Bibliographie

B. Aulbach, Continuous and Discrete Dynamics near Manifolds of Equilibria (Lecture Notes in Mathematics, 1058), IX+142 pages, Springer-Verlag, Berlin—Heidelberg—New York—Tokyo, 1984.

These lecture notes are concerned with the following problem of the qualitative theory of differential and difference equations: which conditions assure that a solution of a differential (or a difference) equation converges to same point of the manifold of stationary solutions? In stability theory and in the theory of the asymptotic behaviour of solutions most attention has thus far been payed to the behaviour of solutions near isolated equilibria. The new direction of the study of continua of stationary solutions is motivated both from a theoretical and a practical point of view. Theoretically, the manifolds of stationary points are very important special cases of invariant manifolds that have been studied actively in the modern theory of differential equations. On the other hand, several model equations in mechanics, physics, economy, biology and medicine possess such manifolds. The basic selection model from population genetics for separated generations (Fisher—Wright—Haldane model) is discussed in the book as an application.

The continuous time case and the discrete time case are treated in two separated parts in a parallel manner. Actually, the book is well-organized and is written very clearly and precisely. Only basic knowledge of ordinary differential equations and some familiarity with some concepts of the qualitative theory of dynamical systems are prerequisite for understanding.

Summing up, these lecture notes can be recommended for mathematicians, users of mathematics and students in mathematics interested in the qualitative theory of differential and difference equations and its applications.

L. Hatvani (Szeged)

Automata, Languages and Programming, 11th Colloquium, Antwerp, Belgium, July 1984. Edited by J. Paredaens (Lecture Notes in Computer Science 172), VIII+528 pages, Springer-Verlag, Berlin—Heidelberg—New York—Tokyo, 1984.

In addition to the texts of the invited lectures, this volume contains 46 contributions selected from a total of 141 submitted papers.

The invited lecturers were R. Fagin (Topics in Database Dependency Theory) and A. L. Rosenberg (The VLSI Revolution in Theoretical Circles).

Other topics cover a wide range of theoretical computer science: automata, formal languages, analysis of algorithms, computability and complexity, program specification, semantics of programming languages, etc. Some papers give deep theoretical results in classical fields, others just outline new trends or make an attempt to meet new demands.

The volume is recommended to experts interested in theoretical aspects of computer science.

Z. Ésik (Szeged)

Banach Space Theory and its Applications, Proceedings, Bucharest, 1981. Edited by A. Pietsch, N. Popa and I. Singer (Lectures Notes in Mathematics, 991), X+302 pages, Springer-Verlag, Berlin—Heidelberg—New York—Tokyo, 1983.

This book contains the printed versions of lectures held at the GDR—Romanian seminar in Bucharest, 1981. The seminar was organized by the National Institute for Scientific and Technical Creation in collaboration with the Department of Mathematics of the University of Jena. The book consists of 26 papers concerning Banach space geometry and Banach space operator theory. Reader's familiarity with functional analysis and general topology is supposed.

L. Gehér (Szeged)

T. Banchoff—J. Wermer, Linear Algebra Through Geometry (Undergraduate Texts in Mathematics), X+257 pages, Springer-Verlag, New York—Heidelberg—Berlin, 1983.

The main purpose of this book is to introduce students into elementary linear algebra by emphasizing the geometric significance of the subject. The first four chapters define vectors in 1, 2, 3 and 4 dimensions, give the geometry of vectors, introduce the concept of linear transformations and their matrix representations, give a connection between linear transformations and systems of linear equations and define determinants. Chapter 5 introduces finite dimensional vector spaces and investigates general systems of finitely many linear equations in homogeneous and inhomogeneous cases.

L. Gehér (Szeged)

C. Berg—J. P. R. Christensen—P. Ressel, Harmonic Analysis on Semigroups (Theory of Positive Definite and Related Functions), (Graduate Text in Mathematics, 100), X+289 pages, Springer-Verlag, New York—Berlin—Heidelberg—Tokyo, 1984.

One of the most fundamental problems of Fourier analysis is to determine the conditions under which a suitable function is just the Fourier resp. Laplace transform of a positive measure. Several famous results of Bochner, Bernstein—Widder and Hamburger can be considered as special cases of a general theorem on positive definite functions on Abelian semigroups with an involution. The purpose of this book is to give a systematic treatment of these functions from this general point of view.

After a few introductory chapters on topological vector spaces, Radon measures and integral representations, the detailed exposition is given in chapters 4—8. Beside the mentioned general theorems the central topics of the book are Schoenberg-type theorems, moment problems and the Hoeffding inequality. The fundamental result of Schoenberg (asserting that to each continuons function $\varphi\colon \mathbf{R}\to\mathbf{C}$ with the property that $\varphi\circ\|\cdot\|_n$ is a positive definite function on $(\mathbf{R}^n, \|\cdot\|_n)$ for all n, there exists a finite nonnegative measure on $\mathbf{R}_+$ with the Laplace transform $\varphi(\sqrt{t})$) is proved in a quite abstract form here, replacing both the real line and the half-line $\mathbf{R}_+$ by arbitrary Abelian semigroups with neutral element. The Hoeffding-type inequalities serve for a probabilistic characterization of the positive (resp. negative) definite functions.

The book is written in a very clear and enjoyable style and can serve as an excellent textbook for an advanced graduate course. It contains many exercises and detailed historical comments as well.

Z. I. Szabó (Szeged)

M. Berger—P. Pansu—J. P. Berry—X. Saint-Raymond, Problems in Geometry (Problem Books in Mathematics), VIII+266 pages, Springer-Verlag, New York—Berlin—Heidelberg—Tokyo, 1984.

Only very few problem books are available for teaching geometry, so all such collections give great pleasure for teachers, especially those as excellent as the present one. Most of the problems contained in the volume are chosen from the book *Geometry* by Marcel Berger.

