contributions are of high quality, and much new information is presented. Most of the papers originated in laboratories in the United Kingdom, but a few present work conducted in the Netherlands, Canada, the United States, France, Czechoslovakia, New Zealand, and Hungary. Fundamental aspects of gas chromatography, including thermodynamic treatment, and factors affecting efficiency and choice of solvents are the main themes in six of the papers. Another half-dozen papers are devoted to experimental evaluation of new supports, liquid phases, detectors, and the like.

Operation of columns at high temperatures has been very effective in extending the scope of gas chromatography to separation of mixtures of high-boiling compounds. Two papers on this subject are included. Other papers describe experimental work dealing with continuous large-scale (semiworks) separation of nearly pure acetylene from partially burned methane, use of the process to study kinetics of reactions, separation of the isotopic modifications of hydrogen, control of refinery processes, separation of fatty acids and alcohols, chlorinated and fluorinated compounds, and determination of isopropyl nitrate in heavy oil. Two papers review the relative merits of the several methods of detection, another describes use of a gas-density balance for detection, and two are concerned with the hydrogen-flare detector.

Much useful information appears in the prepared and extemporaneous discussions. Included are descriptions of a new pipette for sample introduction, separation of alkylated diphenyls, and improvements in the use of a hydrogen-flare detector.

I found an extraordinarily small number of typographic errors. The illustrations are uniformly good, and the printing is clean and sharp. Good quality coated paper was used, and the book is sturdily bound.

This volume can hardly be classified as simply a textbook on gas chromatography. It is an excellent presentation of recent researches in the field, at several prominent laboratories.

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Handbuch der Physik. vol. XX, *Electrical Conductivity II.* S. Flügge, Ed. Springer, Berlin, 1957. 491 pp. Illus. DM. 112.

Volume XX of the *Handbuch der Physik* deals with electric conductivity in semiconductors, in ionic crystals, in glasses, and during electrolysis in liquids. The subjects dealt with are very different, but, in general, the articles are well written and give an excellent account of the present status of the field described.

The article on semiconductors, by O. Madelung, is the longest (245 pages) and the most complex. It is well organized and well written. The article is good in that it is self-contained; for example, the behavior of semiconductors having isotropic Fermi surfaces and under conditions of isotropic electron scattering is considered first. Then the situation which occurs when the constant energy surfaces are anisotropic and the scattering is anisotropic are considered. Similarly, one first considers problems in which the electron and the hole distributions are in local equilibrium and only later are problems considered in which local deviations from the equilibrium state are important. There is, however, one section which I believe is out of its proper place. The article ends with a section on special semiconductors. In many ways this would be useful at the beginning, since one would then see, at the beginning, that many semiconductors—in fact, probably most—have a rather complicated band structure for an understanding of which the complex treatment given for conductivity is useful and indeed necessary. The literature cited is very completely surveyed through 1955, and references for the first few months in 1956 are given. The discussion of the various subjects is, in general, full and careful, and all possible subjects are considered. The description of the cyclotron resonance experiments is perhaps a bit brief, but the references are complete. This review appears at a good time, since one has the feeling that most of the important phenomena in the field are at least qualitatively understood.

The second article, by A. B. Lidiard, is an excellent survey of the present status of ionic conductivity. The article gives careful theoretical consideration to the types of defect which are responsible for ionic conductivity in the alkali halides and the silver halides. If one compares the article with the book of Mott and Gurney (*Electronic Processes in Ionic Crystals,* Oxford University Press, 1940) it is clear, first, that the theoretical calculations in the field have been carried a good deal further, in a quantitative sense, than they had been before World War II; in addition, certain phenomena are discussed and treated theoretically which were not considered before the war; for example, the alternating-current phenomena and the deviations from the Einstein relation connecting the ionic conductivity and the diffusion constants. It is also clear that the quantity and quality of experimental data have increased greatly, so that the improved theoretical treatment is justified. The description of all these changes is given by Lidiard in a very clear and concise fashion. The article confines itself mainly to the alkali halides and the silver halides, whereas a brief mention of the extent of the present knowledge concerning other materials, such as oxides and sulfides, would be welcome. The article is carefully and clearly written and will be useful both for those who have followed recent developments and for the uninitiated.

The third article, by J. M. Stevels, is on the electric properties of glass; both the direct- and alternating-current properties are described. It is clear that in this field, in contrast to the two cases considered in preceding paragraphs, the theoretical development is at a very early stage. The experimental situation is clearly presented, and various qualitative ideas concerning interpretation are discussed.

The last article, by E. Darmois, is a survey of electrochemistry. It considers the phenomena which occur in electrolytic solutions. The major new developments in this field since 1935 are the development of polarographic analysis, by Heyrovsky, and the increasing use of electrolytic polishing and etching. These developments are rather briefly discussed.

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The Theory of Groups. vols. 1 and 2. A. G. Kurosh. Chelsea, New York, 1955. 272 pp.; 308 pp. $4.95 per volume.

The Theory of Groups (in two volumes) is a translation by K. A. Hirsch of the second Russian edition of *Teoriya Grupp.* A German translation of the first edition was published in 1953 by the Akademie-Verlag, Berlin. However, the second edition differs so much from the first that it is virtually a new book.

The theory of groups is one of the most active areas of modern mathematical research, and an up-to-date textbook has been needed for some time. This book fulfills that purpose admirably. Approximately one-quarter of the book deals with the elements of the subject and does this from the modern point of view, without unnecessary assumptions of finiteness. In fact, the theory of finite groups is deliberately omitted from the whole book, and the author mentions the need for a separate textbook on the subject. The translation is excellent, and the translator has added many useful appendixes in addition to extending the bibliography to include relevant research work of the last few years.

Each volume is in two parts. Part I of volume I consists of chapters I, II,

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.

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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 $(p \rightarrow \backsim p) \rightarrow \sim p$ and reject $(p \backsim p) \rightarrow q$, 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.

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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-