Mr. Charles Darwin, in "Cross and Self Fertilization," chap. x., p. 381, says: "We certainly owe the beauty and odor of our flowers, and the storage of a large supply of honey in them, to the existence of insects;" and Professor Asa Gray, in his recently issued "Structural Botany," p. 217, follows by observing: "Anemophilous flowers are mostly destitute of odor, and not nectariferous;" and further, p. 218: "Nor do we know that fragrance or other scent, or that nectar subserves any uses to the flowers than that of alluring insects." You see that the idea uppermost in the minds of these authors is that some direct good to the plant must be inferred from its peculiar form, color, fragrance, or secretions, and the absolute necessity of mere variation is wholly ignored. But we have color and odor even in minerals. We do not look to any special benefit to them from these possessions, but we can understand why they should possess them under the universal law of variety. Besides, odors and sweet secretions are not confined to flowers, but pervade all parts of the plant alike. The leading veins of catalpa, as recently shown by Mr. John A. Ryder, of the Philadelphia Academy of Natural Sciences, are furnished with glands which secrete nectar and furnish food for innumerable ants. We may agree with Dr. Gray that this nectar is for the purpose of alluring insects; but where does the good to the plant come in? Odor and color abound in great variety among toadstools, lichens, and seaweeds. Have these been developed to make them attractive to insects for any purposes that we can conceive of in connection with individual good? They have separate sexes, they have color, and they have odor, and they cross-fertilize; but cross-fertilization is not effected by any insect agency. If, as Mr. Darwin says, we should not have had beautiful or odoriferous flowers had insects not existed, how did these lower orders of plants come by color? We cannot understand it on any theory of natural selection, but we can understand it on the basis of the necessity for a universal variety in all things. Again, bright color is not confined to flowers. In tropical countries colored leaves abound, and of these the Begonias, Crotons, and Dracænas of our greenhouses afford familiar examples; and, strangely enough, most of these colored-leaved plants belong to classes which are supposed to be anemophilous, or fertilized by the wind, and can there-

fore have no object in making themselves attractive to insects.

But perhaps the most remarkable fact of all is, that the statement of Dr. Gray, that anemophilous plants have flowers mostly destitute of odor, is probably incorrect. Certainly there is odor in a large number of anemophilous plants. In monœcious and diœcious plants color or fragrance is usually present in the male flowers. And often both are there, but wanting in the female, unless in flowers with a conspicuous corolla, such as in cucurbitaceous plants. In these cases the degree of fragrance is equal. But odor to a greater or less degree exists in the willows, poplars, maples, rhus, spinach, Indian corn, palms, sweet chestnut, and others; but always in the male, and never in the female flowers. Instead of anemophilous flowers being mostly destitute of odor, I have not been able this year to find any male flowers of this class that have not odor, with the single exception of the common field sorrel, *Rumex acetosella*. The sweet chestnut, *Castanea Americana*, is indeed remarkable for the prodigious amount of odor and other material which, under prevailing notions of individual good, must be regarded as absolute waste, but which comes to be looked on as the height of wisdom under the laws involved in variation. As the branch grows the axillary buds, which in many plants remain dormant till spring, and then, perhaps, make a new branch, push at once and make a spike of male flowers. A bunch of these will fill a room with fragrance. There are about fifty clusters of these flowers in a spike, five flowers in a cluster, five spikes to one branch, and hence twenty-five hundred male flowers; and these all fall before the female flower with its attendant male spike is formed, and which appear at the termination of the growth instead of at the axils. There is no conceivable use for this immense crop of precocious male flowers with its attendant fragrance under any law of reproduction; but if we take into consideration the immense number of minute creatures on the earth, in the atmosphere, in water, everywhere, and the evident design of nature that they should be fed, we may understand, under the laws of variation, how even a chestnut may be made to scatter this food in profusion through the atmosphere, even though not the slightest benefit to itself or to its race should follow the act. Even the views of Professor Huxley, that the coal measures of England are the product of pollen which fell during 30,000 years in the carboniferous era, are explainable under the operation of this law of variation for the purpose of ultimate universal good, but under no theory of individual benefit from natural selection that I can see.

In pursuing our studies of the odors of flowers, we shall find many difficulties in believing that they were developed for the chief reason of attracting insects for the purpose of cross-fertilization. Not the least of these difficulties is the fact of many genera of showy colored flowers existing, which may have one or two species highly odoriferous and the rest destitute of scent. The violets of Europe are of this class. *Viola odorata* is very sweet; the pansy less so; the rest are comparatively scentless. American violets show the same characteristics. I am familiar with many species, but I only know of *Viola primulæfolia* and *Viola blanda*—two nearly allied species—that would be called sweet. Has fragrance given these sweet species any advantage in the struggle for life? If so it is, at least, not apparent. On the other hand, observation will show that the scentless flowers of these genera are just as freely visited as those which have odor. Of the many species of *Reseda* I only know of one that is fragrant, the common mignonnette. In my garden, *Reseda undata*, wholly scentless, is as freely visited by bees as its sweet sister species. Again, it is a fact that among the sweet mignonnettes some are less fertile than others, and that the least productive have the most odor. Another remarkable case in which color and fragrance are in inverse proportion to productiveness is afforded by the genus *Rubus*—the blackberry and raspberry class. *Rubus odoratus* is beautiful and fragrant. How rarely it fruits is notorious. *Rubus cuneatus* is not high colored, but it is fragrant. Not half the flowers usually produce anything, and many of those which do give but a very few carpels. *Rubus Canadensis* has very showy white flowers, but no odor, and its "berries" are always more or less defective. *Rubus villosus* is less attractive than the last, and is more perfectly productive. But the most fertile of all the species is *Rubus occidentalis*. I do not know that I ever saw a flower that did not make a perfect fruit, and yet it has no odor, scarcely any petals, and these of such a green shade of white as to be actually inconspicuous. On the ground of variety, in which fragrance is to play its part, and which must of necessity permeate all things, we can understand its uses; but we are lost when we attempt to explain such facts as these by any hypothesis that has for its foundation mere individual good.

May we not, then, logically say that sex in nature is not primarily for reproduction, but to insure variation; that questions which properly come under this law of variation have but a remote relationship to questions of natural selection, but are referable to some external power governing universal good, with which the individual governed has nothing to do, and which as often tend to the destruction of individuals or races as to their preservation?