The problems cover a very large scale of geometry such as tillings, affine spaces, projective spaces, euclidean vector spaces, triangles, spheres, circles, convex sets, polytopes, quadrics, conics, elliptic and hyperbolic geometry. The book is divided into three parts. The first part is devoted to a summary of the notions, the second one contains the suggestions and hints and the third one provides the solutions.

The volume is of interest to students as well as to secondary school teachers.

Z. I. Szabó (Szeged)

Bifurcation Theory and Applications, Montecatini, Italy, 1983. Edited by L. Salvadori (Lecture Notes in Mathematics, 1057), VI+233 pages, Springer-Verlag, Berlin—Heidelberg—New York—Tokyo, 1984.

Undoubtedly, bifurcation theory is one of the central topics of the modern theory of differential equations. This is shown also by the great number of monographs and textbooks published nowadays on this topic — some of them were reviewed in these Acta, too.

These lecture notes contain the subject-matter of an international summer course held at Montecatini, Italy, June 24—July 2, 1983, organized by the Centro Internationale Mathematico Estivo (C. I. M. E.) Foundation. The main lecturers were outstanding experts in the field: S. Busenberg, Bifurcation phenomena in Biomatematics; I. J. Duistermaat, Bifurcation of periodic solutions near equilibrium points of Hamiltonian systems; J. K. Hale, Introduction to dynamic bifurcation; G. Iooss, Bifurcation and transition to turbulence in Hydrodynamics.

The two common characteristic features of the lectures were: stressing the importance of the connections between stability and bifurcation problems, and showing the role of bifurcation theory in approaching the analysis of natural phynomena. Take just a simple problem as a foretaste. Many models in the theory of epidemics lead to systems of parametrized nonlinear ordinary differential equations. A threshold value α_0 of the parameter α is sought for such that if $\alpha \leq \alpha_0$, then the identically zero function is the only stable non-negative solution, while if $\alpha > \alpha_0$, a non-trivial stable positive solution exists. This solution can be identified with the persistence of an endemic level disease.

L. Hatvani (Szeged)

R. Bott—L. W. To, Differential Forms in Algebraic Topology (Graduate Texts in Mathematics, 82), XII+331 pages, Springer-Verlag, New York—Heidelberg—Berlin, 1982.

Although there are many textbooks in algebraic topology, only a few of them can present the intuitive foundations of this very far developed theory. This excellent book concentrates the attention of the reader on smooth topology and thus can give a treatment of some very intuitive and geometric fundamental questions of this theory. Only a good knowledge of linear algebra, advanced calculus and general topology is assumed but some acquaintance with simplicial complexes, differential geometry and homotopy groups can be helpful. Chapter I starts with a rapid introduction to the Grassmann calculus of exterior differential forms on manifolds. There is given the "computable" definition of de Rham cohomology theory, the treatment of Poincaré duality and its various extensions, such as the Thom isomorphism. Chapter II is devoted to the study of the Čech-de Rham complex using the techniques of spectral sequences as an extension of the Mayer—Vietoris principle. There is a detailed discussion of the topology of sphere bundles. In Chapter III the spectral sequences are treated in a more formal manner. There is given a review of homotopy theory before the discussion of the application of spectral sequences to this theory.

In Chapter IV an introduction to characteristic classes is presented. The self-contained treatment of Chern and Pontrjagin classes is illustrated with interesting computations of concrete examples and applications. Lastly, the geometry of the universal bundle is discussed.

This very nice book is intended "to open some of the doors to the formidable edifice of modern algebraic topology". It can be highly recommended to everybody who is interested in algebraic or differential topology.

Péter T. Nagy (Szeged)

D. Bump, Automorphic Forms on GL (3, R) (Lecture Notes in Mathematics, 1083), XI+ 184 pages, Springer-Verlag, Berlin—Heidelberg—New York—Tokyo.

The book is a useful professional reading for researchers and students with special interests in the theory of automorphic forms on reductive Lie groups or in analytic number theory. The special importance of general linear groups on this field is based upon their natural connection with L-series associated with general automorphic forms. Although the theory concerning automorphic forms on $GL(2)$ can be viewed as classical, our knowledge about the case of $GL(n)$ is still quite lacunary because, as the author remarks, most principal questions e.g. the theory of Ramanujan sums, the coefficients arising from the Hecke algebra, the Whittaker functions and Eisenstein series become much richer when passing to $GL(3)$, moreover they only begin to show their full ramification on $GL(3)$. Since the last decade there has been a considerable development in the theory of automorphic forms on $GL(3)$ due to Jacquet, Piatetski—Shapiro, Shalika, Kostant, Goldfeld, Friedberg, Shintani, Terras, Vinogradov, Thakhtadzyan, Imai, Goodman, Wallach and the author. The book provides a well-arranged and relatively self-contained unified approach to their works in the mentioned directions with an introductory survey of the classical 2-dimensional case for motivation. It should also be mentioned that mainly complete proofs are given almost free of representation theory and emphasizing the computational aspects, furthermore the book includes new results, too.

L. L. Stachó (Szeged)

B. Chandler—W. Magnus, Combinatorial Group Theory: A Case Study of the History of Ideas (Studies in the History of Mathematics and Physical Sciences, 9), VIII+ 234 pages, Springer-Verlag, New York—Heidelberg—Berlin, 1982.

To give a complete definition of combinatorial group theory is not an easy task. As a first approach it may be characterized as the theory of groups which are given by generators and defining relations or, as we would say today, by a presentation. The 1882 paper of W. von Dyck is the first one in which generators and defining relations are not only introduced as new concepts, but are also used effectively for mathematical research, but it is highly probable, that the germs of these ideas can be traced back to earlier authors. Nevertheless, we can state, that Dyck's paper was the initial point of this theory.

