

of subroutines that can be used to build, within a wide range, the procedure for content analysis that the user wishes to explore. The user supplies a dictionary of word categories (or uses one prepared for another application) which defines groups of words which he believes are indicative of some concept (for example, the category POSITIVE VALUATION may contain "good," "excellent," "desirable," and so on). He must then extensively edit the text to be processed, marking with tags the intended senses of ambiguous words, the referents of pronouns, and any syntactic features he wishes considered. He then decides what summary statistics are of interest—frequency counts by category, weighted frequency counts, or, most useful, frequencies of combinations of categories with constraints on ordering and nearness. Using the subroutines provided he constructs the program which will process his edited text. The General Inquirer provides some important operations, such as finding root forms of words by removing affixes, but does not do any sophisticated linguistic analysis.

How useful is this package of programs? Judging by the sample of applications reported, comprising 60 percent of the present book, it has been quite useful to a variety of social scientists, with some interesting results ranging from analysis of presidential nomination acceptance speeches to studies in psychotic language. Such broad application attests to the careful design, enthusiastic promotion, and ease of use of this tool.

This volume is, however, more than a description of the General Inquirer and its applications. The first part contains a thorough review of the history and philosophy of content analysis, being equally careful in pointing out its limitations and its potentialities. The techniques at present available can provide important information from a significant and ubiquitous source of data which in principle is much richer than the narrow channel provided by traditional methods of psychological experimentation. It is obvious, however, that such gross techniques alone cannot recover all, or even the most important, information from these data (for instance, whether an author's arguments are valid, his assertions true, and his intentions moral).

The authors of the book assume the reader knows nothing about anything and proceed to tell him a great deal.

While this makes the book long-winded, it also makes it comprehensible to a wide audience from the sciences and the humanities.

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## Statistical Ensemble

**Differential Space, Quantum Systems, and Prediction.** NORBERT WIENER, ARMAND SIEGEL, BAYARD RANKIN, and WILLIAM TED MARTIN. M.I.T. Press, Cambridge, Mass., 1966. 188 pp., illus. \$7.50.

Several apparently unconnected topics in mathematics and mathematical physics are drawn together, in this book, by their common reliance on the concept of the statistical ensemble. These topics are (i) the mathematical theory of the Brownian motion process (where the ensemble is composed of individual Brownian paths), (ii) analysis in function space (for example, integration of a function over an ensemble of Brownian paths), (iii) prediction of time series (where prior observation on a sample from an ensemble is used to predict the future), and (iv) the problem of "hidden variables" in quantum mechanics.

All these topics were investigated and illuminated by Norbert Wiener. About ten years ago, a seminar under his guidance at M.I.T. was devoted to this material. The present volume developed from that seminar; some new material, post-1956, has been added. The actual writing was divided up, each author accepting responsibility for certain material, and Rankin was the editor.

My impression is that this book can be read comfortably only if one has command of a rather high level of mathematics. But much of the material in the book should be of great interest to physicists, particularly those working in statistical mechanics and in the foundations of quantum theory. For example, the chapter on prediction of time series is important for certain recent work in non-equilibrium statistical mechanics. The chapter on integration in differential space describes elegant techniques that are now being used to solve specific problems in the statistical mechanical theory of phase transitions.

The book closes with an interesting analysis of the question of hidden variables in quantum mechanics. Is the

standard "Copenhagen interpretation" of quantum mechanics, involving use of statistical ensembles, a necessary one, or is it only sufficient? Wiener and Siegel contributed to this discussion by constructing a Brownian motion interpretation of quantum mechanics, in which the individual Brownian path, while not predictable in practice, may be predictable at least in principle. Whether their interpretation is physically significant is presently unclear; but the discussion here sets forth their views clearly.

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## Mathematics Made Easier

**Lie Groups for Pedestrians.** HARRY J. LIPKIN. North-Holland, Amsterdam; Wiley, New York, ed. 2, 1966. 194 pp., illus. \$6.50.

The theory of Lie groups has played an increasing role in the development of physics in the last few years. Unfortunately, a large proportion of physicists are insufficiently educated in this mathematical field and tend to regard its machinations with awe and suspicion. Available texts are too formal and often too extensive to assist those who merely want a good idea of how these techniques are applied in physics. *Lie Groups for Pedestrians* is intended for just these people.

The author achieves his aim by adopting an informal pedagogical approach. Rather than presenting formal definitions and derivations, he leans heavily on analogy with the familiar angular momentum algebra, which enables him to stress the physical content of the material and to convince the reader of its simplicity. He begins by outlining the benefits of a group theoretic approach, and retains the interest of the not-too-mathematical reader by interspersing physical applications throughout the book. The material covered is obviously influenced by the author's experience and contains some of his original contributions. As these comprise both nuclear and elementary-particle physics, the book will appeal to, and be appreciated by, people in rather different fields. There is an extensive discussion of the group SU(3), applied to high-energy physics and in