

October 28, 1938

My dear Eisenhart,

I am glad you found the paper on The statistical utilization of multiple measurements" one that is likely to be useful. It was, as you can judge, a troublesome matter to translate and unify the notation used in the three original lines of research, but the type of data under consideration is really the same in all cases, although the problems which each school of workers had in view in fact diverged in rather an interesting way. I hope you duly received the amendment sheet, for I was much annoyed to find that the important paragraph on degrees of freedom, which is essential for exact treatment, and becomes numerically important in many practical cases, had been omitted from the paper as printed.

I think your idea of a book on "Readings in Statistical Methods" on the lines of a source book is really a brilliant one. I think mathematics has suffered more than most subjects from the professional teacher acting as rédacteur and, with the best intentions - usually the elimination of difficulties and complications - often

present<sup>ly</sup> the ideas of his originals very inadequately. This is especially so when, as is too often the case, he is, himself, only familiar with their work at third hand.

Naturally, the selection of such an anthology will be greatly a matter of judgment, and what is worth choosing will depend greatly on the interests of the supposed readers. The field chosen might be very wide, or considerably more narrow, and this is a point which it will be necessary to think about carefully, I should judge, at all stages during the growth of the collection. As regards my own work, I have tried to look at it from the point of view of such a compiler, and I send you a bibliography in which the various strains of ideas have been followed by classifying the different papers. My early work in mathematical statistics was principally concerned with giving the exact solution of a number of problems of distribution which, until then, had been almost totally neglected. These lead to the exact tests of significance. Initially these problems all appear under different disguises, although later the whole system could be telescoped, and can now be taught quite briefly in a course on the Analysis of Variance. I have marked the whole series of which this is the central idea with an  $\alpha$ , putting it in brackets where the new solutions were given, incidentally, as problems arose in special lines of work. The  $\alpha$  series really culminates

in 1928-9 with such problems as the general sampling distribution of the multiple correlation coefficient, the tests of significance in harmonic analysis, and the general formulae for moment and product moments of sampling distributions.

Closely associated with  $\alpha$  was the interest in the more abstract and philosophical problem of estimation. I have marked these papers  $\beta$ . The practical results of these two lines of research have been best made known in Statistical Methods.  $\beta$  leads naturally to  $\gamma$ , a series of papers on inductive inference dealing with inverse probability, likelihood and fiducial probability. It is easy to see what totally different emphasis these series deserve, according to the interests of the reader. The group of applications <sup>(d)</sup> concerned with heredity, evolution and eugenics commences almost as early, and inevitably overlaps on theoretical ground points; thus the 1918 paper has the first hint of the analysis of variance, which was not fully developed until the 1923 paper on crop variation. The 1919 paper also contains a pretty solution of the distribution problem. The later papers on human genetics are also very largely methodological. I have marked  $\xi$  papers much concerned with the interpretation of experimental data, and these lead naturally to  $\eta$ , concerned primarily with the design of experiments, always

in conjunction with their interpretation.

I am afraid that numerical illustrations of statistical methods not previously used occur practically throughout the series, so that a classification for which this feature was particularly important would cut across the one I have attempted. I have also marked § for the beginning of a series on the interpretation of multiple measurements, which, from the point of view of tests of significance, fits into the analysis of variance, but involves ideas with very different applications.

I believe papers published by the Royal Society can always be obtained separately from the Society, though they are not very cheap. Occasionally, of course, one may find their supply has been exhausted, but I believe they do put by a considerable number. Some of the old offprints published from Rothamsted <sup>will</sup> ~~are~~ also be obtainable from that station after my own supply has been exhausted.

Travers is now at Columbia University, N.Y., but Stevens and Norton are still here, and I will pass on your reminder to them.

Yours sincerely