Foundations of Geometry and Induction. By Jean Nicod, with prefaces by Bertrand Russell and André Lalande. New York, Harcourt, Brace, and Co., 1930. 284 pp.

This book is a posthumous publication of the two theses which its author had completed before his death in 1924. The first part, consisting of about 190 pages, is entitled Geometry in the Sensible World and has a preface by Bertrand Russell; the second, of about 80 pages, which deals with the Logical Problem of Induction, is introduced by André Lalande. After having perused the book the reader will doubtless agree with these two teachers of the author, that he was a man of great promise and that his early death was a distinct loss for the future development of the philosophy of the sciences. It would be unfortunate, however, to consider this work as a mature attainment. It seems to me valuable rather for what it attempts than for what it actually accomplishes.

The second part, which deals with a problem of real concern to the natural sciences rather than to mathematics, is linked very closely to the Theory of Probability of Keynes, with whose position the author agrees in the main. This part of the book will also be of interest to those acquainted with Nicod's earlier paper on *A reduction in the number of primitive propositions of logic* (Proceedings of the Cambridge Philosophical Society, vol. 19), in which he showed how the formal logic of Whitehead and Russell's *Principia* could be based on the single undefined notion of "negation."

The first part represents an elaboration and partially a critique of those sections in Poincaré's *Science et Hypothèse* in which this great scientist sought to establish for geometry a basis in the domain of the senses. We find here constructions in terms of sense data, isomorphic with certain simple geometries; these constructions are more or less elaborate, but in every case they are robbed of their immediate reality by idealizations without which the problem would probably be entirely unmanageable. A clear account of these constructions can not be made without mention of many details; and hence a critical examination of the work must be omitted. The principal purpose of this work becomes clear from the following passage on page 13: "The discernment of the sensory order around us, which forms the qualitative background of our life and of our science, and which is ever present, however indistinctly, should certainly be a source of curiosity to any philosopher, even if his metaphysics should not obtain any aid from it. Such is the end at which we aim. We hope to approach it by the study of the objective aspect of geometry. It is impossible, in fact, to possess a proper idea of the order of our sensations if we are hampered by a false or confused idea of space."

There are unfortunately some things in this book which will cause mathematicians to squirm; such are the discussion of "infinitely small" on page 217, the talk about infinite probability, and a passage like the following on page 21: "The discovery of one system of meanings satisfying a group of axioms is always logically very important; it constitutes the proof that these axioms do not contradict one another."

Finally I must make a remark which applies not only to this book but equally to most other philosophical books which deal with the foundations of mathematics. There are definitions and reasoned discussions; but one is never informed as to the fundamental, undefined concepts nor about the basal assumptions. Consequently one has the sensation of the oft quoted traveler who is aware that he is going, but who does not know his destination. Possibly and probably such discussions are necessary as a preliminary clearing of a field. They give one a feeling for the significance of a question and may help to formulate the essential problems. But they can never be conclusive in character. To obtain real insight in the foundations of mathematics, mathematical methods have to be used.

ARNOLD DRESDEN

Tafeln der Besselschen, Theta-, Kugel-, und anderer Funktionen. By Keiichi Hayashi. Berlin, Julius Springer, 1930. 125 pp.

Fünfstellige Funktionentafeln. By Keiichi Hayashi. Berlin, Julius Springer, 1930. 176 pp.

The title of the first of these volumes indicates its principal contents, the other tables referred to being for the most part subsidiary to those named. An idea of the scale on which this useful compilation has been made can be had from the table for $J_0(x)$ and $J_1(x)$. From 0.000 to 0.110 the entries are carried to sixteen places; from 0.12 to 0.50, to fourteen places; and from 0.50 to 25.10, to twelve places. Among the less usual functions included in this collection are $1/(n!)^2$, $n=1, 2, \cdots, 70$, and the arithmetic-geometric mean between 1 and k', $(k')^2=0.00000$ to 0.00300. The presence of these two tables illustrates the intention of the author to provide the computer with means of amplifying, if necessary, the primary tables of this volume. A convenient appendix of fourteen pages gives the analytic expressions for the functions tabulated.

In *Fünfstellige Funktionentafeln*, we find an even greater variety of tables. Besides abbreviated forms of the tables found in the volume which we have just mentioned, there are included in the forty-nine tables listed such functions as the gamma function, tables of powers and factorials, values of the probability integral as a function of its upper limit, the solutions of eight transcental equations such as $\tan x=x$, and many other items for which the computer will be grateful.

As for the physical make-up of these books it would be sufficient to point out that they are from the press of Julius Springer, were it not for the fact that to users of tables this is matter of special importance. The reviewer wishes to record that he has never seen tables in which the general appearance of the printed page is more pleasing to the eye.

T. H. RAWLES

Statistical Résumé of the Spearman Two-Factor Theory. By Karl J. Holzinger. Chicago, The University of Chicago Press, 1930. 43 pp.

An interesting and clearly expressed review of Spearman's theory that every mental ability may be resolved into two linear components, of which one contains a factor common to all abilities, and the other a factor specific to the given ability. Some original mathematical discussion has been added, and the theory is amply illustrated. Much of the data for the illustrative material was gathered by the author.

B. H. CAMP