the product for a second multiplication was used instead of factorial and logarithm approximations, and that all probabilities were computed in at least two different ways, leads the authors to make highly confident statements as to the accuracy of the figures.

The reviewer's reaction to a first reading of this work was mainly a sense of increased appreciation of the fundamentals and potentialities of the game—much as one gets from a study of a good chess book. Further study of some of the vital points would undoubtedly save many a trick and generally improve the game of most of us.

JOSEPH A. GREENWOOD

Introduzione al Pensiero Matematico. By Friedrich Waismann. Translated by Ludovico Geymonat. (Biblioteca di Cultura Scientifica, vol. 111.) Torino, Einaudi, 1939. 325 pp. Lire 20.

This book, originally published in German (Vienna, 1936) and now translated into Italian, is a popular exposition of the fundamental concepts and views underlying modern mathematics. Special attention is paid to those sides of present day mathematics which may seem to involve "philosophical" problems, and a manifold of philosophical suggestions are advanced, mostly credited to an unpublished manuscript by Wittgenstein. The expository part of the book combines, to a rare degree, accuracy and comprehensibility.

After having traced in outline the historical growth of our present numbers system, the author envisages the question, often raised by philosophers: "How can the postulation of 'new' numbers be justified? Do there 'exist,' e.g., any irrational and complex numbers?" It is shown that these questions are equivalent to the questions whether the enlarged mathematical calculus is consistent, and whether it can be given an interpretation. The answer by a reference to geometrical facts is rejected as unsatisfactory, since proof of the consistency of geometry will depend on the assumption that our number system is consistent. The problem of the existence of the non-natural numbers —as far as it can be separated from the consistency problem—is now solved by giving the well known construction of them on the basis of the natural numbers. Following Skolem, the author then shows how elementary arithmetic can be strictly developed on the minimum basis of three undefined notions (natural number, successor, identity) and one inductive definition (of addition) by using the method of complete induction. The present situation of the "Grundlagenforschung" is reviewed, mention being made of theorems by Gödel and Skolem.

The "philosophical" ideas, expressed in the book, are unfortunately