Book Reviews

Mathematical Thinking in the Social Sciences. Paul F. Lazarsfeld, Ed. Free Press, Glencoe, Ill., 1954. 444 pp. $10.

This is an era of rapid interplay between theory and method in sociology and social psychology. There is a search for empirical categories that can be utilized within general theoretical schemes, and a decreasingly slavish reliance upon statistical techniques borrowed from other disciplines. Thus, Lazarsfeld has performed a timely service by stimulating and assembling in this volume a variety of challenging, readable papers which apply mathematics to psychological and social questions *per se*.

Much of the book's specific content relates to the study of the individual human being and his attitudes. It includes such long-awaited materials as Lazarsfeld's own conceptual introduction to latent structure analysis and Louis Guttman's announcement of a psychological theory to match his previously published mathematical theory of principal components. T. W. Anderson applies stochastic analysis to the prediction of future attitudes. Jacob Marschak, in a general discussion of probability, deals with subjective probability, a concept that seems to come close to that of attitude. Herbert A. Simon, in a brilliant exposition, compares models of rational behavior, as these have been developed in economics especially, with models that set limits to rationality and incorporate such notions as motivation and learning. Guttman in a second paper introduces, and illustrates from mental testing, a new radex theory of factor analysis. Portions of the book also relate to the study of the group, as distinct from the individual: notably, in Simon's mathematical translation of certain of George Homans' theoretical postulates; Nicolas Rashevsky's enunciation of models for imitation and social status distribution; and James S. Coleman's lucid commentary on the Rashevsky models.

Apart from its specific content, the volume illustrates the general role which may be played by mathematical thinking in the social sciences. First, it provides numerous instances of the use of mathematics to derive additional propositions from initial theoretical postulates—propositions that might not have been reached through the more cumbersome language of words. Second, certain of the models—those involving status, for example—may perhaps seem to be oversimplifications, poor representations of empirical reality. If so, this should point up the challenge of mathematics to the substantive theorist to clarify his concepts to examine his assumptions, and to communicate with greater precision. Third, the book suggests the relative ease of comparing and integrating theories from diverse fields once these theories have been translated into the basic language of mathematics. Marschak, for instance, demonstrates from economics that groups cannot always be effectively treated as mere aggregates of their individual members, a principle that might well be heeded in developing further sociological group models. Finally, the interplay between models and data, the *sine qua non* of useful mathematical application, is dramatized in Guttman's engrossing account of the way he fitted together the many solutions to an equation and the several components of an attitude.

The volume represents, of course, an early stage of development. Much research remains to be done before the proximity between many of these models and their empirical counterparts can be determined. Many computational problems must be solved before some of the necessary operations can be performed by the average social scientist. Yet the book points in a direction that should at once quiet the pangs of some who have bemoaned the "emptiness" of earlier quantitative approaches and focus the efforts of others who have long been looking to mathematics for greater precision of conceptualization and measurement and fresh insights into the complex relationships among the variables of social science.

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Active Networks. Vincent C. Rideout. Prentice-Hall, New York, 1954. xvi + 485 pp. Illus. $10.65.

Most physical objects are passive in the sense used in the expression "passive networks." These are electric circuits consisting of resistances, capacitances, and inductances, containing no energy sources, and characterized by having a small "response" to a small "stimulus" (except for relatively rare unstable configurations), and in which transient disturbances ultimately die out. If a component capable of amplification—for instance, a vacuum tube and associated power supply—is added to such a network, transients need not die out; large response (output) can be obtained with a small stimulus (signal); the network is "active." Many active physical systems can be devised—electric, mechanical, chemical, their combinations, and others. The great variety of behavior possible in such systems and their comparative "irritability" make them, rather than passive systems, what one would choose in constructing physical analogies for vital behavior.

The tube circuits of the communication and controls engineer seem to be the portion of this field that has been most highly developed. This book gives an excellent introduction to a large variety of electronic circuits, makes no demands on the reader's mathematical knowledge beyond the elements of differential and integral calculus, is well organized, and is well written. Each of its 15 chapters has a bibliography of textbooks and original journal articles, several hundred carefully chosen references in all, help-

ing the reader to find more detailed treatments of the scores of topics necessarily presented very briefly. Approximately 150 exercises, many with several parts, present the student with practical problems of circuit design and well illustrate the principles discussed. Graphic as well as analytic methods are analyzed in detail. The hundreds of clearly drawn line diagrams of circuits, curves, wave-forms, and so forth add materially to the vigor and clarity of the presentation.

