

August 9, 1940

Dear Riddell,

I doubt if Brownlee can be taken to be using the same classification in different publications, and indeed he may not be consistent in the same publication. He was clearly trying to find, what we all very much want, any classification which should be both feasible clinically and capable of genetic interpretation. As the latter process is likely to lag behind, awaiting population or family data by which it can be checked, our first line for guidance must be clinical distinctness, recognising that quantitatively slight differences, if sharply definable, may be genetically important, e.g., <sup>those</sup> ~~though~~ writers may be right who assert that even small amounts of yellow pigment, such as you found in Mrs Fisher, indicate the presence of the gene which is absent in purely blue or grey eyes.

Apart from the pigment question, Brownlee's classification of blue, blue-grey and grey eyes in three classes with frequencies consistent with a single factor without dominance was extremely interesting, but I gather you find that, clinically, the distinction pure grey against blue-grey is not workable. I interpret Brownlee here as excluding yellow pigment from all classes, but distinguishing

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blue without stroma, blue with stroma and, finally, stroma so abundant as to hide the blue.

Brownlee also by his theoretical interpretation was attracted by the theory that blue or grey mixed on the surface of the iris with chocolate or yellow indicated a heterozygote, of which the corresponding homozygote had the iris pigmented all over with chocolate or yellow. This might be true, even though his classification of the greys was arbitrary and agreement with theory only accidental. In your data, putting both sexes together, there are 112 blue or grey, 54 mixed and 34 yellow or chocolate, a series which has many too few mixed compared with expectation on the basis of Brownlee's single factor. To make agreement on Brownlee's lines about 20 of those you have classified as yellow, chocolate, or yellow and chocolate would have to be transferred to the mixed class, e.g., grey and chocolate. I should like to know if you regard this as definitely impossible, as, if so, the positive result is gained that Brownlee's views must be disregarded in the light of your clinical experience with eye colour.

There would remain the probability that your 56% blue and grey are really homozygotes for the absence of colour factor, and of the remaining 44% (88 children) about a dozen are homozygotes, and these predominantly to be found among your 34 in which neither blue nor grey is noted, but that, at present, we can make no genetical distinction between homozygotes and heterozygotes.

I may say that, studying Tocher's material statistically and using the criterion of the predictability of hair colour from eye

colour, there seems to be very nearly as much difference between his dark and medium eyes as between his medium and the blue and light classes, and this makes me think that his dark eyes were chiefly homozygotes. This result is confirmed by obtaining quite similar figures when we maximise the difference between counties as compared with differences among parishes in the same county, so that I think it is clear that some genetic difference, or differences exist in which the medium eyes are genetically intermediate between dark on the one hand and blue and grey on the other. In your material, for example, if one took the 13 chocolate eyes as the homozygotes and other combinations, including the five yellows and the 16 yellow & chocolate, as heterozygotes, the comparison would be quite good.

Another point which is relevant is that the proportion of extreme types would be enhanced if your sample were strongly mixed in respect of race, e.g., if you had 20% Jews in your sample; but I imagine you would not have left this unmentioned.

Yours sincerely,