responding need in the United States, the reviewer feels that the book will have limited appeal to American numerical analysts.

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40[K].—W. S. CONNOR & MARVIN ZELEN, "Fractional factorial experiment designs for factors at three levels," *Nat. Bur. Standards Appl. Math. Ser.*, No. 54, May 1959, v + 37 p., 26 cm. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price $.30.

This is a sequel to NBS Applied Mathematics Series, No. 48 [1] which contains plans for fractional factorial designs for factors at two levels. The present compilation lists fractional factorial designs for factors at three levels as follows: for 1/3 replications, 2 for 4 factors and 3 each for 5, 6, and 7 factors; for 1/9 replications, 3 each for 6, 7, and 8 factors; for 1/27 replications, 3 each for 7, 8, and 9 factors; for 1/81 replications, 3 each for 8 and 9 factors; and for 1/243 replications, 3 each for 9 and 10 factors. For the same replication and number of factors the designs differ by the size of the blocks into which the treatment combinations are arranged. No main effects are confounded with other main effects or with two-factor interactions. Measurable two-factor interactions when the design is used as completely randomized or when treatments are grouped into blocks are listed. In addition, interactions confounded with blocks are given. Text material discusses the plan of the designs, loss of information, and the analysis of this type of designs.

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1. NBS APPLIED MATHEMATICS SERIES, No. 48, *Fractional Factorial Experiment Designs for Factors at Two Levels*, U. S. Gov. Printing Office, Washington, D. C., 1957 (*MTAC* Review 7, v. 12, 1958, p. 66).

41[K].—EDWIN L. CROW & ROBERT S. GARDNER, "Confidence limits for the expectation of a Poisson variable," *Biometrika*, v. 46, 1959, p. 441–453.

For any m, the inequalities $\sum_{i=c_1}^{c_2} p_i(m) \geqq 1 - \epsilon$, $\sum_{i=c_1+1}^{c_2+1} p_i(m) < 1 - \epsilon$, $\sum_{i=a+1}^{a+c_2-c_1} p_i(m) < 1 - \epsilon$ for all a, where $p_i(m) = e^{-m}m^i/i!$, define $c_1(m)$ and $c_2(m)$ uniquely. Define $m_L(c)$ to be the smallest m for which $c_2(m) = c$, and $m_U(c)$ to be the greatest m for which $c_1(m) = c$.

Table 1, p. 448–453, gives m_L and m_U to 2D for $\epsilon = .2, .1, .05, .01, .001$, and $c = 0(1)300$. The table was computed to 3D on an unspecified electronic computer; when the computed third place was a 5, the 5 was retained in the printed table.

Table 2, p. 444, compares the present confidence limits with the system δ_1 of Pearson & Hartley [1] and the system δ_3 of Sterne [2]; table 3, p. 445, compares them with the approximate formulas of Hald [3]; table 4, p. 446, compares them with the mean randomized confidence intervals of Stevens [4].

Reprints may be purchased from the Biometrika Office, University College, London, W.C. 1, under the title "Tables of confidence limits for the expectation of a

Poisson variable." Price: Two Shillings and Sixpence. Order *New Statistical Tables*, No. 28.

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1. E. S. PEARSON & H. O. HARTLEY, *Biometrika Tables for Statisticians*, Cambridge Univ. Press, 1954, p. 204–205. [*MTAC*, v. 9, 1955, p. 205–211].
2. T. E. STERNE, "Some remarks on confidence or fiducial limits," *Biometrika*, v. 41, 1954, p. 275–278. [*MTAC*, v. 9, 1955, p. 216].
3. ANDERS HALD, *Statistical Theory with Engineering Applications*, John Wiley & Sons, Inc., New York, 1952, p. 718.
4. W. L. STEVENS, "Fiducial limits of the parameter of a discontinuous distribution," *Biometrika*, v. 37, 1950, p. 117–139.

—F. G. FOSTER & D. H. REES, *Tables of the Upper Percentage Points of the Generalized Beta Distribution*, New Statistical Tables Series No. 26. Reprinted from *Biometrika*, vols. 44 & 45. Obtainable from the Biometrika Office, University College, London, W.C. 1, 30 p., 27 cm. Price five shillings.

In sampling from a k-variate normal population, let A and B be independent estimates, based on ν_1 and ν_2 degrees of freedom, respectively, of the population variance-covariance matrix. Let $\theta_1 \leqq \cdots \leqq \theta_k$ be the roots of the determinantal equation $|\theta\nu_1 A + (\theta - 1)\nu_2 B| = 0$. Then the distribution of θ_k is given by

$$I_x(k; p, q) = K \int_0^x d\theta_k \int_0^{\theta_k} d\theta_{k-1} \cdots \int_0^{\theta_2} d\theta_1 \prod_{i=1}^{k} \theta_i^{p-1}(1 - \theta_1)^{q-1} \prod_{i>j} (\theta_r - \theta_j)$$

where $p = \frac{1}{2}(|\nu_2 - k| + 1)$, $q = \frac{1}{2}(\nu_1 - k + 1)$. $I_x(1; p, q)$ is simply the incomplete-beta-function ratio $I_x(p, q)$. Foster & Rees argue that the 'generalized beta distribution' is *a* (not *the*) natural generalization of the Beta distribution from univariate to multivariate analysis of variance; for other generalizations see [1], [2], [3], [4].

The tables under review constitute a compilation of tables previously published in three papers by Foster and Rees [5], [6], [7]. Tabulated therein to 4D are values of the root of the equation

$$I_x(k; p, q) = P$$

for $P = .8(.05)\ .95, .99$;

$$k = 2,\ p = \tfrac{1}{2},\ 1(1)\ 10,\ q = 2\ (1)\ (20)\ (5)\ 50,\ 60,\ 80;$$
$$k = 3, 4,\ p = \tfrac{1}{2}(\tfrac{1}{2})\ 4,\ q = 1\ (1)\ 96.$$

Two- to four-point Lagrangian interpolation in p and q is recommended; no specific accuracy is guaranteed.

The computations for $k = 2$ were carried out on the N.R.D.C. Elliott 401 computer at Rothamsted; for $k = 3, 4$, on the DEUCE computer of the English Electric Company. Tables for $P = .95, .99$ and $k = 2(1)6$ have been given by Pillai [8], [9].

Two examples are given of the application of the tables to the analysis of dis-