Starting with a report on Dyck's paper mentioned above, the book describes the unfolding of combinatorial group theory. On the basis of the nature of research in this field the authors distinguish two periods. Part I of the book covers the period from 1882 to 1918, and Part II from 1918 to 1945, but this second part contains some outlook to the contemporary research, too.

Part I, The Begining of Combinatorial Group Theory contains the following main topics: Dyck's group-theoretical studies, the theory of discontinuous groups, the fundamental groups of topological spaces, precursors of later developments (arithmetically defined linear groups of higher dimensions, geometrical constructions, braid groups, finite groups etc.).

Part II, The Emergence of Combinatorial Group Theory as an Independent Field, deals with the developments during the period from 1918 to 1945. This period starts with a paper of J. Nielson in which problems of combinatorial group theory were investigated and solved which do not show an obvious dependence on problems in topology or in other fields. From this time, although it had not ceased to have its original stimulating effects, the field began to develop its own problems and its own methods.

For the period from 1918 to 1937 the authors selected seven topics which they considered to be the most important contributions to the field. These are the following: free groups and their authomorphisms, the Reidemeister—Schreier method, free products and free products with amalgamations, one-relator groups, metabelian groups and related topics, commutator calculus and lower central series, varieties of groups (this latest topic started essentially with a 1937 paper of B. H. Neumann). The arrangement of these seven topics is chronological with respect to the first papers in each section, but the later literature is considered as well. The subsequent chapters mostly deal with later developments and the impact of mathematical logic.

In both parts some chapters are dealing not with mathematics as such, but with phenomena relevant to mathematical research.

The prerequisite for Part I except Chapter I.6 is a not too rigorous but sound knowledge of the fundamentals and basic terms of algebra. Especially group theory is necessary. The technical prerequisites for Part II are somewhat higher than those for Part I, although the definitions and technical terms are given.

Lajos Klukovits (Szeged)

Combinatorial Theory, Proceedings, Schloss Ranischholzhausen, Germany, 1982. Ed. by D. Jungnickel and K. Vedder (Lecture Notes in Mathematics, 969), VI+326 pages, Springer-Verlag, Berlin—Heidelberg—New York.

This volume contains the proceedings of a conference on combinatorial theory that took place at Schloss Ranischholzhausen in May to mark the 375th anniversary of the Universität Giessen. The book is a selection of the invited lectures and the contributed talks. The 21 papers cover the whole range of Combinatorics. The reader can find new results on regular sets, partitioning problems, Dedekind numbers, optimal coverings, etc.

The wide range yields a good overwiew of this fast developing and diverging field of mathematics.

G. Galambos (Szeged)

R. Cooke, The Mathematics of Sonya Kovalevskaya, IX+235 pages, Springer-Verlag, New York—Berlin—Heidelberg—Tokyo, 1984.

Is S. Kovalevskaya a serious mathematician of the 19th century or more of a heroine of the women's movement? At the present time there exist different opinions. In general one knows something about her life which was packed full of exciting events, and perhaps about the theorem of Cauchy—Kovalevskaya. This is insufficient to answer the above question in any direction. In her life famous mathematicians as Hermite, Picard, Chebyshev, Mittag-Leffler, and first of all Weierstrass considered Kovalevskaya as one of the best mathematicians of the world. Now her role in the mathematical life is a little obscure. The negative comments came partly from Felix Klein. One of the problems is an error in Kovalevskaya's paper on the Lamé equations discovered by Volterra. One can consider this mistake as a "disaster" or a starting point of further research. Choose the suitable for you. Another problem is that her papers are written in Weierstrass' style, therefore one can hardly decide how much of the work is her own. Be it as it may, again, Klein expressed great admiration that Kovalevskaya achieved so much in her short life.

In this book the author focuses attention on some important parts of the late 19^{th} century mathematics. He makes us deeply acquainted with the history of problems studied by Kovalevskaya. This work is the first complete exposition of her mathematical work and seems to be suitable for developing the reader's own view about Kovalevskaya as a mathematician.

L. Pintér (Szeged)

C. W. Curtis, Linear Algebra (An Introductory Approach), (Undergraduate Texts in Mathematics), IX+337 pages, Springer-Verlag, New York—Berlin—Heidelberg—Tokyo, 1984.

This book is the fourth edition of a textbook designed for upper division courses in linear algebra. It does not suppose an earlier course, so it may be useful for students. To understand the theoretical results, there are several examples of concrete problems in almost every section. The author attributes great importance to these examples, and presents not only numerical exercises, but theoretical ones as well. To encourage students to develop their own procedures for checking their work, not all the solutions are given.

The main feature of the book is that it provides an introduction to the axiomatic methods of modern algebra. The first five chapters discuss basic properties of vector spaces. This is followed by the theory of a single linear transformation. Chapter 8 deals with dual vector spaces and multilinear algebra. The last chapter of the theoretical part of the book discusses orthogonal and unitary transformations.

The interested reader can find some applications of linear algebra in Chapter 10. Anyway, the survey of applications is the most useful part of the book which is a good introduction to linear algebra for those not having any preliminary knowledge in this field of mathematics.

G. Galambos (Szeged)

Differential Geometry of Submanifolds, Proceedings, Kyoto, 1984. Edited by K. Kenmotsu (Lecture Notes in Mathematics, 1090), VI+132 pages, Springer-Verlag, Berlin—Heidelberg—New York—Tokyo, 1984.

