

To be read a your leisure - or never!

Cripps's Corner, Forest Row

Sept. 10 35.

Dear Fisher

I ought to have written to you long ago to thank you for various papers of yours, some of which are much above my head mathematically. And now comes your second poultry paper. I am indeed glad that these experiments are answering your expectations so well; though here again my old Grami finds new Mendelian ideas rather difficult to absorb.

If I understand linkage in its new bearings, the facts are somewhat as follows. A gene A^1 gives rise by mutation to A^2 periodically. A^2 modifies the effects on the growth of the organism due to the presence of gene B, without altering that gene. If A^2 is recessive, then the heterozygous form will show the altered effects of B. If this altered effect is harmful, it will help greatly to eliminate A^2 . If it is very beneficial, it might eliminate A^1 , or it might make A^2 appear more frequently. In many cases, like in the exact shape of a leaf, the modification due to $A^2 + B$ will

be neutral, ~~as in the flat shape of a leaf.~~
 Thus it seems to me that when searching
 for secondary signs of the presence of
 harmful hidden recessives, it would generally
 be best to look for differences from the normal
 which are neither beneficial nor harmful.

I see that the old fashioned attacks on
 natural selection have been going on full blast
 at the B⁵. Ass. If breeders of cart horses
 were to operate quite independently in different
 parts of the world, we should not be surprised
 if the resulting breeds resembled each other in
 many respects. Similarly we should expect
 evolution to ~~find~~ proceed normally on parallel
 lines, as far as adaptive characters are concerned.
 But the changes produced by the altered
 effects of the genes not primarily affected may
 well be non-adaptive, and consequently parallel
 non-adaptive modifications seem to be a
 probable result of natural selection.

My father, when pointing to the great
 differences in the vegetation always found
 growing side by side in slightly different

Soils used to say that no one could say why one form was better suited than the other to either environment; and yet here was an obvious case of differences in adaptability. With this before us, it seems absurd to point with confidence to differences in fossil remains as being non-adaptive - ^{many} ~~all~~ such differences may be due to the hampered modifications in the effects of ^{the} genes which were not ~~promoted~~ ^{theoretically} ~~actually~~ ^{changed in the} ~~process~~ ^{process} of evolving ~~changes~~. I am getting muddled, so had better bore you no more. I will only say that I do not see how all this helps to account for such uniformity of useless characters as does exist, and I have to go back to explanations which I have considered and which still seem to me sufficient.

Well, I have no right to bore you like this — for I do it for my own amusement. Nothing much strong with me — I hope all goes well with you. But do not trouble to write till you want to say something especially

yours sincerely
 Leonard Darwin