CHAPTER XI.

LATENT ELEMENTS.

Latent Elements not very numerous.—Pure Breed.—Simplification of Hereditary Inquiry.

Latent Elements not very numerous.—It is not possible that more than one half of the varieties and number of each of the parental elements, latent or personal, can on the average subsist in the offspring. For if every variety contributed its representative, each child would on the average contain actually or potentially twice the variety and twice the number of the elements (whatever they may be) that were possessed at the same stage of its life by either of its parents, four times that of any one of its grandparents, 1024 times as many as any one of its ancestors in the 10th degree, and so on, which is absurd. Therefore as regards any variety of the entire inheritance, whether it be dormant or personal, the chance of its dropping out must on the whole be equal to that of its being retained, and only one half of the varieties can on the average be passed on by inherit-

ance. Now we have seen that the *personal* heritage from either Parent is one quarter, therefore as the *total* heritage is one half, it follows that the Latent Elements must follow the same law of inheritance as the Personal ones. In other words, either Parent must contribute on the average only one quarter of the Latent Elements, the remainder of them dropping out and their breed becoming absolutely extinguished.

There seems to be much confusion in current ideas about the extent to which ancestral qualities are transmitted, supposing that what occurs occasionally must occur invariably. If a maternal grandparent be found to contribute some particular quality in one case, and a paternal grandparent in another, it seems to be argued that both contribute elements in every case. This is not a fair inference, as will be seen by the following illustration. A pack of playing cards consists, as we know, of 13 cards of each sort—hearts, diamonds, spades, and clubs. Let these be shuffled together and a batch of 13 cards dealt out from them, forming the deal, No. 1. There is not a single card in the entire pack that may not appear in these 13, but assuredly they do not all appear. Again, let the 13 cards derived from the above pack, which we will suppose to have green backs, be shuffled with another 13 similarly obtained from a pack with blue backs, and that a deal, No. 2, of 13 cards be made from the combined batches. The result will be of the same kind as before. Any card of either of the two original packs may be found in the deal, No. 2, but certainly

not all of them. So I conceive it to be with hereditary transmission. No given pair can possibly transmit the whole of their ancestral qualities; on the other hand, there is probably no description of ancestor whose qualities have not been in some cases transmitted to a descendant.

The fact that certain ancestral forms persist in breaking out, such as the zebra-looking stripes on the donkey, is no argument against this view. The reversion may fairly be ascribed to precisely the same cause that makes it almost impossible to wholly destroy the breed of certain weeds in a garden, inasmuch as they are prolific and very hardy, and wage successful battle with their vegetable competitors whenever they are not heavily outmatched in numbers.

If the Personal and Latent Elements are transmitted on the average in equal numbers, it is difficult to suppose that there can be much difference in their variety.

Pure Breed.—In a perfectly pure breed, maintained during an indefinitely long period by careful selection, the tendency to regress towards the M of the general population, would disappear, so far as that tendency may be due to the inheritance of mediocre ancestral qualities, and not to causes connected with the relative stability of different types. The Q of Fraternal Deviations from their respective true Mid-Fraternities which we called *b*, would also diminish, because it is partly dependent on the children in the same family taking

variously after different and unlike progenitors. But the difference between b in a mixed breed such as we have been considering, and the value which we may call β, which it would have in a pure breed, would be very small. Suppose the Prob: Error of the implied Stature of each separate Grand-Parent to be even as great as the Q of the general Population, which is 1·7 inch (it would be less, but we need not stop to discuss its precise value), then the Prob : Error of the implied Mid-Grand-Parental stature would be $\sqrt{\frac{1}{4}} \times 1{\cdot}7$ inch, or say 0·8 inch. The share of this, which would on the average be transmitted to the child, would be only $\frac{1}{4}$ as much, or 0·2. From all the higher Ancestry, put together, the contribution would be much less even than this small value, and we may disregard it. It results that b^2 is a trifle greater than $\beta^2 + 0{\cdot}04$. But $b = 1{\cdot}0$; therefore β is only a trifle less than 0·98.

Simplification of Hereditary Inquiry. — These considerations make it probable that inquiries into human heredity may be much simplified. They assure us that the possibilities of inheritance are not likely to differ much more than the varieties actually observed among the members of a large Fraternity. If then we have full life-histories of the Parents and of numerous Uncles and Aunts on both sides, we ought to have a very fair basis for hereditary inquiry. Information of this limited kind is incomparably more easy to obtain than that which I have hitherto striven for, namely, family histories during four successive generations.

When the "children" in the pedigree are from 40 to 55 years of age, their own life-histories are sufficiently advanced to be useful, though they are incomplete, and it is still easy for them to compile good histories of their Parents, Uncles, and Aunts. Friends who knew them all would still be alive, and numerous documents such as near relations or personal friends preserve, but which are mostly destroyed at their decease, would still exist. If I were undertaking a fresh inquiry in order to verify and to extend my previous work, it would be on this basis. I should not care to deal with any family that did not number at least six adult children, and the same number of uncles and aunts on both the paternal and maternal sides. Whatever could be learnt about the grandparents and their brothers and sisters, would of course be acceptable, as throwing further light. I should however expect that the peculiarities distributed among any large Fraternity of Uncles and Aunts would fairly indicate the variety of the Latent Elements in the Parent. The complete heritage of the child, on the average of many cases, might then be assigned as follows: One quarter to the personal characteristics of the Father; one quarter to the average of the personal characteristics of the Fraternity taken as a whole, of whom the Father was one of the members; and similarly as regards the Mother's side.