of gravity on plants. The account of aquatic plants is also somewhat disappointing, especially as the author has himself worked in this branch of the subject.

Nevertheless, the book is worth reading, bringing together as it does a considerable body of scattered facts which are lucidly arranged within a moderate number of pages.

J. B. F.

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