The present volume contains the text of most of the lectures presented by young Japanese mathematicians at the Conference on Differential Geometry of Submanifolds held at the Research Institute of Mathematical Sciences of Kyoto University of January 23—25, 1984. The proceedings include 12 papers written by the following authors: Kause A. (Estimates for Solutions of Poisson Equations and their Application to Submanifolds); Miyaoka R. (Taut Embeddings and Dupin Hypersurfaces); Adachi T., Sunada T. (Geometric Bounds for the Number of Certain Harmonic Mappings); Ohnita Y. (The First Standard Minimal Immersions of Compact Irreducible Symmetric Spaces); Takakuwa S. (A Hypersurfaces with Prescribed Mean Curvature); T. Ohsawa (Holomorphic Embedding of Compact S. P. C. Manifolds into Complex Manifolds as Real Hypersurfaces); Koiso M. (The Stability and the Gauss Map of Minimal Surfaces in $\mathbf{R}^3$); Kitagawa Y.

(Compact Homogeneous Submanifolds with Parallel Mean Curvature); Watanabe K. (Sure les ensembles nodaux); Mashimo K. (On Some Stable Minimal Cones in R^7); Naitoh H. (Symmetric Submanifolds of Compact Symmetric Spaces); Kenmotsu K. (Gauss Maps of Surfaces with Constant Mean Curvature, Appendix).

Z. I. Szabó (Szeged)

J. Dixmier, General Topology (Undergraduate Texts in Mathematics), VII+ 140 pages, Springer-Verlag, New York—Berlin—Heidelberg—Tokyo, 1984.

The experienced reader curiously opens the book because to write a text on general topology for undergraduate students is not an easy task. Topology is the axiomatic study of the notions of limit and continuity. Thus, it demands a very high level of abstract thinking and gives a generous experience not only in the theory of real-valued functions of a real variable but in the advanced branches of mathematical analysis, too. The author, who is an outstanding analyst, has performed this not easy task excellently. The treatment is well-chosen. It is written in the general spirit of Bourbaki, but it is elementary and easily accessible. The basic concepts are motivated appealingly to the reader's experience in elementary analysis. Already on the first pages of the book the author introduces the notions of the open and closed sets in metric spaces and shows their basic properties. For students this gives a good base to the definition of the abstract topological space.

The book contains valuable discussions of some topics which are not always found in topology books (numerical functions, Stone—Weierstrass Theorem, normed spaces, infinite sums).

J. L. Kelley's General Topology is generally referred to as What Every Analyst Should Know. The present book can be recommended as What Every Mathematician Should Know.

L. Hatvani (Szeged)

R. D. Driver, Why Math? (Undergraduate Texts in Mathematics), XIV+233 pages, Springer-Verlag, New York—Berlin—Heidelberg—Tokyo, 1984.

There exist only few mathematical books which are useful to almost everyone, even to students who don't like mathematics. In my opinion this is such a book. Requiring only a little algebra and geometry, the author presents various interesting problems and examples mainly taken from the real world. These problems seem to be suitable to make the readers understand the advantage of mathematics in the everyday life, and so to make them wonder to solve similar problems. They hardly realize and deal with real mathematical questions. Besides the examples, teachers find interesting methods too.

Chapter headings are: Arithmetic review, Prime numbers and fractions, The Pythagorean Theorem and square roots, Elementary equations, Quadratic polynomials and equations, Powers and geometric sequences, Areas and volumes, Galilean relativity, Special relativity, Binary arithmetic, Sets and counting, Probability, Cardinality. Finally, here are some problems chosen a little accidentally of the book (surely the reader will find more interesting ones):

1. How long might it take you to factor the integer 38009 without the aid of a calculator or a computer?

2. A baseball is thrown straight upwards from a height of 7 feet with an initial velocity of 50 feet per second. Find the maximum height of the baseball and the time when this height is reached.

3. If the value of an investment increases by 26% in 2 years, what is the equivalent effective annual rate of interest?

4. A police radar signal reflected by an approaching car returns at a frequency 2×10^{-7}% higher than the transmitted frequency. Find the speed of the car.

5. How can a sailboat sail at right angles to the wind direction?

6. If a moon is traveling at 99,9% of the speed of light, how long would it live and how far could it travel from the viewpoint of a stationary observer?

L. Pintér (Szeged)

B. A. Dubrovin—A. T. Fomenko—S. P. Novikov, Modern Geometry. Methods and Applications (Part I. The Geometry of Surfaces, Transformation Groups, and Fields), (Graduate Texts in Mathematics, 93), XV+464 pages, Springer-Verlag, New York—Berlin—Heidelberg—Tokyo, 1984.

Modernization of the teaching of geometry in the Soviet Union started in 1971. This modernization was directed mainly towards the applications of the subject. The present book is the most significant representation of this trend. It is the translation of the first volume of a three-volume series published originally under the same title by Moscow Nauka in 1979.

The volume covers the following topics of differential geometry: The theory of surfaces, the algebraic and differential calculus of tensors and fields, and the calculus of variation. The last two chapters are devoted to physical applications, especially to the study of Hamiltonian structures, Yang-Mills fields and gauge transformations.

The book is one of the best introductions to modern differential geometry. Its material is explained very clearly and enjoyably. It is useful for mathematical students, teachers and physicists as well.

Z. I. Szabó (Szeged)

H. D. Ebbinghaus—J. Flum—W. Thomas, Mathematical Logic (Undergraduate Texts in Mathematics), IX+216 pages, Springer-Verlag, New York—Heidelberg—Berlin, 1984.

This introductory text is translated by A. S. Ferebee from the German original „Einführung in die mathematische Logik", published by Wissenschaftliche Buchgesellschaft, Darmstadt, 1978.

The volume consists of two parts. PART A provides a good, easily comprehensible, self-contained introduction to the fundamental notions and results of first order logics. After defining syntax and semantics, a sequential inference system and a Henkin-type proof of its completeness are presented with extreme care. Compactness and Löwenheim—Skolem properties are then derived. The last chapter of PART A titled "The Scope of First Order Logic" discusses with clarity how these formal tools are applied in the foundation of other branches of mathematics.

