14th February, 1951

My dear Horace,

I must have heard of your move to Illinois, though I still had a vague impression that you were arranging these little affairs in Nevada.

About your formula for the differential coefficient of a tabulated function, what I think you need is a central expansion using δ, where δ^2 is defined as the second central difference.

$$\delta^2(u_x) = u_{x+h} - 2u_x + u_{x-h}$$

and this comes to $$D = \delta - \frac{1\delta^3}{24} + \frac{3\delta^5}{640} - \text{etc.}$$

which is easy enough to apply at a point mid-way between two tabular values. It differs from the formula you quote from R. A. Fisher in having δ^3 instead of δ^2 in the second term.

You can obtain demonstrations and continuations of this sort of expansion from the algebraic connection between the different operators used in the infinitesimal calculus and in that of finite differences. e.g. advancing finite difference Δ is recognised to be equivalent to $e^{hD} - 1$ and $\delta^2 = \dfrac{\Delta^2}{1 + \Delta}$, from whence expansion of D in terms of δ may be derived.

In general, as one is not always concerned with a point mid-way between two tabular entries, I think it is best to consider the expansion of an interpolate in Everett's central difference formula, and to differentiate this respect to θ remembering that $\theta + \phi$ is constant.

With greetings to Anne and your rascals,

Yours sincerely,