UNIVERSITY COLLEGE, LONDON

~~GOWER STREET, W.C.1~~

DEPARTMENT OF BIOMETRY
at Rothamsted Experimental Station,
Harpenden, Herts.

Please Quote:
Professor J. B. S. Haldane

6th March, 1944.

Dear Fisher,

I enclose Olbrycht's thesis. I thought it had been sent off before, but it had not been. The delay was due to my having to work in Harpenden, in London, and near Kingston, which makes for the mislaying of papers. I am very sorry for the delay, and hope that it has not caused trouble. You may think I have been over-critical, but, in the absence of any evidence to the contrary, I find it hard to believe that the environment of the sows was sufficiently homogeneous to have no appreciable effect on fertility, and I think Dunn's work on modifiers of piebaldness in mice is decidedly relevant.

Curiously enough I am getting some problems of the more or less classical biometrical kind in my Navy work. The accompanying letter relates to one of these. I am aware that Pearson studied the correlation between successive measurements, but I thought perhaps a fresh start might simplify the matter, since his treatment of such problems was not always the most accurate possible. If the problem is really difficult, please do not trouble yourself with it, but if it can be dealt with in half an hour or so, this would certainly be useful, as one may as well get one's significance tests as accurate as possible. You will perhaps be interested to hear that we are getting a number of cases where logarithms are normally distributed as judged by g_1 and g_2.

Yours sincerely,

J. B. S. Haldane

Enclosure.

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Dear Fisher,

If x is normally distributed, and a sample of n, x_1, x_2, ... x_r, ...x_n is available, then I take it that if

$$R = \frac{\sum_{r=1}^{n-1}(x_r - x_{r+1})^2}{2\left[\sum x_r^2 - n^{-1}(\sum x_r)^2\right]} = 1 + \frac{2n^{-1}(\sum x_r)^2 - x_1^2 - x_n^2 - 2\sum_{r=1}^{n-1} x_r x_{r+1}}{2\left[\sum x_r^2 - n^{-1}(\sum x_r)^2\right]},$$

then the mean of R is 1. But I am not so sure about its variance $\overline{(R-1)^2}$. I make this $\frac{1}{n-2} + O(n^{-3})$ when n is large, but am not sure of this. Could you help me with a formula which would be fairly reliable for n = about 100. And though, so far, x has been normally distributed, this may not always be so. The problem arises in some naval work where there is sometimes, at least, a correlation between successive observations. I am sorry to trouble you, but a good test of significance might perhaps save a life.

Yours sincerely,

J.B.S. Haldane