



Mathematical Institute
16 Chambers Street
Edinburgh

Nov. 2, 1932.

Dr. R. A. Fisher, F.R.S.
Rothamsted.

Dear Dr Fisher,

I am glad you think there is something in my way of fitting polynomials. I may say, and I shall make this clear in the paper I am submitting, that I am indebted for the idea to your own method of summation as expounded in "Statistical Methods"; partly also to Jordan. The double use of the rows and the columns is not so magical; it is an old trick of mine which I observed in some orthogonal expansions of a different nature some years ago.

In regard to method, I think any worker who was dealing with, let us say 43 data, might construct his own tables to use upon the column-sums fairly readily. He has indeed only to take the



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fully realising, so far as one can gather, that the central sums and averaged central sums were central and mean central factorial moments. In the central case the computer could easily prepare his own table of coefficients, placing a triangle of coefficients of Legendre polynomials (up to quintics)

1	0	-1	0	$\frac{1}{4}$	0
	2	0	-2	0	$\frac{1}{2}$
		6	0	-5	0
			20	0	-14
				70	0
					252

opposite

1	0	q^2-1	0	$(q^2-1)(q^2-4)$	0
	1	0	q^2-1	0	$(q^2-1)(q^2-4)$
		1	0	q^2-4	0
			1	0	q^2-4
				1	0
					1

and multiplying corresponding elements, if n (your n')

~~$n = 2q$~~ is ~~not~~ even, and with

1	0	$q^2-\frac{1}{4}$	0	$(q^2-\frac{1}{4})(q^2-\frac{9}{4})$	0
	1	0	$q^2-\frac{9}{4}$	0	$(q^2-\frac{1}{4})(q^2-\frac{9}{4})$
		1	0	$q^2-\frac{9}{4}$	0
			1	0	$q^2-\frac{25}{4}$
				1	0
					1

if $n = 2q$ is odd, the values of ΣT_n^2 being the same as before.

I think the construction of such a table of multipliers for any reasonable n is a short and easy matter, and the numbers one

obtains are decidedly smaller than those in the non-central case. At the same time the central sums, especially those of odd order, which have negative terms on the negative side of the central origin, are also much smaller than the usual one-end-to-another sums. Borel, of the Nautical Almanac, favours non-central sums, chiefly, I imagine, because he is able to arrange batteries of machines which do three or four columns at once; but the ordinary worker, unprovided with such mechanical advantages, would probably find summations towards the middle less arduous.

The ms. sheets which I wrote out for you I do not require, as I possess ample duplicates in my notes; and I do not wish you to return them.

I may say, that in spite of Isserlis's apologia in Biometrika 1927, I was decidedly disappointed in Debycheff's papers, and of course in Bhotunsky, which is a reprint, almost, of Debycheff. If it were worth while, the whole of his theory could be potted within some half dozen pages; and the arithmetical applications are unpractically laborious. I have invited fire by saying so in my paper.

Yours sincerely,

A. C. Atken.

¹⁴
3 November 1932.

Dr. A.C. Aitken,
Mathematical Institute,
16 Chambers Street,
EDINBURGH.

Dear Dr. Aitken:

I am glad you are taking an independent line about Tchebychef. His work, I mean that to ~~term~~ ^{line} relatively unimportant side lines which concern polynomial fitting, has been absurdly over-rated, considering that anyone faced with the polynomial problem, with the analogy of Fourier series in mind would inevitably construct orthogonal polynomials. In fact this very obvious discovery has been made independently in a number of cases: verifiable in print, and probably in hundreds that never got printed.

The fact is that it has always been a cheap way of maintaining a shaky reputation for expert knowledge, to quote some foreigner unknown to most of one's countrymen, as of the highest importance. Russians have done long and fruitful service in this respect, owing to their admirably inaccessible language. When you find me browbeating an audience with Japanese authorities, you will recognise the first signs of

decrepitude. If Thiele, for example, had never published his 1903 volume in English, we might all be still ^{bearing} ~~bearing~~ Joss sticks to his name. Translations are ruinous, as the virtuous^{do} cannot in mathematics, as in poetry, claim that the original ^{merit} ~~intent~~ is ten times that of any translation.

So I shall find it refreshing if you choose to go for this particular piece of humbug; and as in all such cases, I think you need fear no real ill from such a sally.

Yours sincerely,