11th February, 1956.

My dear Frank,

I do not regard the Behrens table as urgent, though I agree with you that it will be worth publishing as the probable reaction of Bartlett and his friends is certain to be obstinate. I enclose two exhibits, which will be of use if you think you or anyone in your department could usefully cooperate in the computation, which is, I have found, a good deal of a load on such time as I can spare to it. The first exhibit shows the framework of the table as planned, and gives values for the easy case when both degrees of freedom are unity, and the results of my computations when the numbers are one and three. You may notice that I have corrected two values under 75°, and the 1% value in the same column is doubtless also inaccurate; the 10% value is correct. Under 30° I do not like the 1% value to be more than twice the 2% value, but I have not yet looked into this. In fact the values obtained are ragged and pro forma showing the kinds of result which accurate computation would give. Probably three decimal places would be sufficient for the printed table, though having explicit formulae for P rather tempts one to greater accuracy.

The second exhibit is a copy of six of the ten formulae involved which I have worked out so far, which form a basis for as much computation as I am likely to get done for a long while. You will see that I have expressed both P and the tabular value d in terms of a variable α, and that the expressions involve also the modular angle θ, in terms of which the tabulation is to be made. I doubt if we need more values of θ than those which Sukhatme used, though with the explicit formulae no more than computation would be needed to fill it in so close as 5°, for example.

To me it is rather curious that the compound of two values t_3 should involve a component of t_5, and that the compound of two values t_5 should involve t_5, t_7, and t_9.

The analysis is simple enough, though rather confusing, and I just hope that I have made no error in these formulae. So much for the Behrens problem.

I shall be glad to see the new logit table. I have long thought that table 7 needed enlarging so as to facilitate interpolation for those, among whom I am coming to reckon myself, who find mental arithmetic fatiguing. It would not do any harm either if the lower values had 5-figure accuracy conformably with the rest of our tables. In genetical work we are constantly using the closely analogous transformation $2y = \tanh(2x)$ which of course leads, when table 7 is used, to the kind of additional mental arithmetic that you want to avoid. I wonder if it will be better to use values, whatever their symbols, corresponding with *y* and *x* above instead of R and Z, and leave people who want to use the correlation coefficient to double the values of *y* derived from the table; *y* would then be $\pm$ P, but any modification of course brings in its own drawbacks.

I am sure it is most important that the form of table either for the transformation, or for the final adjustments, should be the same for each transformation. This, I think, implies that we should ordinarily use a whole page for the final adjustment tables, and if you see what could usefully be done with table 7 to help the weaker brethren, it probably will need a whole page too.

You do not mention what you think of George's* comment, or on the example of the angular transformation which I suggested as providing the material for a worked example in the preface. It may be you think our introduction is getting overloaded with transformation material, but I am sure it will be useful to many to have these things sorted out in one place.

* [A.R.G. Owen]

I like your use of $\log_e(-\log_e p)$ as the basis for tabulation. If I could be in time with the new Behrens table it would, as you say, go pretty well into the space left by the old table 7. The form of economy I should practise in view of the asymmetrics of this table would be to use all angles, but to tabulate only one of the two cases in which n_1 and n_2 are two unequal numbers. The whole thing would then be ten tables, each consisting of four lines, and seven columns with headings. I suppose for the symmetrical cases it is just worthwhile repeating the three columns on either side of 45°.

I hope this will catch you in time. Good luck for your Indian trip.

Sincerely yours,

Encs.