PART B starts by introducing some extensions of first order logic, namely second order logics and certain infinitary ones. Then Church's Theorem on undecidability of first order logics, Trachtenbrot's Theorem, incompleteness of second order logics, and Gödel's Incompleteness Theorems are stated and proved in detail.

In the last two chapters, the Ehrenfeucht—Fraïssè characterization of (first order) elementary equivalence and Lindström's Theorem stating that no proper extension of first order logic admits both the compactness and the Löwenheim-Skolem properties are included.

The whole text is well structured for the use of students and is written in a clear, appealing style.

P. Ecsedi-Tóth (Szeged)

D. B. Fuks—V. A. Rokhlin, Beginner's Course in Topology (Universitext), XI+516 pages, Springer-Verlag, Berlin—Heidelberg—New York—Tokyo, 1984.

The material of this book is based on a rather lengthy course of lectures held at the Leningrad and Moscow Universities, and presents an introduction into the most fundamental topics of topology. The book is divided into 5 chapters. Chapter 1 is devoted to general topological spaces. The most important concepts and results are given, including homotopies. The following chapters deal with spaces of special characters. Chapter 2 defines and investigates cellular spaces, especially simplicial spaces, and their topological properties. Chapter 3 gives the fundamental concepts of topological manifolds and special manifolds. At the the end of this chapter, the simplest structure theorems can be found. Chapter 4 deals with bundles with and without group structure, and with vector bundles. Chapter 5 studies homotopy groups. Starting with the general theory, the homotopy groups of spheres, classical manifolds and cellular spaces are investigated.

The book is highly recommended to anyone interested in topology and having some familiarity with higher mathematics.

L. Gehér (Szeged)

C. George, Exercises in Integration (Problem Books in Mathematics), X+ 550 pages, Springer-Verlag, Berlin—Heidelberg—New York—Tokyo, 1984.

This book contains over 200 exercises in Lebesgue integration and its applications in analysis (convolution, Fourier transforms, trigonometric series). Students can deal with the problems usefully if, after having worked seriously upon a problem, seek some pointers from the solution, or compare it with their own. Teachers will find this book an important supplement completing their collection of problems on Lebesgue integration and will discover some new original solutions. Finally, as the author says: "In this book researches will find some results that are not always treated in courses on integration; they are either properties whose use is not as universal as those which usually appear and which are therefore found scattered about in appendices in various works, or are results that correspond some technical lemmas which *I* have picked up in recent articles on a variety of subjects: group theory, differential games, control theory, probability, etc; ..."

J. Németh (Szeged)

H. Gericke, Mathematik in Antike und Orient, XII+292 Seiten, Springer-Verlag, Berlin—Heidelberg—New York—Tokyo, 1984.

This book of four chapters is the material of the first one of the author's two semester course on the history of mathematics (the second one is devoted to the western mathematics).

The first chapter, the Pre-Greek Mathematics, starts with a brief account of prehistoric mathematics, the mathematical content of the megalitic monuments. After it we can read about the Babylonian algebra, geometry and stronomy, the Rhind and Moscow papyri, and the Egyptian calendar and astronomy. The latest part deals with some problems from the Indian Śulvasūtras.

The second chapter sets up some important questions of the Greek mathematics: the development of the deductive method (the Pythagorean school and the influence of the Elean philosophy), incommensurable line segments, the Eudoxos' theory of magnitudes, the quadrature of the parabola by Archimedes, conic sections, theory of numbers (primes, Pythagorean triples, figurate numbers), algebraic problems from Diophantus' Arithmetica, the development of sciences (astronomy, the theory of motions), etc.

The third chapter deals with Oriental mathematics. Here we can read about the famous Chinese "Nine Chapters of the Mathematical Art", and the works of Aryabhata, Brahmagaupta and Bhaskara II. The chapter ends with a short outline of the mathematics of the Moslem countries (e.g. the work of Al-Khwarizmi, the cubic equations, the parallel postulate).

Chapter 4, Biographical and Bibliographical Notes, is very useful for teaching purposes. It contains an extensive bibliography for each chapter and short biographies of the mathematicians mentioned in the text.

This book is recommended not only to students and teachers of mathematics but everybody who wants to read a short but substantial historical outline of the ancient and Oriental mathematics.

Lajos Klukovits (Szeged)

K. Itô, Introduction to Probability Theory, X+213 pages, Cambridge University Press, Cambridge—London—New York—New Rochelle—Melbourne—Sydney, 1984.

This book is an English translation of the first four chapters of Itô's book, Probability Theory (in Japanese, Iwanami-Shoten, Tokyo, 1978), based on courses of probability at different universities. By reading these chapters we can well conclude that it would be desirable to have an English translation of the complete book, which must be just as enjoyable as these translated chapters are.

The first chapter deals with finite trials in order to acquaint the reader with some of the ideas of probability. It is written with mathematical accuracy, but it does not require any knowledge of higher mathematics. The rest is based on measure theory and analysis, assuming that the reader is familiar with them. The second chapter treats properties of probability spaces and measures. It contains, for example, the extension theorem, direct products of probability measures, the Luzin theorem and the Lebesgue decomposition.

The main aim of Chapter 3 is to rigorously define the concept of probability for general trials in terms of measure theory. Itô first defines conditional probability with respect to decompositions of the sample space (Kolmogorov's definition), and then explains Doob's definition followed by a discussion of the relationship between these two definitions. Properties of sums of independent random variables are discussed in the last chapter. Convergent and divergent series of random variables, strong laws of large numbers, Lindeberg's central limit theorem are included.

At the end of each section several problems are presented with hints for solution to help the reader to understand the material involved. Unfortunately, these four chapters of the book do not contain any references, leaving the reader without orientation concerning further parts of probability theory.

Students and researchers who like modern, abstract and rigorous mathematics will enjoy this book, and it can be also used as a text.

