Bibliographie

M. S. Bartlett, An Introduction to Stochastic Processes, with Special Reference to Methods and Applications, third edition, XVII + 388 pages, Cambridge University Press, Cambridge—London—New York—Melburne, 1978.

Professor Bartlett is a leading statistician of the last forty years, and his book is one of the first texts on stochastic processes. The first edition has appeared in 1955 [MR 16 (1955) p. 939] and it was four times reprinted. The second revised and enlarged edition appeared in 1966 [MR 35 (1968) # 3785]. The primary aim of the book is to acquaint (mainly) statisticians and other applied mathematicians with the techniques for studying stochastic processes, but it can also be interesting to the pure mathematician who wants to know the kinds of applications. Written in the best tradition of English scholarship, this twenty-three year old text is still fresh and elastic enough to incorporate some recent developments without breaking the unity. Seven new sections are included, and four sections are enlarged, and the opportunity has also been taken to make a number of corrections and small changes to the existing text. The condensation in places is natural since the book covers a great amount of matarial in a moderate number of pages.

Sándor Csörgő (Szeged)

J. Brey and R. B. Jones, Ed., **Critical Phenomena,** Sitges International School on Statistical Mechanics, June 1976, Sitges, Barcelona/Spain, Springer Lecture Notes in Physics, Vol. 54, 383 pp. 1976.

Statistical physics, both rigorous and non-rigorous, has developed very vividly in the last decade. The most suitable form for expounding and understanding new ideas seems to be something like lecture notes (in rigorous statistical physics, the exception was Ruelle's excellent 1969 book): collections of surveys, like this one, and those written by one author (or group of authors), like Simon's book on $P(\varphi)_2$ or Sinai's lecture notes on some mathematical problems of statistical physics (to appear in 1979).

This collection contains the lectures held at the International School on Statistical Mechanics, June 1976, at Sitges, Barcelona. The lectures are about both rigorous and non-rigorous results: those of Miracle-Solé, Lebowitz and Gallavotti belonging to the first direction and those of Wegner, Green, Ma, Enz, Szépfalusy, Kadanoff and Brout belonging to the second one. Haag uses this more free genre to speak to physicists about mathematical results and to include his "hopes for the future". The topics of the lectures are: phase transitions in classical equilibrium systems, quantum equilibrium states, renormalization group methods and scaling, critical dynamics and critical fluctuations, spontaneous broken symmetry, gauge theory.

For the reader with mathematical or physical intelligence and intuition, these lectures offer a quick way to understand the state of affairs in several branches of statistical physics and they can be recommended to scholars and graduate students in mathematics or physics.

D. Szász (Budapest)

A. Brown—C.Pearcy, Introduction to Operator Theory. I, Elements of Functional Analysis (Graduate Texts in Mathematics 55), XIV+474 pages, Springer-Verlag, New York—Heidelberg—Berlin, 1977.

This book was written to serve as a textbook for a one- or two-semester introductory graduate course in functional analysis. Its companion volume "Operators on Hilbert Space" will be published soon and is planned to be a textbook for a subsequent course in operator theory. The only critical prerequisite for the volume under review is the ability to follow and construct $\varepsilon-\delta$ arguments. The reader of part II of this volume is supposed to be familiar with the equivalent of a one-semester course in each of the following areas: linear algebra, general topology, complex analysis, and measure theory. As most courses in these subjects fail to treat certain topics that are needed in the study of functional analysis and operator theory, in part I the authors compiled the material that a student must know in order to study functional analysis and operator theory. There are many examples and exercises. The exercises constitute an integral part of the text, many topics are first introduced in problems. Because of the abundance of examples and problems the authors think this textbook will be of use also to those who wish to study functional analysis individually. The following list of the chapter headings of part II may give more insight to the content of the book: Normed linear spaces; Bounded linear transformations; The open mapping theorem; The Hahn—Banach theorem; Local convexity and weak topologies; Duality; Banach spaces and integration theory; The spaces $\mathscr{C}(X)$; Vector sums and bases.

J. Szűcs (Szeged)

Tosio Kato, Perturbation theory for linear operators (Grundlehren der mathematischen Wissenschaften — A Series of Comprehensive Studies in Mathematics, 132), XXI+619 pages, Springer-Verlag, Berlin—Heidelberg—New York, 1976.

