III, IV, and V and covers the fundamentals of group theory: homomorphisms, normal subgroups, groups with operations, series of subgroups, direct products, and so forth. The elements of free groups and defining relations are treated in chapter V.

Part II in volume I consists of chapters VI, VII, and VIII and deals with the theory of abelian groups. Chapter VI is concerned mainly with free abelian groups and finitely generated abelian groups and gives the usual structure theory. Ulm's theorem, characterizing countable periodic abelian groups, is given in that chapter, and chapter VIII contains a discussion of torsion-free abelian groups, including the work of Baer and others.

Chapters IX and X, in part III, go into the deeper properties of free groups, free products, and groups given by generators and relations. The structure of subgroups of free groups, and of free products, is discussed in chapter IX. Part of chapter X is devoted to the recent work of B. H. Neumann, H. Neumann, and G. Higman, including the theorem that every countable group can be embedded in a two-generator group. The remainder of part III (chapters XI and XII) deals with lattice-theoretic methods in group theory, direct decompositions, group extensions, and an introduction to the Eilenberg-MacLane cohomology theory for groups.

In part IV (chapters XIII, XIV, and XV) there is a detailed account of recent work, much of it by Soviet mathematicians, in the theory of solvable and nilpotent groups.

TREVOR EVANS
Emory University

Scientific Inference. Harold Jeffreys. Cambridge University Press, New York, rev. ed. 2, 1957. 236 pp. $4.75.

This is a fascinating book and, also, a valuable contribution to fundamental research. That should be sufficient praise for any review, but let me make the judgment plausible. This is virtually a new book, by comparison with the first editions (1931, 1937). It is by the author of the monumental *Theory of Probability,* the masterly *Methods of Mathematical Physics,* and an incisive geophysical study, *The Earth.* No one who is familiar with these works would expect less than great analytical ability and a remarkable range of knowledge, but even such a reader would still be greatly impressed. The main purpose of the present volume is to show that scientific method can be understood only by way of an understanding of probability; but, in the course of this enterprise, we find substantial discussions of transfinite arithmetic and the foundations of mathematics, including the Gödel theorem, biological classification, dimensional analysis, Newtonian dynamics, the history of astronomy, relativity, quantum theory, Euclidean geometry as a mensurational theory, and numerous philosophical problems (for example, solipsism and determinism).

It will be seen that the 231 pages of text are at a level quite unlike that of any ordinary category of book on the American market. They cut across academic boundaries, but not in the sense of any "general survey." This is a postdoctoral interdisciplinary course, marked by considerable originality and great common sense.

It is worth adding some specific comments. I do not consider satisfactory the suggestion (page 21) that the barber paradox is self-contradictorily formulated whereas the liar paradox is not. In each case, the paradox arises on examination of an apparently consistent assertion. The suggestion that scientists know more about causality than philosophers do (pages 12, 60) is surely only superficially plausible, like the idea that linguists "must" know about linguistics. Scientists are suckers for the hoariest philosophic eccentricities [as Jeffreys ably demonstrates in the cases of Eddington (page 223), Born (page 221), and von Mises (page 81)], just as philosophers are sometimes suckers for the latest scientific craze. A man with eyes all 'round his head probably would not know which way to go.

A good many of the early developments of probability theorems (Chapter 2) are open to serious difficulties, owing to Jeffreys' use of the propositional calculus notations with their well-known peculiarities. For example, the idea that a contradiction implies "every proposition in the language" (page 27) (derived from the *Principia Mathematica* notation) forces Jeffreys to introduce a requirement of consistency on the data. He defends this by saying, "In science we are not interested in inferences from self-contradictory data" (*ibid.*). But we are; reductio ad absurdum proofs are crucial in mathematics and have an obvious analog in identifying faulty instruments and hypotheses. Besides, the thesis that *any* proposition follows from a contradiction is surely very extreme, and certainly avoidable [we can retain $(p \rightarrow \frown p) \rightarrow \sim p$ and reject $(p \frown p) \rightarrow q$, although at some cost in systematic simplicity].

Some modern analytical philosophers will be made uneasy by various remarks —for example, that a hypothesis *entails* (rather than implies) observable consequences (page 34); that conventions could produce reasons (page 39); that a wavelength definition of "red" would make the red sensation useless as an indicator (page 172); that entropy directly measures the passage of time (page 173); and that psychoanalytic insight cures neuroses (page 195). But it is hard to imagine a reader of this book who will not be greatly stimulated and educated. Its pedagogical message alone is indisputable and valuable—specifically, that a scientist who is untrained in statistics is seriously handicapped and, generally, that the boundaries of subject matter are barriers to creation.

MICHAEL SCRIVEN
Swarthmore College

A Symposium on the Chemical Basis of Heredity. Sponsored by the McCollum-Pratt Institute of Johns Hopkins University with support from the A.E.C. W. D. McElroy and Bentley Glass, Eds. Johns Hopkins Press, Baltimore, Md., 1957. 834 pp. $12.50.

Probably no field in modern biology is of more fundamental significance and interest, is more intriguing and exciting to the imagination, is more rapidly developing, and involves the application and integration of more varied disciplines than is the subject of this symposium volume, the chemical basis of heredity. The major chapters—"Cellular units of heredity," "Role of the nucleus, nucleic acids and associated structures in cell division and protein synthesis," "Nucleic acids as transforming agents," "Viruses as bearers of heritable characteristics," "Nucleic acids, chemical composition and structure," "Synthesis of nucleotides and nucleic acids," "Mechanism of duplication"—include presentations and interpretations of the latest experimental results by most of the leaders in each of the many and varied fields represented. The discussions following each section are perhaps even more valuable and interesting than the formal papers.

Although major questions, such as the detailed structure of genetic units, the mechanism of information coding, transfer, and expression, the molecular basis of mutation, and the mechanism of duplication of genetic material, cannot as yet be answered definitively, they are carefully analyzed and evaluated in illuminating detail. These analyses include the clarifying introduction of useful new terms and definitions, such as the *recon* (smallest genetic recombination unit), the *muton* (smallest genetic unit susceptible to mutation), and the *cistron* (smallest functional genetic unit); the classification of genetic replication schemes into "conservative," "semi-conservative," and "dispersive"; and the classification of recombination mecha-