After an introductory chapter on fundamental concepts, including those of elementary network analysis, a discussion is given of the characteristics of vacuum tubes, gas tubes, transistors, and magnetic amplifiers as elements of active networks. The next six chapters give a comprehensive treatment of low-pass and band-pass amplifiers, transient response, negative feedback amplifiers, special types of small signal amplifiers, and power amplifiers. A chapter on oscillators is followed by three on modulation and frequency conversion, frequency, phase and pulse modulation, and detectors and demodulators. The last three chapters discuss wave-shaping circuits, relaxation oscillators and trigger circuits, and noise and information theory. There are three appendixes on Fourier analysis, Laplace transforms, and tube and transistor characteristics. Relay circuits, amplidynes, and the like are not discussed at all, although positioning servosystems are briefly discussed. The book is highly recommended as a course textbook or for self-study and deserves great popularity. If this book is typical of what the author can do, and the uniformly high level indicates that it is, it is greatly to be hoped that further books will be forthcoming from his pen.

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Cellulose and Cellulose Derivatives. pt. I. Emil Ott, Harold M. Spurlin and Mildred W. Grafflin, Eds. Interscience, New York–London, ed. 2. 1954. xvi + 509 pp. Illus. $12.

This is the first of three volumes designed to replace and modernize a much larger single-volume treatise which appeared about 12 years ago. The practical advantage of easier handling will be welcomed by those who use the book frequently. All three volumes of the new edition will be necessary ultimately for easy use, since indexes are to be located only in the third volume.

This volume comprises five main chapters, each sectionalized according to a pattern that had been set up in the original edition. In general, the same authors have participated, although new authorship now includes McBurney, Howsmon, and Lewis.

The chapters for the most part have been completely rewritten. The approach differs from that of the 1943 edition, with more emphasis on the objective and critical, rather than the historical, viewpoint and with consequent improvement. This must now be considered definitely a reference work rather than a textbook for undergraduates.

As is stated in the introductory chapter, principal emphasis is on the chemistry of cellulose and its derivatives. There is deliberate omission of many aspects of cellulose technology, such as those that pertain more specifically to industry.

The section dealing with crystalline and accessible cellulose has undergone major changes, which is not surprising in view of the great amount of experimental work done in this field in the last decade. Considerable emphasis is placed on new methods for measuring and controlling orientation of cellulose structure and on its influence on the important physical properties of the cellulose in question. All this invites and stimulates further effort toward a better understanding.

The discussion of the significance of "alpha cellulose" is timely and, although not conclusive, adds greatly to earlier speculations on the same subject.

Degradation of cellulose is comprehensively reviewed, and new attempts are made to correlate such breakdown by various methods with the resulting changes in physical, as well as chemical, properties. The present-day importance of cellulose plastics and cellulose base textiles adds further importance to this critical approach.

A major revision was found necessary in the field of chemical structure of cellulose where the weak-link theory was thoroughly discredited.

This first volume of the revised edition is excellently assembled, authoritative, and well written and if, as is to be expected, the following volumes are equally well prepared, they will become an important addition to both private and public libraries that specialize in advances that have been made in fundamental and applied science.

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Chemical Specificity in Biological Interactions. Harvard Memoirs, No. 3. Frank R. N. Gurd, Ed. Academic Press, New York, 1954. 234 pp. Illus. $6.

These memoirs are the permanent record of the third of a series of symposiums at the laboratory of the late Edwin J. Cohn and the last he attended. The chapters, with one exception, were derived from the seminars but were written by the speakers afterward in order to permit each to include any ideas suggested by the others during discussion or in summaries that were prepared and distributed.

In the introductory chapter, Cohn emphasizes conclusions that "metals react reversibly with a great variety of proteins in very specific ways." He relates this to the processing of proteins and points out the necessity of avoiding oxidation and changes of *p*H in isolating tissue constituents. A translation of a specially prepared article by Gerold Schwarzenbach, on the "Specificity of metal complex formation," makes the results of his studies available for the first time in English. Charles D. Coryell discusses "Special prob-