Lajos Horváth (Szeged and Ottawa)

I. M. James, General Topology and Homotopy Theory, VIII+248 pages, Springer-Verlag, New York—Berlin—Heidelberg—Tokyo, 1984.

This book gives a good glimpse of the basic material of the subject in a convenient form. The text is as self-contained as possible, and can be understood easily. The subject is developed in eight chapters. The first two chapters contain the fundamental knowledge concerning categories and topological spaces. The third chapter is connected with the various categories associated with the basic category of topology, which is of central importance. Chapter 4 contains an outline of the basic theory of topological groups and, in particular, topological transformation groups. The last four chapters are devoted to various aspects of homotopy theory. In Chapter 5 the notion of homotopy of maps is introduced, the homotopic classification of maps and the classification of the points of a space into path-components are studied. In Chapter 6 the notions of a fibration and of its dual, a cofibration are defined, based on homotopy lifting property and homotopy extension property, respectively. These are of fundamental importance in the theory of classification of maps by homotopy. Chapter 7 deals with separation axioms and discusses various concepts which are associated with them. In the final chapter the extension problem for mappings has been considered using the notion of cofibration.

Only familiarity with the theory of point-set topology is supposed.

L. Gehér (Szeged)

A. J. E. M. Janssen—P. van der Steen, Integration Theory (Lecture Notes in Mathematics, 1078), V+224 pages, Springer-Verlag, Berlin—Heidelberg—New York—Tokyo, 1984.

The main purpose of this book is to present and compare various ways to introduce Lebesgue-integration. This presentation is mainly based on lectures of N. G. de Brujin. The following topics are treated among others: the Riemann and the Riemann—Stieltjes integral; measurable functions and measurable sets; L^p spaces; measure spaces and integration; approximation properties of measurable sets and measurable functions; the Riesz approximation theorem; Baire sets and Baire functions; the Radon—Nikodym theorem; continuous linear functionals on L^pspaces; the Fubini—Stone and Tonelli—Stone theorems; the Fourier transform in $L^2(R)$.

The book contains a large set of exercises. In some cases the exercises extend the theory while several examples may help the reader to understand the theory more deeply. There are hardly any prerequisites for studying the book: a course on introductory calculus is sufficient.

J. Németh (Szeged)

S. Kantorovitz, Spectral Theory of Banach Space Operators (Lecture Notes in Mathematics, 1012), VIII+179 pages, Springer-Verlag, Berlin—Heidelberg—New York—Tokyo, 1984.

The material of this book is based on lectures given at various universities in 1981. The main purpose is to get a spectral analysis and operational calculus for a rather large class of Banach space operators. The book contains results obtained in the last few years. The text is divided into the following 14 chapters: Operational calculus, Examples, First reduction, Second reduction, Volterra elements, The family $S+\varrho V$, Convolution operators in L^p, Some regular semigroups, Similarity, Spectral analysis, The family $S+\varrho V, S$ unbounded, Similarity (continued), Singular C^n operators, Local analysis.

Familiarity with Banach space theory and Banach algebra theory is supposed.

L. Gehér (Szeged)

M. H. Karwan—V. Lotfi—J. Telgen—S. Zionts, Redundancy in Mathematical Programming (A State-of-the-Art Survey), (Lecture Notes in Economics and Mathematical Systems, 206), VIII+285 pages, Springer-Verlag, Berlin—Heidelberg—New York—Tokyo, 1983.

Redundancy in mathematical programming is common, being generally brought about by the lack of complete knowledge about the system of constraints and the desire on the part of the problem formulator not to omit essential elements of the formulation. This volume presentsts an up-to-date survey of methods for identifying and removing redundancy and presents the results of extensive empirical tests on these methods. Based on the results of these tests, recommendations for improvements of the methods are given and some of the improvements are tested.

The first chapter considers the phenomena of redundancy as it arises in formulating mathematical problems, and a comprehensive survey of the literature on it is presented. The second chapter contains the mathematical foundations and notation. The succeeding chapters discuss several methods of identifying redundant constraints in linear programming (Chapter 3—Chapter 15). Chapter 16 deals with the improvements and extensions of the methods discussed earlier.

This book has a theoretical value because it holds together the main methods on redundancy, and it is valuable from the practical point of view as well, because the results of extensive empirical tests on moderate size linear programming problems provide a means of comparing the various methods.

G. Galambos (Szeged)

B. S. Kashin—A. A. Saakjan, Orthogonal series (Russian), 496 pages, Nauka, Moscow, 1984.

This excellent book collects together, in a unified treatment, a lot of important results in the field achieved during the last 25 years mainly by Russian authors. Among others, the following basic facts have been revealed:

(i) A number of statements of the properties of the classical trigonometric system have a common nature so as they remain valid for a wide class of orthonormal systems (e.g., for uniformly bounded or complete ONS).

(ii) There are certain questions where nonclassical ONS (e.g., the Franklin system) behave better than the classical ones.

(iii) The study of general function systems is often reduced to the study of ONS (e.g., in the case of the so-called factorization theorems).

The book is not intended to comprise all new essential results in the field. Some themes are not included at all or appear only in the form of remarks. The choice of the material presented was definitely influenced by the topics of the seminar by D. E. Menshov and P. L. Ul'janov on the theory of functions of a real variable, which has been working at the State University of Moscow for many years.

A certain portion of the theorems in the book has not been presented in any monograph yet and even experts will find new pieces of information for themselves. Nevertheless, the authors were guided by the rule that a graduate student could understand everything without special efforts. In other words, the authors prove all assertions whose proofs lie outside the standard university material at the Soviet universities. In order to emphasize the essence of the methods, the results are usually not presented in their most general forms.

