Nov 20.32

Note new address

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Dear Fisher

As you will have discovered, I am a very bad correspondent and owe you, along with some others, letters for more than a year. So I now am trying to remove the stigma of this fault by answering not only your last letter, but others kept for answering from January and December 31 not to mention a letter of Nov 1930! I fear that in the interval some of the things have faded from my mind, so that I shall not do much good in mentioning them.

(1) Your discussion recently received of cocks and hens. I am not habituated to correlation arguments and have to think over them very hard. In your third page you give

$$(x_1 - \bar{x})(y_2 - \bar{y}) = k \quad y_2(y_2 - \bar{y}) = k \quad \text{which I follow, but also}$$
$$(x_2 - \bar{x})(y_1 - \bar{y}) = r^2 k \quad \text{and as } x_2 \text{ is the "hen's cock-beauty"}$$

and y_1 the "cock's "hen-taste" I do not see where this comes from — so it a matter of thinking of paternal grandmothers and things like that?

But thinking it over in general I now see where I went wrong. I had been thinking that every hen left her full complement of offspring, and so I could not see where the inartistic ones got eliminated. I overlooked that they all left rather too much offspring of cocks and the ugly ones would tend to carry lack-of-hen-taste and so would not themselves leave offspring. But now, if this is what your argument means I do not see that the process is any way different from a natural sllection

process affecting only one sex. There must be many qualities of direct survival value which only belong to one sex — such as most of the habits of a bee-hive, or the milking powers of mammals for ♀ or again say the eye sight of glow-worms for ♂ &c. (I do not know if there may be a catch in any of my examples on account of sex-linked genes; I did not mean there to be). In these cases the character will get across into the other sex just like your sexual selection case, and there will be just the same exponential increase, assuming that the survival value does not diminish as the improvement takes place. I ask if I am right in this, because when I read the book I got the impression that you meant it to be a still more violent process than the natural selection one, and this was what I could not see.

(2) The acquisition of dominance. I fear I have forgotten most of this but want to put some matters arising out of your letter of last January (I could send it you if you like, but as it is typed you probably have a copy). There was a talk about "Jones only known through Smith's auto-biography", which you claim lets you off from speculating about the people mentioned in Jones's (non existent) biography. I do not agree that this is right. As I understand your main argument (which very possibly I do not) you want to say that "dominance of character A" is controlled by "character B" which only exhibits itself through that and that this lets you off thinking about C which controls B. Dominance! A = Smith and B = Jones and it is obviously easier to find out about Smith than Jones, though I do not see that B is much more indirect than

some of these complicated genes which inhibit the inhibition of this or that and have no other effect. But one can regard the business from the other end in terms of genes, and I suppose that one can link each gene with a piece of a chromosome; at least I imagine the evidence points that way. Then I suppose that when you get a mutant you see a kink in one of the chromosomes say representing Smith, and that according to you if one had a better microscope one would see another kink for Jones. The implication is that every mutation will bring with it another ruling it and another ruling that ... ad inf. which is absurd. That is why it seems to me you have to invoke some non-Mendelian law of inheritance, and it is supported by the following. Your general principle of acquisition of dominance seems to imply that it does not take many generations to acquire it, that is to say that Jones mutates much more easily than Smith[+]. Why?

I have forgotten a great deal on this subject, and it is quite likely am making some grossly stupid fallacy of argument, so if it is worth answering do not fear to point out any argument however childish, for fear it should be insulting me on account of its obviousness.

(3) Here is a vague question. There was recently a Nature correspondence about birds eating butterflies, and making trouble for NS. by eating just as many of the nasty ones. It was answered, I think by Huxley, in a way that seemed to me very satisfactory, and this suggested that you might make a theorem entitled "The Equipartition of Dangers", meaning that NS only operates effectively on the greatest danger to a species and reduces it to the point where it

[+] also if it is easy to acquire dominance for an existing gene, than to wait for a new gene to come then it should be easier to disacquire it. Is it observed that dominance can be bred out again?

equals the next danger, and then works equally on the two as against a third. This is I suppose fairly obvious, but it is interesting to consider types of animal which have 1, 2 or more dangers. Thus I suppose speed is the only thing for a horse, but a butterfly has got to dodge both birds and ichneumons. Could one make a classification like this, or is it too vague. I gather the direct evidence in Nature did not entirely bear out Huxley's explanation, but that is by the way.

(4) <u>Blending Inheritance</u>. This seems to me to be a really fundamental question in the theory, and I believe that you have really got to make pre Mendelian NS work. In a population of a million there is say 1 mutation per generation. N.S. will not get much chance at it when so rare (and usually disadvantageous); so say the anti NS ists, and it looks reasonable. But we meet it by saying that it is not each single mutation that counts, but combinations of them. But to get over the argument of the rarity of opportunity of NS we must take a fair number of combing genes and say that it requires the combination to be beneficial. But in proportion as we do this we in effect bring in blending, because the combination of even as few as 10 genes will get spoilt in every generation, so that you will get the perpetual return to the average of the blending theory. I may say that I do not feel any strong opposition to the blending theory; it may be that the change per generation is proportional to the sizes of mutations, (though I don't see why), and if so then the infinitely small continuous conception of blending would take an ∞ time to make a change, but I do not see why this must be so.

Looking at NS as a whole, I sometimes wonder if there is some principle lacking (like the quantum from classical mechanics). It would not of course be anything like the ideas of most anti's, and can only be discovered by finding out what the classical theory can do. Perhaps your dominance theory connects with it.

yrs sincerely C Darwin