tation of malaria, dysenteries, the rickettsiae, plague, cholera, trypanosomiasis and the filarial diseases are noteworthy. The section on tropical hygiene and sanitation and the consideration of the general medical problems presented by practice in the tropics contain much useful information for individuals lacking special training. The index of clinical diagnosis and laboratory diagnosis are likewise useful for quick reference.

The two volumes are well printed and profusely illustrated with excellent and well-selected photographs and drawings. There are surprisingly few typographical errors.

This second printing of the sixth edition constitutes an outstanding contribution to the literature on tropical medicine. It provides an enormous amount of detailed information on many subjects and is an essential and practical text, both for the student and the practitioner in this field. There is no other single work which approaches the usefulness of this text.

THOMAS T. MACKIE

STATISTICAL TABLES

Statistical Tables for Biological, Agricultural and Medical Research. By RONALD A. FISHER and FRANK YATES. Second edition. viii + 96 pp. London: Oliver and Boyd, Ltd. 1943.

IN the past five years no book in my possession has had more constant use than the first edition of these tables. It has furnished in compact form the data needed in designing an experiment, computing its results and interpreting the statistics obtained by analysis. The second edition, therefore, is as welcome as an old friend.

Four new tables have been added, each with an explanatory introduction. Table V_1 by P. V. Sukhatme is based upon a compound of two student distributions and gives the Behrens-Fisher test at the five and one per cent. levels for the significance of the difference between two means. It applies where the variances estimated from two series differ significantly, so that they can not properly be pooled for the usual t-test of their means. Table V_2 expands the test at one limit of Table V_1, for comparisons where one variance is determined from a large number of observations and conforms to the normal distribution and the other, differing from it significantly, has been computed from a small series of Student's type. It may be noted, however, that the adequacy of the Behrens-Fisher test has been questioned by some mathematical statisticians who accept the rest of the book.

Table $VIII_1$ by W. L. Stevens gives the lower and upper limits of the expectation for the binomial and Poisson distributions at probabilities of .005, .025 and .1. If an event is observed to occur from 0 to 15 times (= a) in N trials, where N varies from 2a to ∞, the table gives directly for each probability the expected number of occurrences with which the observation is compatible. With Table $VIII_2$, also by Stevens, the experimenter can estimate the density of organisms in a culture and the variance of the estimate from the incidence of sterile and fertile tubes in two-fold, four-fold and ten-fold dilution series.

Modern experimental technique has been greatly strengthened by designs known as balanced incomplete blocks. Experimenters are well aware of the increase in precision when treatments can be compared on the same animal or plant or on litter mates or on smaller, more homogeneous areas of land. The designs shown in an expanded Table XVII enable the experimenter to compare many treatments with the precision formerly possible only when treatments were few or when one treatment in each small unit was allotted to a "control" or standard with the corresponding loss in efficiency. Answers are given for four of the "cases not yet solved" in Tables XVIII and XIX of the first edition and the introduction for this group of tables has been rewritten to include the Youden square and to describe the newer methods of analysis for recovering the information between as well as within blocks.

The new edition omits the description of how the tables of random numbers were prepared and checked, and other smaller changes are scattered through a very informative introduction. The references have been extended to a list of thirty. Errata for the first edition, all of which have been corrected in the second edition, follow the table of contents.

Other tables in the book are unchanged. These include with suitable introductions the normal distribution; the distribution of t and χ^2; z and the variance ratio (Snedecor's F) at four levels of significance; the correlation coefficient at different levels of significance and degrees of freedom; the transformation of r to z; tests of significance for 2×2 contingency tables; the probit and angular transformations and the terms needed in obtaining maximum likelihood solutions with them; an adequate series of Latin squares and complete sets of orthogonal squares; normalizing scores for ranked data to facilitate their use in the analysis of variance; initial differences of powers of natural numbers; orthogonal polynomials for fitting equations of the first to the fifth degree; common and natural 5-place logarithms; squares, square roots, reciprocals, factorials and selected trigonometric functions; six pages of random numbers and a concluding table of miscellaneous constants.

Additions that would be welcome in a third edition may be suggested. Since few biologists take readily to interpolation, several tables could be expanded to

advantage. Thus the variance ratio might be given for more intermediate degrees of freedom, the angular transformation assigned a more detailed table and Tables VIII and XI expanded. Useful new tables could include tests for the significance of runs; the range of the normal distribution in different-sized samples at various levels of significance, in terms of the standard deviation computed with varying degrees of freedom; other terms of value in statistical control of quality; and criteria for identifying discordant observations. These omissions, however, are not vital. The appearance of a second edition on good paper, in the same convenient format as before and with as many additions as have been made, must rank as a real achievement under present war conditions.

