

ON THE DEVELOPMENT OF FORMULAE FOR GRADUATION
BY LINEAR COMPOUNDING, WITH SPECIAL REFERENCE
TO THE WORK OF ERASTUS L. DE FOREST*

BY MR. HUGH H. WOLFENDEN,
Consulting Actuary, Grimsby, Canada.

“Graduation” by “linear compounding” is effected by replacing an observed value u_0 (where the true value $U_0 = u_0 + e$) by a linear compound, v , of u_0 and terms $u_1, u_2, \dots, u_{-1}, u_{-2}, \dots$ on either side of it, on the assumption that differences of U beyond a certain order may be neglected. This may be done (I) by interpolation, from single values, or groups, or averages thereof, without any criterion of “fit” or “smoothness” beyond the above assumption, (II) by fitting—making the mean square error of v a minimum (least squares), or (III) by reduction of error—making the mean square error of $\Delta^n v$ a minimum. The names usually associated with the development of (I) are Davies, Berridge, Woolhouse, Higham, Hardy, Karup, Spencer, Lidstone, King, Wickens, and others; of (II), Landré, and W. F. Sheppard; of (III), Hardy, W. F. Sheppard, Henderson, and Larus. It is not generally known that much of the theory of (I), the “least square formulae” of (II), and those of (III) which make the mean square error in $\Delta^n v$ a minimum had previously been discussed very fully by Erastus L. De Forest, in Smithsonian Reports 1871 and 1873, in a pamphlet “Interpolation and Adjustment of Series” (1876), and in the Analyst (Des Moines), 1877-79. This paper traces the development of the above methods, and classifies them, with the particular object of showing the relation of De Forest’s important work to that of more recent investigators.

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COMMUNICATIONS

SECTION VI

PHILOSOPHY, HISTORY, DIDACTICS

