pered by a maze of mathematical symbols. To accomplish such a feat of simplification in the interpretation of atomic spectra is not a simple task, and the author is to be commended for the facility with which he carries through his plan.

LEO GOLDBERG

HARVARD OBSERVATORY

AN APPEAL FOR MATHEMATICAL UNDERSTANDING

Mathematics for the Million. By LANCELOT HOGBEN, F.R.S., London School of Economics. Illustrations by J. F. Horrabin. W. W. Norton Company, Inc., New York. xii + 647 pages. $3.75. 1937.

THE title might suggest that here is another "mathematics made easy," a short-cut course in technical tricks for the apprentice computer. On the contrary, this is a reasoned appeal for common sense and understanding on the part of educated readers for the application of the mathematical discoveries of the race toward the solution of present-day problems. The earlier British edition stirred wide interest. For the wealth of historical and social contacts, for the pervasive philosophical motivation, for the breadth of sympathy and vigor of attack upon entrenched apathy this book is outstanding. It is not designed to inform the specialist, since it contains little material on pure mathematical theory with which any competent instructor in college mathematics is not already familiar. No brief list of its twelve chapters can do the work justice. Perhaps the most unusual are Chapter III—"The Grammar of Size, Order and Number, or Translating Number Language," and Chapter XII—"Statistics or the Arithmetic of Human Welfare," which strike notes that traditional text-books seldom suggest. Undoubtedly even the little mathematical technique assumed will discourage or repel many scholarly persons. Yet the lively, informative and gracious style and suggestive illustrations will maintain the average reader's interest through its six hundred and fifty pages, leaving him eager for more, and thrilled with a new sense of the power and flexibility of mathematics as a method of thinking.

ALBERT A. BENNETT

SPECIAL ARTICLES

DIGITALIS AND CALCIUM SYNERGISM[1]

EXPERIMENTS were published by Gold and Edwards[2] in 1927, which showed that hypercalcemia resulting from the injection of calcium chloride or the parathyroid hormone rendered the normal dog more susceptible to the action of ouabain. This was confirmed by the experiments of Lieberman[3] in which another digitalis glucoside and calcium gluconate were used. That digitalis and calcium act synergistically in animal experiments has been known for a long time and observations have been published indicating a similar phenomenon in man (review of literature, Berliner, 1933).[4] Bower and Mengle[5] reported two cases in which patients under the influence of digitalis died after an intravenous injection of calcium gluconate. They ascribed this to synergism between the two drugs and performed experiments in dogs which led them to the same conclusion. Their animal experiments, however, are not very convincing because of the large doses of digitalis they injected, although their conclusions are in accord with the work of others.

A discordant note is struck in a more recent report by Nahum and Hoff,[6] who tested the effect of intravenous calcium chloride in rabbits which had received digitalis in the form of digifoline. A careful examination of their paper, however, shows that in those animals in which no additive effect was observed, there is reason to believe that the animals were no longer under the influence of digitalis, and furthermore, in those in which there is reason to believe that the animals were under the influence of digitalis, a very strong synergistic effect with calcium may have been present.

Two significant facts which Hatcher[7] demonstrated in 1912 appear to have escaped consideration, namely, (1) that the rabbit excretes digitalis with extraordinary rapidity and (2) that the rabbit is very tolerant to digitalis. In the experiments which we performed (see Table I), it was found that approximately three to seven times the largest doses of digitalis used by Nahum and Hoff were excreted completely or almost so within less than eight hours (experiments 4 and 5). It must be concluded therefore that in the eighteen rabbits in which these authors observed no additive action between digitalis and calcium, there was little or no digitalis present, because the dose (0.5 to 0.75 cat unit per kgm subcutaneously) was administered eighteen hours prior to the calcium, and the probability is that during that period most or all of it was excreted.

Another group of their animals was treated in a somewhat different manner. In addition to the subcutaneous dose of digitalis eighteen hours previously, they received a dose of 0.25 cat unit per kgm intravenously one half hour before the calcium. This treat-

[1] From the Department of Pharmacology of Cornell University Medical College, New York.

[2] H. Gold and D. J. Edwards, *Am. Heart Jour.*, 3: 45, 1927.

[3] A. J. Lieberman, *Jour. Pharmacol. and Exp. Therap.*, 47: 183, 1933.

[4] K. Berliner, *Am. Heart Jour.*, 8: 548, 1933.

[5] J. O. Bower and H. A. Mengle, *Jour. Am. Med. Assn.*, 106: 1151, 1936.

[6] L. H. Nahum and H. E. Hoff, *Proc. Soc. Exp. Biol. and Med.*, 36: 860, 1937.

[7] R. A. Hatcher, *Arch. Int. Med.*, 10: 268, 1912.