Just 10 years after its first edition this excellent monograph already necessitated a new edition. This success is firstly motivated by the fundamental importance and continuous use of perturbation theoretical arguments and techniques in various areas of modern physics and by the intrinsic mathematical interest of the analytical and operator theoretical methods which are applied in, or even were invented for the needs of perturbation problems. Indeed this, nowadays very extended, area of research is a striking result of interplay of problems and methods of a great variety of physical and mathematical disciplines.

Professor T. Kato, one the foremost creative experts in all branches of Perturbation Theory, succeeded in this monograph to make this interplay clear and vividly felt throughout his work. Although the emphasis is on the purely and rigorously mathematical aspects of the theory, he never loses contact with the physical origins of the problems: another reason for the success of the book.

In view of recent developments of the theory, some supplementary notes and a 10 page supplementary bibliography were added in the new edition, and — besides several minor changes — three of the sections were completely rewritten.

Béla Sz.-Nagy (Szeged)

John Laperti, Stochastic Processes, A Survey of the Mathematical Theory (Applied Mathematical Sciences, Volume 23), XV+266 pages, Springer-Verlag, New York—Heidelberg—Berlin, 1977.

This tiny book gives an excellent introduction to the theory of stochastic processes. It is at least as excellent as the author's previous book (Probability, A Survey of the Mathematical Theory, Benjamin, 1966) with the same intention. The author writes: "I did not discuss specific applications

of the theory; I *did* strive for a spirit friendly to application by coming to grips as fast as I could with the major problems and techniques and by avoiding too high levels of abstraction and completeness. At the same time, I tried to make the proofs both vigorous and motivated and to show how certain results have *evolved* rather than just presenting them in polished final form." There are ten chapters (General introduction — Second-order random functions — Stationary second-order processes — Interpolation and prediction — Strictly-stationary processes and ergodic theory — Markov transition functions — The application of semigroup theory — Markov processes — Strong Markov processes — Martingale theory), and two appendices (Existence of random processes with given finite-dimensional distributions — Review of conditional probability). A carefully compiled index helps the orientation. There are (on the average) six-seven problems to solve in each chapter. The prerequisites (carefully listed after the preface) for reading the book with profit are an adequate knowledge of mathematical analysis (including measure theory, standard Hilbert and Banach space ideas and techniques, elementary differential equations, potential theory and harmonic functions, familiarity with Laplace transforms and topology), knowledge of basic probability mathematics, and "familiarity with examples and applications from elementary probability, preferably including finite Markov chains". If all these are previously given, then the quality of the book guarantees the fulfillment of the author's hope "that after finishing this book readers will be prepared either to go on to the frontiers of mathematical research through more specialised literature, or to turn toward applied problems with an ability to relate them to the general theory and to use its tools and ideas as far as may be possible". Besides the sympathetic modest style — which is so rare nowadays — of a formemost researcher, special attention must be paid to the words (in the Preface) of the responsible mathematician urging to organize the scientific community to struggle against militarism and oppression.

Sándor Csörgő (Szeged)

R. S. Liptser—A. N. Shiryayev, Statistics of Random Processes. I. General Theory, II. Applications (Applications of Mathematics, Volumes 5 and 6), X+394 and X+339 pages, Springer-Verlag, New York—Heidelberg—Berlin, 1977/1978.

This two-volume book, being an extensively revised and expanded translation of the Russian original (Statistika sluchaĭnyh protsessov, Nauka, Moskva, 1974), is an outstanding contribution to mathematical stochastics. The authors, both among the foremost researchers in the field, take the problems of nonlinear filtering as their central theme in this study. But the prerequisites for doing this are such that they had to write seven chapters (296 pages) in the first volume on the general theory of martingales, stochastic differential equations, the absolute continuity of probability measures, Itô and various diffusion processes. This part of the book is probably the best condensed presentation of today's knowledge on these topics. Chapters 8—10 present the main filtration theorems, and these are used in volume II, which is mainly devoted to various aspects of applications. Chapters 18 and 19 were specifically written for the English edition. The material covered is so wide and deep that we must restrict ourselves to the below listing of the contents. Many new important results and many new proofs of known ones are first published here. The book is designed primarily for research workers, but the clear and detailed presentation makes it accessible to graduate students also. No doubt, this work will be a leading reference book in the field. In the Bibliography, Russian versions of non-Russian authors' names and article titles were "translated" back into English. This results in a great number of inaccuracies.