The reader is only assumed to be familiar with the elementary facts in the theory of functions of a real or a complex variable, and in functional analysis; approximately to such an extent what is contained, e.g. in the books "Elements of the theory of functions and functional analysis" by A. N. Kolmogorov and S. V. Fomin and "A short course in the theory of analytic functions" by A. I. Markushevich. In addition, certain supplementary information is added in two Appendices to the end of the book.

The book consists of ten chapters, Remarks on Notations, two Appendices, Notes, List of References involving 201 items, and a short Subject Index. These Notes provide detailed accounts of the priority as well as comments and additional remarks concerning the results included in the text.

Ch. 1 contains the fundamental notions of completeness, totality, minimality, biorthogonality, bases, unconditional bases, etc. and interrelations among them. Ch. 2 is a concise summarization of stochastic independent functions. Ch. 3 deals with the Haar system whose basic properties play a key role in Chs. 8—10. The main emphasis is laid on the study of unconditional convergence of Fourier—Haar series. Ch. 4 gives a brief account of the trigonometric system including the proof of the Littlewood conjecture.

Ch. 5 is a good summary of the chief points in the theory of the Hilbert transform. The famous theorem of C. Fefferman that the dual space of Re $\mathscr{H}^1$ is the BMO is also presented with a proof using the notion of atoms. (Re $\mathscr{H}^1$ consists of those functions $f\in L^1(-\pi, \pi)=L^1$ for which the conjugate function $\tilde{f}$ also belongs to L^1.)

In Ch. 6 the Faber—Schauder and the Franklin systems are studied in detail. The result of P. Woytaszczyk that the Franklin system is an unconditional basis in the nonperiodic space $\mathscr{H}(0, 1)$ is presented, as well. A consequence is that Re $\mathscr{H}^1$ also possesses an unconditional basis.

Ch. 7 deals with the questions of orthogonalization of systems by means of extension of their domain to a larger set, and with the famous factorization theorems of E. M. Nikishin and B. Maure.

Ch. 8 collects the most traditional theorems on the a.e. convergence of general orthogonal series, in particular, the Menshov—Rademacher theorem, the influence of the order of magnitude of the Lebesgue functions, etc.

Ch. 9 is devoted to divergence problems. For example, they deal with the theorem of P. L. Ul'janov and A. M. Olevskiĭ according to which there is no complete ONS of unconditional convergence for l^2, and the theorems of S. V. Bochkarev according to which any uniformly bounded ONS exhibits almost the same divergence behavior as the classical trigonometric system.

Ch. 10 offers a delicate selection of the vast subject of the representation of (not necessarily a.e. finite) measurable functions by orthogonal series using a certain convergence notion (convergence in measure, a.e. convergence, etc.).

The above short account can hardly give a right impression of the wealthiness of this well-written book. The authors have been quite successful in including the most useful results in the field. The book is highly recommended to both beginners and experts in Classical Analysis who want to make acquaintance with the up-to-date methods and results in the theory of orthogonal series. It will certainly stimulate new researches in this area as well as various applications in Functional Analysis, Probability, etc.

F. Móricz (Szeged)

R. Lidl and G. Pilz, Applied Abstract Algebra (Undergraduate Texts in Mathematics), XVIII + 545 pages, Springer-Verlag, New York—Berlin—Heidelberg—Tokyo, 1984.

The purpose of this volume is to give a systematic introduction to applications of modern algebra at an advanced undergraduate level. A first course on abstract algebra is prerequisite, although most of the concepts needed to understand the material are explained in detail.

The book is organized around 3 topics: Boolean algebras, finite fields, and semigroups. Applications of Boolean algebras include switching circuits and simplification methods in propositional logic. Additional material demonstrates the use of Boolean algebras in topology and in probability theory. Coding theory, combinatorial applications, algebraic cryptopraphy, and linear recurring sequences comprise the core of the material on applications of finite fields. The combinatorial applications are Hadamard matrices, balanced incomplete block design, Steiner systems, and Latin squares. Fast adding and Pólya's theory of enumeration give further topics on finite fields. Semigroups and their relation to automata and formal languages form the subject ot the last main area. The discussion on automata culminates in the Krohn—Rhodes decomposition theory.

Many illustrative examples and exercises help the reader in attaining new concepts and methods.

The last chapter is devoted to detailed solutions of the exercises. Except for the last one, all chapters end with historical notes. Several computer programs are contained in an appendix.

The book is warmly recommended to everyone who is familiar with the material of a standard first algebra course and wants to get acquainted with the highlights of applied modern algebra.

Z. Ésik (Szeged)

Padé Approximation and its Applications, Proceedings, Bad Honnef, Germany, 1983. Edited by H. Werner, H. J. Bünger (Lecture Notes in Mathematics, 1071), VI+264 pages, Springer-Verlag, Berlin—Heidelberg—New York—Tokyo, 1984.

Several topics are considered nowadays in the field of Padé approximation. Their common property is that functions (on one or more variable) are approximated by means of rational fractions (continued fractions and other expressions) or that related techniques (acceleration of convergence of sequences) are used in applications. Recently, it has become a visible trend towards the treatment of multivariate problems.

This volume (which is the ninth one in a series started in 1972 in Canterbury) is not an introduction to the Padé approximation. It contains some results concerning special problems. From the content; M. de Bruin: Some Convergence Results in Simultaneous Rational Approximation to the Set of Hypergeometric Functions $\{{}_1\mathcal{F}_1(1; c_i; z)\}_{i=1}^n$. A. Cuyt: The Mechanism of the Multivariate Padé Process. A. Iserles: Order Stars and the Structure of Padé-Tableaux. F. Lambert, M. Musette: Solitary Wawes, Padeons and Solitons. A. Magnus: Riccati Acceleration of Jacobi Continued Fractions and Laguerre—Hahn Orthogonal Polynomials.