C. I. BLISS

CONNECTICUT AGRICULTURAL EXPERIMENT STATION

SPECIAL ARTICLES

A PROTECTIVE ANTISERUM AGAINST MOUSE PNEUMONITIS VIRUS[1]

A VIRAL agent causing pneumonitis in mice has been isolated in this laboratory on two occasions, in 1938[2] and in 1940, by intranasal "blind passage" of the normal appearing lungs of white mice. A general study[3] of its properties indicates that it is similar if not identical to certain other latent pneumotropic viruses found in mice.[4] The morphology of its inclusion bodies, as seen in sections of mouse lungs, and of its elementary bodies, as revealed by smears of mouse lung or infected chick embryo yolk sac, relate it very definitely to the viruses of psittacosis, other ornithosis strains, lymphogranuloma venereum, meningopneumonitis, trachoma, inclusion conjunctivitis and others. Some cases of primary atypical pneumonia of man are related to agents within this group.[5]

Although the serum neutralization test is applicable to the study of most viruses, difficulty has been encountered in the use of the test in this group of agents. Repeated attempts in this laboratory to induce neutralizing antibody in the rabbit against the mouse virus have failed. In general, it has been the experience of other investigators that infection or artificial immunization of animals with these agents gives rise to neutralizing antibody only to a slight extent or not at all. Similar results have been obtained with convalescent human serums, although exceptions are found in some of the reports regarding lymphogranuloma venereum serum,[6] and in the demonstration of neutralizing antibodies in monkey and human serums after artificial immunization with psittacosis virus.[7]

TABLE 1

COMPARATIVE SERUM NEUTRALIZATION TESTS ON RABBIT AND CHICKEN SERUMS

Serums	LD_{50}*	Average infectivity scores† at virus dilutions								
		10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	10^{-8}	10^{-9}
Normal rabbit	$10^{-3.60}$	5.00	5.00	5.00	3.5	1.83	1.00	.67	.00	
Immune rabbit	$10^{-3.25}$	5.00	5.00	4.33	1.33	1.00	1.00	.00	.00	
Normal rooster	$10^{-4.50}$	4.83	4.83	5.00	5.00	3.00	1.20	1.00	.33	.00
Immune rooster	$> 10^{-1}$	2.00	1.00	1.00	.33	.00	.00	.00	.00	

Three-tenths cc volumes of the serums were added to equal amounts of virus dilutions. Infected mouse lung served as antigen in the rabbit serum test, and infected yolk sac with the rooster serum. After standing at 20° C for 1 hour, 0.03 cc from each tube was instilled intranasally into each of 6 mice. Mice were observed daily and survivors were autopsied on the 10th day.

* The 50 per cent. mortality dose computed according to the method of Reed and Muench (L. J. Reed and H. Muench, *Am. Jour. Hyg.*, 27: 493, 1938) from the record of deaths not included here.

† Computed by the method of Horsfall (F. L. Horsfall, *Jour. Exp. Med.*, 70: 209, 1939) which gives a numerical value to the amount of infection as determined by the extent of lung consolidation.

Recognizing the similarity of our mouse virus to the several strains infecting birds, we investigated the ability of chickens to produce antiserum against this virus. Repeated injection of infected mouse lung emulsion into roosters resulted in the appearance of neutralizing antibody of relatively high titer. Parallel inoculations of rabbits were made, but only traces of antibody were produced. The immunizing procedure for both species was the same and consisted of a series of 25 intraperitoneal and 3 intramuscular injections of mouse lung virus over a period of 15 weeks.

[1] This investigation was supported by the John Rockefeller McCormick Memorial Fund of the University of Chicago.

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[3] H. V. Karr, *Jour. Infect. Dis.*, 72: 108, 1943.

[4] A. R. Dochez, K. C. Mills and B. Mulliken, *Proc. Soc. Exp. Biol. and Med.*, 36: 683, 1937; K. Herzberg and W. Gross, *Zentralbl. f. Bakt. (Abt. I), Orig.*, 146: 129, 1940; K. Herzberg, *ibid.*, 177, 1940; R. Goonert, *Klin. Wchnschr.*, 20: 76, 1941; C. Nigg, SCIENCE, 95: 677, 1942.

[5] T. Francis and T. P. Magill, *Jour. Exp. Med.*, 68: 147, 1938; M. D. Eaton, M. D. Beck and H. E. Pearson, *ibid.*, 73: 641, 1941; J. E. Smadel, *Jour. Clin. Invest.*, 22: 1, 1943.

[6] E. Rodaniche, *Jour. Infect. Dis.*, 66: 144, 1940.

[7] T. M. Rivers and F. E. Schwentker, *Jour. Exp. Med.*, 60: 211, 1934.