Volume I: 1. Essentials of probability theory and mathematical statistics; 2. Martingales and semimartingales: discrete time; 3. Martingales and semimartingales: continuous time; 4. The Wiener

process, the stochastic integral over the Wiener process, and stochastic differential equations; 5. Square integrable martingales, and structure of the functionals on a Wiener process; 6. Nonnegative supermartingales and martingales, and the Girsanov theorem; 7. Absolute continuity of measures corresponding to the Ito processes and processes of the diffusion type; 8. General equations of optimal nonlinear filtering, interpolation and extrapolation of partially observable random processes; 9. Optimal filtering, interpolation and extrapolation of Markov processes with a countable number of states; 10. Optimal linear nonstationary filtering.

Volume II: 11. *Conditionally Gaussian processes*; 12. *Optimal nonlinear filtering: interpolation* and extrapolation of components of conditionally Gaussian processes; 13. Conditionally Gaussian sequences: filtering and related problems; 14. Application of filtering equations to problems of statistics of random sequences; 15. Linear estimation of random processes; 16. Application of optimal nonlinear filtering equations to some problems in control theory and information theory; 17. Parameter estimation and testing of statistical hypotheses for diffusion type processes; 18. Random point processes: Stieltjes stochastic integrals; 19. The structure of local martingales, absolute continuity of measures for point processes, and filtering.

Sándor Csörgő (Szeged)

Cristopher J. Preston, Gibbs states on countable sets (Cambridge Tracts in Mathematics 68) IX+128 pages, Cambridge University Press, Cambridge 1974.

This book considers a relatively new field in mathematics, the theory of phase transitions in mathematical physics. The aim of this purely mathematical theory is to explain some physical phenomena like the possibility of magnetization at a low temperature.

The author beings the book with the definition of the Gibbs states and Markov random fields. First he considers them on a finite and then on an infinite lattice. He proves the equivalence of these notions. It is shown that under mild conditions for any potential and parameter β (β means the inverse temperature) there exists a Gibbs state also in an infinite lattice. But the main problem of the theory is the unicity of the Gibbs states. In order to tackle with this problem the author presents some basic identities and inequalities (Holley inequality, Kirkwood-Salzburg equations, Griffith inequality, Lee-Yang circle theorem etc.). With their help it is shown that at small β there is a unique Gibbs distribution. Physically this means that at a high temperature there is no phase transition. In the last chapter one of the most important models in this theory the so-called Ising model is investigated in detail. It is shown that if the lattice is two or more dimensional, then at large β there are several Gibbs distributions with a fixed potential. This means that at a low temperature a phase transition may occur.

The book is clear and well presented. It is a good introduction to a theory which could be studied previously only from the original articles.

Péter Major (Budapest)

M. Loève, Probability Theory, I—II, 4th edition (Graduate Texts in Mathematics, Volumes 45 and 46), XVII+425/XVI+413 pages, Springer-Verlag, New York—Heidelberg—Berlin, 1977/1978.

There is no need to advertise this book or to review it thoroughly, since every reader of this note has at least heard of it. After the 1955 [MR **16** p. 598], 1960 [MR **23** # A 670] and 1963 [MR **34** # 3596] editions a fourth one became necessary. The second and third editions improved the quality and the size was expanded moderately. Now twenty per cent of the text of the fourth edition

is new and "the additions increased the book to an unwieldy size and it had to be split into two volumes". The main additions are the following: Section 12 (Convergence of probabilities on metric spaces), Section 25 (Regular variation and domains of attraction), Section 26 (Random walk) — the latter two constituting a new Chapter VII (Independent identically distributed summands) —, and the new Chapter XIII (Brownian motion and limit distributions). The "Complements and details" sections are also expanded according to these additions. Of these sections the new one following Chapter XIII deserves special mention which contains a note "An extension of Donsker's theorem" written by LeCam.

The general experience seems to be that the book can hardly be recommended as a textbook. It has been extremely successful as a reference book for research workers in the last twenty three years, and the fourth edition certainly will maintain this role for a long time to come.

Sándor Csörgő (Szeged)

C. R. Rao, Lineare statistische Methoden und ihre Anwendungen, (Mathematische Lehrbücher und Monographien), XIV+519 Seiten, Akademie-Verlag, Berlin, 1973.

