Vacancy chains, White argues, expedite the analysis of mobility processes in tight systems. When expressed in terms of vacancy chains the invariant properties of mobility supposedly assume a relatively simple form. Furthermore vacancy chains express the duality between men and jobs which White believes to be an essential feature of occupational mobility, and also take cognizance of connections between the movements of different men in a system of fixed jobs.

Having developed the vacancy chain concept White proceeds to formulate and test a large variety of mathematical models based upon it. These models fall into three general categories: models depicting the movement of vacancies in a system of jobs, models describing the overall evolution of mobility systems, and models portraying the careers of men. White also devotes considerable space to comparing vacancy models with other formulations.

The most empirically relevant vacancy models are those that describe the circulation of opportunities in a fixed job system. These models partition jobs into broad status categories. A cohort of vacancies arrives in the system each year. These vacancies circulate independently, their movements obeying a finite Markov chain in which the external world appears as an absorbing state. All vacancies presumably complete their movements and leave the system within the space of a single year.

Using these models White derives predictions for length distributions of vacancy chains. These predictions are compared with vacancy chain distributions observed in the Episcopal, the Presbyterian, and the Methodist churches during several different time periods over the last 60 years. Generally speaking, quite close agreement exists between observed and predicted distributions, especially for the Episcopal and Methodist churches.

In addition to specific analyses of mobility, *Chains of Opportunity* offers, at least by implication, a general philosophy of sociological model building. Its methodological stipulations underscore the systematic nature of social organization, or put differently, the interactive and contingent character of social action. Social structure transmits the impact of local events throughout the social system. To obtain valid causal theory one must "trace social processes at a microscopic level of social structure." Moreover model building must rely upon theoretical insight rather than mathematical virtuosity. According to White,

> . . . mathematical style and complexity have little to do with the essential nature of a model. More often than not technical elaboration of a model is a blind alley that distracts attention from the main theoretical issues.

The present reviewer believes *Chains of Opportunity* will (or at least should) exercise a seminal influence on the analysis of social structure. This is perhaps the first work that uses the concept of social system not as a heuristic device or a quasi-theoretic slogan but as an effective tool for empirical investigation of social processes. The system models proposed by White are not sickly transplantations from other disciplines but original constructions based squarely upon striking structural insights. The vacancy chain notion is more than a new concept; it betokens an entirely new way of perceiving the social world. Often sociology inadvertently adopts conventional modes of conceptualizing reality. This usually means a motivational as opposed to a structural orientation toward human action. The vacancy chain notion makes possible an analysis of action in strictly structural terms. White's work furnishes an object lesson in deciphering the logic of social structure and clearly reveals the potentialities that lie dormant in sophisticated forms of structural analysis.

The most serious defect of this book rests in the author's rather hasty rejection of models other than his own. White denies the possibility of detecting simple lawful patterns in the flow of men, and comes close to asserting a universal propriety for vacancy models. Neither the empirical evidence produced nor the arguments advanced justify such conclusions. White is undoubtedly correct in chastizing mobility theorists for neglecting the constraints imposed by the structure of opportunity and for entirely overlooking the duality between men and jobs. But both ideas can be incorporated into mobility models that postulate essential regularities in the flow of men. Bartholomew and also Gordon and Newell have proposed mobility models of approximately this kind. White illegitimately converts criticisms based upon particularistic features of these formulations into a rejection of the entire genre.

Given due consideration of opportunity constraints and man-job duality, the question of whether lawful pattern lies in the flow of vacancies or in the flow of men (or in some other alternative) appears contingent upon the nature of the particular system under scrutiny. If, for example, job controllers exert strict regulation over the candidate selection process, important uniformities might indeed occur in the flow of vacancies. If regulation of the candidate selection process by job controllers is lax, the main uniformities may reside in the flow of men. A hypothesis of this sort might explain why vacancy chain models fit data from the relatively centralized Episcopal and Methodist churches better than data from the decentralized Presbyterian church.

One can cite other shortcomings: the Markovian nature of vacancy movements is not adequately justified; the constraints exercised by manpower distribution on vacancy chains receive short shrift; the author places excessive reliance upon equilibrium solutions; several of his proposed mobility models rest upon highly arbitrary assumptions; he occasionally uses strained mathematical arguments when simulation would seem more appropriate. These, however, are minor defects. It is to be hoped that neither they, nor the author's less than elegant writing style, nor the volume of mathematical notation will prevent this important book from attracting the broad readership it deserves.

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Medical Genetics

Genetic Disorders of Man. RICHARD M. GOODMAN, Ed. Little, Brown, Boston, 1970. xviii, 1010 pp., illus. $38.50.

As the editor of this book says, "It is practically impossible for the physician today, regardless of specialty, to avoid contact with some aspect of medical genetics." Unfortunately, the average physician is seemingly unaware of the contribution that medical genetics can make to the practice of medicine, especially in the prevention of disease. This book is intended as a guide and reference work for such a practitioner.

