

19th. February, 1930.

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Dear Ford,

Many thanks for sending me your paper. I am writing my comments at once as my head is rather full of the subject. I think strongly that the note is worth publishing from every point of view, and I am sure the "American Naturalist" will share this view; the second question, whether I agree with it, is of little relative importance; I have therefore marked a few places, and am writing comments on each of them. These do not affect the question of the usefulness of publication, but you may like to see them while you are in the act.

1. (p. 2). "Obviously such a character can not be controlled by direct selection". I wish we had any criterion as to the selective advantage of small internal changes. I agree entirely that so far as we can judge such a character as that described is indifferent, but however high the probability which we ascribe to such a judgment I should hesitate to call it obvious.

2. (p. 4). <sup>to it</sup> ~~It is~~ not true that in the white <sup>lines</sup> ~~lines~~ as in several others, while all allelomorphs are recessive to wild red eye, the heterozygotes such as Eosin/White are intermediate between the two corresponding homozygotes? This is different from each stage of reduction being recessive. The first condition is compatible with progressive genic loss provided we assume a saturation condition higher than the mutant showing least loss, but such that the wild type has what Haldane calls a factor of safety of at least 2. One would however expect to find higher <sup>mutin</sup> numbers of the series giving the full red eye when homozygous, though showing incomplete dominance with the others, and I do not know any such case.

Apart from the shape of the spermatheca did you not mention internal pigment (colour of testes)? Is the data on this not good enough to give?

3. (p. 6). I should refer to the factor as "bobbed" giving if necessary its German equivalent in brackets.

4. (p. 6). Stern agrees with me that the existence of saturation values (why "threshold") is not in opposition to the modification of dominance, since the saturation value can be modified. Your remark on this point is an important one; do you not lose sight of it in conclusions 5 and 8?

5. (p. 7). Haldane's recent note to which you ought to ref

brings in the dimorphic and the polymorphic species. This opens out a very big subject, on which I am inclining to a very different interpretation. Do you remember some comments of mine on Papilio polytes in a paper on mimicry? The gene for the non mimetic type is recessive. Since both mimetic and non mimetic types are common in Nature there must be a balance of selective advantages; possibly this is due to partial <sup>or</sup> stability or inviability of the homozygous dominants (you remember Fryer's impression of 'illegitimate matings?'); if this is so, the heterozygote has become mimetic owing to the phenotypic advantage of this condition, although the mimetic gene has no net selective advantage. The condition is very favourable to dominance modifications since the heterozygotes are apparently between 40 and 50 per cent. of the population, instead of being one in  $10^4$  or so.

So in other cases of polymorphism there ~~must~~ always be a balance of net genetic advantage, but the heterozygote will be particularly quick to modify itself to the more advantageous form or appearance. Thus in the orthoptera I suspect all the dominant colour patterns to have a survival advantage over their common recessive, and that all their homozygotes are to some extent crippled constitutionally, a view which goes well with Haldane's suggestion of duplication, <sup>since</sup> save a homozygous duplication is generally lethal. In fact, working

through Wabour's data, I find there is a deficiency of the numbers of homozygote dominants relative to heterozygotes, which is significant for 4 different dominants individually, and very clear in the aggregate.

The full story of these forms with close linkage is certainly more complex than this, for one wants to know why the recessive cannot <sup>impress</sup> ~~impress~~ its colour <sup>factor</sup> ~~factor~~ except by injurious duplications. We need a guessing competition on this problem, in which I am willing to compete, provided it is recognised that we are guessing.

Do not take any more notice of these notes than you think will make your paper better express your own views.

Yours sincerely,