Deutsche Übersetzung der originalen englischen Ausgabe (Linear Statistical Inference and Its Applications, Wiley, 1965). Die exakte Formulierung wird durch die mathematischen Methoden und wahrscheinlichkeitstheoretischen Begriffe, die in den ersten drei Kapiteln eingeführt werden, gesichert. Der weitere Teil des Buches beschäftigt sich mit der modernen Theorie und Technik statistischer Schlussweisen. Neben der mathematischen Theorie der Statistik werden auch die Anwendungen auf Probleme der Praxis behandelt. Das ermöglicht auch ein besseres Verständnis der hinter dieser Methode stehenden Theorie. Zusätzlich wird am Ende der einzelnen Kapitel eine grosse Anzahl von Aufgaben angegeben.

Die Titel der Kapitel sind: I. Vektoralgebra und Matrizenkalkül; II. Wahrscheinlichkeitstheorie, Hilfsmittel und Verfahren; III. Stetige Wahrscheinlichkeitsmodelle; IV. Die Theorie der kleinsten Quadate und die Varianzanalyse; V. Kriterien und Methoden der Schätzung; VI. Theorie und Methoden bei grossen Stichproben; VII. Theorie der statistische Schlussweisen; VIII. Mehrdimensionale Theorie.

Das Buch wird, wegen der ausführlichen mathematischen Formulierung und wegen der Vielzahl praktischer Beispiele sowohl den theoretischen als auch den angewandten Mathematikern empfohlen.

János Csirik (Szeged)

I. E. Segal—R. A. Kunze, Integrals and Operators, Second Revised and Enlarged Edition (Grundlehren der mathematischen Wissenschaften 228), XIV+371 pages, Springer-Verlag, Berlin—Heidelberg—New York, 1978.

Since the publication of the first edition of this book several treatments of various advanced topics in analysis have appeared. As these treatises assume much prerequisite knowledge on the part of the reader, in this second edition the authors give an introduction to some of these topics which meshes with the material of the first edition. Consequently, four chapters have been added. They give brief introductions to semigroups and perturbation theory, operator rings and spectral multiplicity, C^*-algebras and their applications, and to the trace as a non-commutative integral. These topics

are in connection, for example, with partial differential equations, harmonic analysis, quantum mechanics, group representations, and the analysis on manifolds. The authors have taken the opportunity to correct errors, terminological variations, and expository lapses of the first edition.

J. Szűcs (Szeged)

Larry Smith, Linear Algebra (Undergraduate Texts in Mathematics), VII+280 pages, Springer-Verlag, New York—Heidelberg—Berlin, 1978.

This text is written for students, versed in one-variable calculus and having little contact with complex numbers and abstract algebra. It deals almost exclusively with real finite dimensional vector spaces in a setting and formulation that permits easy generalization to abstract vector spaces. The parallel complex theory is developed in exercises.

The first 7 chapters contain an elementary introduction. The notions of a vector space, subspace, linear independence, bases etc. are illuminated by a large number of examples and exercises.

The central topic of the book is the principal axis theorem for real symmetric linear transformations, in which a more or less direct path is followed. This is done in the subsequent chapters from 8 to 16, in which the notions of a linear transformation, matrices, eigenvalue and eigenvector, inner product space, quadratic form etc. and the more important properties, interrelations and applications (for example, to systems of linear equations) are developed.

The main value of the book is that the presentation is as concrete as possible, and it provides a wide selection of examples of vector spaces and linear transformations that may serve as a testing ground for the theory.

The book is a good introduction to linear algebra. Although there are many areas that are not included (and this is intentional on the part of the author), the theory developed contains the essentials of linear algebra. The book will be useful for both students and lecturers.

F. Móricz (Szeged)

Livres reçus par la rédaction

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A. L. Besse, Manifolds all of whose geodesics are closed (Ergebnisse der Mathematik und ihrer Grenzgebiete — A Series of Modern Surveys in Mathematics, 93), IX+262 pages, Springer-Verlag, Berlin—Heidelberg—New York, 1978. — DM 78,—.

A. Bressan, Relativistic theories of materials (Springer Tracts in Natural Philosophy, Vol. 29), XIV++290 pages, Springer-Verlag, Berlin—Heidelberg—New York, 1978. — DM 98,—.

A. Brown—C. Pearcy, Introduction to operator theory. I. Elements of functional analysis (Graduate Texts in Mathematics, Vol. 55), XIV+474 pages, Springer-Verlag, Berlin—Heidelberg—New York, 1977. — DM 54,—.