

Dec. 14 - 1919.

Cripps' Corner
Forest Row
Sussex.

Dear Fisher.

I am down here in the quiet, with a little - all too little - time to think.

You raise the question as to the meaning of 'large'. It is difficult to define, but generally 'organically important' would meet the case. I should say large or intense. I am thinking of the word as applied to mutations. As to characters it may no doubt be impossible to say that one is larger than another: they may be simply different. Thus if a gene has either a chemical component A or B, and cannot be without one or the other, there is no grounds on which to say which is the larger. The change from one to the other is one of the abrupt and possibly large mutations which may occur but which seem to me infrequent. The more common case is when there is a series formed somehow, and what I say

only applies to such series. I mean with regard to the crossing over. There can be no crossing over when the two genes differ as above described.

You quote the 'origin' about ^{each part of an} ~~the~~ ^{organism} ~~its~~ ^{condition} being so beautifully related to ~~the~~ ^{its} conditions that it could not have been suddenly created. But in Chap II of The Descent of Man my Father says he did not sufficiently consider structures neither beneficial nor injurious, and that this was "one of the greatest oversights as yet detected" in his work. He then goes on to argue that uniformity of character would never the less arise from 2 causes. First from uniformity of exciting causes. But is not this a double edged argument? If we assume, as we must, the heritability of mutations, then must not the exciting cause produce only mutations in one direction in order to produce uniformity?

And, if so, where comes in the possibility of selective action? Secondly he speaks of the effects of free intercrossing. But Mendelism has killed that argument.

You ask in your letter ⁱⁿ what way specific differences differ from differences between varieties or orders. I don't know what answer men like Bateson would make. I myself think they are only differences of degree, not of kind. But I don't see how the variety heap is formed any more than the species heap, as regards useless characters. And even as to useful characters, where the change seems to have been brought about by changes of environment and where the different environments still exist, there is no reason why natural selection as ordinarily described should kill out the intermediates.

It is this consideration, as well as the desirability to suggest some means of ambitious progress that makes me suggest the limited crossing over theory.

Whether you will find this worth the trouble of reading I don't know. I fear I shall not now have time to go over the whole ground again, or to rewrite it, as you suggested, I doubt. I don't like the paper; but I never do like my own production much. But I want to show that I value your criticisms, which I shall reconsider if ever I can attack the problem in earnest. Especially I should like to know if you see any error in the quasi-mathematical thought underlying part of the paper.

Yours sincerely
L. Darwin