

2nd February, 1956.

My dear Frank,

Thanks for your note about the 5th Edition. I hope the material for my tables is all in order; I have copies here if they are needed.

Stevens' suggestion merits consideration, but in view of what we have <sup>already,</sup> it is rather redundant. Our table of natural logarithms covers a range of a thousandfold without any multiplication or addition, and gives three to four figure accuracy without interpolation, and fully five figures with it. For my part I rather agree with those schoolmasters who paste up the antilogarithm table, in four figure logarithm tables issued to schoolboys, in order that they shall learn to use the logarithm table inversely and avoid the constant nuisance of confusing one table with the other. Perhaps a short paragraph in the preface emphasizing and illustrating the use of this table inversely would meet Stevens' need.

The function he asks for is, however, also available in another part of our tables, namely by adding the two new columns for cosh and sinh which I have added to Table XIV.2. It would,

I think, cramp the page uncomfortably if we were to add an eighth column by doing this addition for the reader. As it stands, he has equally access to  $e^{-x}$  by taking the difference of these columns, which actually seems never to have less than seven figure accuracy. Here the range is more limited than it is on the logarithm table, but the entries are quite sufficiently close for any sensible user.

George Owen has suggested that the angular transformation would have been more used, or more often used correctly, if we had not dealt with it so briefly in the preface, but had set out an example inserted on page 14 comparable with the example we give on probits in Example 7. In the enclosed offprint the arithmetical material is available for such an example, in which I discuss the possible effects of age and genotype on the recombination fraction between agouti and undulated, of which the only significant effect is that of age. Table 8 gives the works. If you think it would be useful to enlarge the introduction with a further example, this material would seem to be fairly handy.

I suppose the same solution would be right for the logarithmic transformation, i.e. I see no great point in tabulating the very simple algebraic expressions  $1/1+A$  and  $1/1-A$ , but their use could be exhibited in a suitable example. One of the more interesting examples of the loglog transformation would seem

to be dosage and infection with some virus in which there is a theoretically expected slope, but I have not a handy example of this.

Being led recently to think about Behrens' distributions, I have found explicit expressions suitable for small numbers when both  $n_1$  and  $n_2$  are odd, and so shall be making a framework of tabular values for  $n_1, n_2 = 1, 3, 5, 7$  at significance levels 10%, 5%, 2%, and 1%. Using, like Sukhatme, seven angular values, the whole thing is only 448 <sup>(with 6m)</sup> entries and should take not much more space than Sukhatme's table which has 350 for only two levels of significance. Of course, the ratios required are enormous, and it may be necessary to emphasize this in view of the great laxity of the table based on Welch's calculation, though God knows what Welch's method, involving, I believe, a non-convergent series, would lead to for really small numbers of degrees of freedom. However, the published table shows that his values must be wildly wrong, and many people would like to have the correct values for comparison, though, as I have always said, the table is not one which would be very frequently used.

I am enclosing a form for Healy which I hope you will get him to fill in and return to me for signature when you have gathered in other supporters you think suitable.

Sincerely yours,

Encs