

purposes. But he must be a bold man who dares assign to it historical limits;—on the contrary, it may be supposed to date from the creation—or rather, it is in a manner certain that it does. The presence of winds or insects must necessarily from the beginning have produced effects upon plants which resulted in hybrid productions.

Hybridizing is effected by applying to the stigma of one plant the pollen of some other; the end of which is the generation of a form, participating more or less in the attributes of both its parents. Nature, in her wildest state, opposes no insurmountable difficulties in the way of this operation. Insects, bespattered with the pollen of one plant, plunge into the recesses of another, and thus effectually destroy the purity of races. The natural brush on the body of a bee will convey the subtle powder as well as the trim camel's-hair pencil of the artificial operator.

It is contended, indeed, that this cannot be; because if it were so, all species must, in the lapse of ages, be confounded in one inextricable chaos. But in the first place, this supposition is of little force, till it is shown that that which is easily done artificially cannot possibly take place naturally; and secondly, it must be proved that the wild races of plants actually do remain in all their original purity. No botanist would, we suspect, venture upon such an argument as that. The genera *Salix*, *Rubus*, *Rosa*, and *Carex*, would make the stoutest advocate of original purity pause before he threw himself into the lists. Nobody, in fact, can possibly doubt that wild hybrids exist, are common, and perhaps much more frequent than we think for. We will not stop to quote notorious and proved instances of this, because we regard the fact as being beyond all dispute.

Let us not, however, infer from this that no natural obstacles are opposed to the indiscriminate mixture of races in plants; on the contrary, there are barriers which cannot be overleaped. By some mysterious agency, there is a complete bar to all intermixture of plants not closely related to each other. An elm may certainly mix with an elm, and perhaps with a nettle-tree; but not with an oak. A peach may, peradventure, cross a plum, but not an apple. These obstacles are, doubtless, connected with the molecular constitution of plants, the precise nature of which we have no means of examining. Another obstacle consists in the obvious fact that the pollen of a flower has a better opportunity of falling upon the stigma that belongs to it, than pollen brought from any distance; and we know that if pollen has once taken effect, no after-application of other pollen can change the result. In fact the natural hybrid of wild plants will generally take place when, owing to some accidental cause, the proper stamens of the flower prove defective.

But there is a still more effectual obstacle to the confusion of races by natural hybridizing. Although we conceive that the production of hybrid plants naturally is of more common occurrence than may be supposed, it must be remembered that the preservation of them is quite an artificial process. A hybrid tree springs up; it has no means of multiplying itself, except by seed. That seed has no stable constitution, but has a tendency to return towards the condition of one of its parents; in this way the hybrid disappears, while the parents remain; or it may be, and often is, barren; and then it remains as a solitary, childless individual. Again, a hybrid herb appears; it is exposed to the same obstacles as the tree, in the way of perpetuation: it is barren; its seed of themselves tend towards the original stock, which is recovered in a generation or two; or they are at once fertilized by the pollen of one of the hybrid parents, when the tendency to a return to its original stock is increased tenfold in strength. It is not, therefore, likely that natural hybrids will often be long perpetuated, although they may be frequently produced.

We mention these things by way of vindication of hybridizers, who have been accused of attempting to subvert the whole order of nature by monstrous practices. It is clear that they only imitate the practices of nature. It is equally clear, too, that the occasional formation of natural hybrids is intended as a manifestation to man of one of the sources of power with which he is so largely provided:

His reason is to be called upon to turn to profitable account that which, in savage nature leads to no result.

Hitherto the operation of hybridizing has been mainly confined to gardens. But see what advantages have come of it there. What were our *Roses* in 1789, when the first China Rose reached England? and what are they now? The China Rose hybridizes so freely with almost every other, that there is hardly an ancient species to which it has not lent some part of its rich foliage, gay colors, and abundant blooming. Can anything be more striking than the effect of hybridizing upon *Pelargoniums*, *Heaths*, *Gloxinias*, *Verbenas*, and *Gladioli*? By this process we have given to the hardy Pears of the north all the richness and delicacy of those of the south; to watery grapes the perfume of the Muscat; to the pale-faced but hardy *Rhododendrons* of the Caucasus and America the rich and glowing colors of their tender brethren of India; to the gaudy *Azalea* of Pontus, the crimson of the small-flowered fragrant species of the United States.

Such striking consequences of the very first operation in hybridizing, have excited a universal desire to vary and extend them. Everybody now, who cares for his garden, asks himself in the first place what he can do to get new seedlings; and to hybridizing he looks exclusively for assistance.

Hybridizing is a game of chance played between man and plants. It is in some respects a matter of hazard. What increases the charm of the game is, that although the end of it may be doubtful, yet a good player can judge of the issue with tolerable confidence, and that skill and judgment have in this case all their customary value.

Though hybridizing has already led to important results, they are probably nothing compared with what may be expected to come of it. We anticipate through its assistance a change in the whole face of cultivated plants, and we shall be much surprised if even a few years do not bring us acquainted with races of trees, esculents, corn, and forage plants, of at least as much importance in their way as those which have already appeared among fruits and flowers; all that is wanted is to call attention to the subject, and to point out what the principles are which the experimenter has to bear in mind.

The effect is produced by applying the pollen of one flower to the stigma of another. The pollen indicates the male parent, the stigma the female. In performing the operation, it is necessary to use these precautions:—The female flower must be deprived of her stamens before they burst and disperse their pollen; and as soon as the stigma is glutinous enough to hold it fast, the pollen must be applied with care. Should this care not be taken, the stigma is very likely to be inoculated with the pollen of her own or some other flower, and then the pollen which it is intended to use will not take, for it must always be borne in the mind that a stigma once inoculated cannot be inoculated again. From want of these precautions, people are continually fancying they have obtained hybrids when they have only gained natural seedlings. At least half the specimens of so-called hybrids sent to us for examination, are not hybridized at all. When the Dean of Manchester, who is the greatest of all authorities in this matter, wishes to obtain a cross, he always endeavours to force the female parent before others of its kind blow, so as to be insured against accidental inoculation from pollen floating in the air. Want of attention in these minute has led to some singular errors on the part of a very ingenious correspondent, who fancied he had obtained hybrids between *Crinum*, *Ismene*, *Buphane*, *Calostemma*, &c., while he had only raised the usual seedlings.

It is hard to say within what limits the operation may be successfully practised. The general rule is, that plants very nearly related, are able to inculcate each other. But there may be exceptions to this. At least we know that very near connexions have, or seem to have, a great aversion for one another. For example, a Raspberry and Strawberry are first cousins, yet they appear to have no mind for an alliance. A Gooseberry, Currant, and Black Currant, are still nearer to each other, and their repugnance seems invincible; at least nobody has yet found means to hybridize them with each other, though many have attempted it. On the other hand, *Heaths*, different