The book is a compilation of dissertations by 21 different authors. The papers are arranged in two parts, one headed An Introduction to Genetic

Principles and Cytogenetic Disorders and the other headed Genetic Disorders Involving Various Systems and containing separate papers on for example skin, connective tissue, and the gastrointestinal system. The format of the latter section is unfortunate, since multisystem diseases (and most diseases do involve more than one system) are fragmented and discussed in a brief and superficial way in various chapters. The medical geneticist, in particular, must view a disease with regard to its total influence on the patient and his family, not as it affects a particular system. As a result of this tendency for the discussions of individual clinical entities to be brief and superficial, this text will serve only as a starting point for further reading. This, however, is one of the book's major assets, every discussion being documented by an excellent and up-to-date bibliography.

Part 1, dealing with genetic principles, is in general readable and well done in the sense that it gives an accurate survey of basic genetics. It is unfortunate that cell hybridization, a new and powerful method of studying gene localization, linkage, and cell physiology, and recent advances in the study of evolution through protein structure are not mentioned.

Particularly good are the sections on the hemoglobinopathies, connective tissue, and the endocrine system. On the other hand, in view of the fact that the major application of our knowledge of human genetics to medicine lies in genetic counseling, the discussion of that subject is weak. The author does not address himself sufficiently to the power of this great advance in clinical medicine, including both pre- and postconceptional counseling. In fact, the latter is completely ignored.

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Improving Endocrine Research

Statistics in Endocrinology. Proceedings of a conference, Dedham, Mass., Dec. 1967. JANET W. MCARTHUR and THEODORE COLTON, Eds. M.I.T. Press, Cambridge, Mass., 1970. xiv, 476 pp., illus. $12.50.

The conference of which this book is the proceedings was held three years ago, but the value of the book is not lessened by the publication lag. Furthermore, in spite of the wide range of topics and details of mathematical treatment included, because of excellent cross-referencing from one chapter to another the book has more coherence and smoothness of style than might be expected. For this happy result the editors deserve praise.

The book consists of 23 chapters written by 29 authors, at least 16 of whom are specialists in applied mathematics, especially statistics. A bibliography and an index are included. The format and printing are pleasant to the eye, and the copy editing has been well done. Two chapters of general discussion contributed by many of the 37 conference participants as well as by the authors are included, and most of the individual chapters have discussions appended also. The editors have treated the discussions well, so they are interesting and pertinent (with occasional references) and give the satisfying impression that the questions forced the experts to sweat —yet the replies are to the point, competent, and clear.

This is a book about statistics addressed to problems arising out of endocrine research, with examples taken from primary endocrinology literature. Papers range from introductory but solid philosophical discussions of experimental design, problems of invalidity in bioassays, the nature of digital computers, and the use of mathematics in biology to advanced, highly specific, technical opinions from the experts about how to deal with outliers, unbalanced designs, missing values, and the choices to be made among various statistical techniques when several may seem to apply to the problem at hand. Most of the chapters present comments about particular techniques from parametric and nonparametric statistics that may be applied to classes of experiments and data common in endocrine research. The level of presentation is above that of a first course in statistics, and if the reader does not already know, and preferably already use, t and F distributions, logit or probit transformations, analysis of variance, sign tests, randomization, and models in his endocrine work he may have some difficulty in reading parts of this book with sufficient comprehension to use immediately what he has read to improve his performance in the laboratory. But for the professional endocrinologist who already uses many of the concepts and techniques discussed in this book, but who does so with diffidence and knows he may use them badly (a category that includes me and many of my friends), this book can be very valuable. Reading it made me aware of the sometimes appalling lack of care with which experimental design is chosen and data are treated in endocrine work, including my own. I couldn't help wondering what would happen if the high level of statistical competence represented by the authors of this book were brought to bear on the many routine manuscripts I and other reviewers pass upon for endocrinology journals. What would happen to the rejection rate?

Endocrinology is a branch of science in which reproducibility of experimental results is notoriously low: relevant conditions are not always adequately described or known, and the experimental design may not have been optimized to answer the question being asked (supposing, charitably, that the investigator had a question clearly in mind when he started to collect his data). For such a branch of science, a book such as this is not merely useful, but can also serve to elevate the conscience of the reader so that he will no longer settle for his past casualness in matters of experimental design and treatment of data. Thus, at least for me, the book had an almost moral effect—it made me desire to do better work, and it points the way. However, to travel far along that way a more detailed exposition of statistical theory and practice would be necessary; fortunately, the references supplied are well chosen.

If you are an endocrinologist, and more especially if you are doing radioimmunoassays or bioassays, and if you know that in statistical matters you are a slothful sinner, this book is for you. I expect it to find a large market in endocrinology. Although it may be too much to believe that preceptors will actually read it, their graduate students will—and endocrinology will profit.

Because the book is wide-ranging, a critical review of each of the chapters is inappropriate here. However, I believe it will be helpful to offer a partial list of the contents. Some of the chapters are: "Experimental design," "Analysis of variance," "Multiple comparisons," "Continuous-response assays," "Quantal-response assays," "Obtaining maximal information from bioassays," "Nonparametric statistics," "Radioimmunoassays," "Saturation assays," "Statistical quality control of radioimmunoassays," and "Dose-response curves for radioimmunoassays."

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