Some results are useful in problems of the numerical application of approximation theory including their implementations on a personal computer, although several papers present new methods more or less in an experimental stage of the development.

G. Németh (Budapest)

M. H. Protter—H. F. Weinberger, Maximum Principles in Differential Equations, VII+261 pages, Springer-Verlag, New York—Berlin—Heidelberg—Tokyo, 1984.

It was a long time ago when the maximum principle became one of the best known and most useful tools of the theory of differential equations. Perhaps the root of the maximum principle is the elementary fact that a function f: $[a, b]\to R$ with $f''>0$ assumes its maximum value at one of the endpoints of $[a, b]$. The main advantages of the principle are its relatively short simple and descriptive forms and its easy and natural applicability in various fields. By the principle we have information about the solutions without knowing them explicitly. Therefore the principle is an important tool in the approximation of the solutions. Although the maximum principle is used especially for partial differential equations, it has various attractive and simple applications to ordinary differential equations too, furnishing a natural introduction.

The second, third and finally the fourth chapter are devoted to elliptic, parabolic and hyperbolic partial differential equations, respectively. The book contains classical as well as modern results. (This is a corrected reprint of the second printing originally published in 1967.) The material is chosen and organized in such a way that this work may be recommended not only to mathematicians but also to physicists, chemists, engineers and students, who are interested in differential equations. Surely the readers will enjoy the interesting exercises ending the sections.

L. Pintér (Szeged)

H. Reinhard, Equations différentielles, XIV+446 pages, Gauthier-Villars, Paris, 1982.

There are many books discussing the theory of ordinary differential equations. Some of them made a significant effect on the further development of the theory by raising new ideas. But after a while the effect decreases. The new problems and the new results require a new presentation of the fundamentals. Some results and methods which were new a few years ago are nowadays frequently used means and fundamental theorems. This gives a possibility for a partly new discussion of the fundamentals.

In addition to providing a frame for deep understanding, a work that puts the fundamentals in new light may help the reader in getting acquainted with modern results and becoming able to read up-to-date articles.

In my opinion this is such a book. The notions and theorems are well thought out and illustrated by several examples. Surely this book will be very interesting and useful for both mathematicians (also specialists find interesting ideas in the work) and non-mathematicians, e.g. engineers, who are interested in the applications.

L. Pintér (Szeged)

G. de Rham, Differentiable Manifolds (Grundlehren der mathematischen Wissenschaften, 266), X+167 pages, Springer-Verlag, Berlin—Heidelberg—New York—Tokyo, 1984.

The book is the English translation of Georges de Rham's classic work on differential manifolds published originally by Hermann (Paris) in 1955. It gives a coherent exposition of the theory of differential forms on a manifold and harmonic forms on a Riemannian space.

The first two chapters give an introduction to the elements of differential manifolds and the theory of differential forms, while Chapter III is devoted to the study of currents means of which the relationship between differential forms and chains can be described. This part contains the classical de Rham's cohomology theory. The last chapter deals with the Hodge theory of harmonic differential forms on a Riemannian space. There is given a new proof for Hodge's fundamental theorem. In addition, Kodaira's decomposition theorem and an interesting theorem of A. Andreotti and E. Vesentini is considered too.

A new introduction of S. S. Chern is added to this English translation, where the last sentence reads: "I believe, however, that in his enthusiasm for new results a mathematician will be well-advised to stop at this landmark, where he will have a lot to learn both on the mathematics and on the mathematical style."

Z. I. Szabó (Szeged)

A. Rényi, A Diary on Information Theory, 192 pages, Akadémiai Kiadó, Budapest, 1984.

Many people nourish the notion of remoteness of mathematics and mathematicians from the rest of society, and frequently enough they are proven right in their belief. There are however a number of exemptions from this assumed scenario, and Rényi was certainly one of them. Devoted to his research as he was, he also managed to find time for writing on mathematics for the joy of sharing it with others. It gives one great pleasure to know that he had succeeded eminently in his strive to do so in books like *Dialogues on Mathematics* and *Letters on Probability*.

The first part of the present book, entitled: "On the Mathematical Notion of Information (Diary of a university student)", was intended to be a continuation of these two books. Unfortunately, it was left unfinished at his untimely death. The final chapter of the text given here was completed from Rényi's own notes by one of his students, Gyula Katona. Just like that of the other two, the intent of the present work is to explain what mathematics is, or can be, in a literary, enjoyable style. An imaginary university student, Bonifác Donát, sends him his diary which, after reading it, Rényi proposes to publish without any modification. The result is a deeply probing masterpiece, just like its predecessors.

This book also contains a number of other popular articles by Rényi, most of which appeared in various journals. They are on games of chance and probability, on the teaching of probability, on variations on a theme by Fibonacci, and on the mathematical theory of graphs and trees. Their overall message is again the theme of how one can come to like and appreciate mathematics. While some mathematical knowledge is certainly of help to read some of them, their deep insight and style of writing are often convincing enough even without understanding all the technical details which themselves are also explained in a series of footnotes by Gyula Katona.

The translator Zsuzsanna Makkai-Bencsáth of Montreal, and translation editors Marietta and Tom Morry of Ottawa, Canada have done an excellent job in rendering the original Hungarian into English. Students of any trade of life should find it to their liking, a gift from someone who cared for them.

Miklós Csörgő (Ottawa)

W. Ruppert, Compact Semitopological Semigroups: An Intrinsic Theory (Lecture Notes in Mathematics, 1079), 260 pages, Springer-Verlag, Berlin—Heidelberg—New York—Tokyo, 1984.

A semigroup S with a topology such that only the left and right translations are supposed to be continuous are called semitopological semigroups (for in topological semigroups the multiplication map $S\times S\to S$ is continuous). They occur naturally in the context of selfmaps of a topological space and operator semigroups on a locally convex vector space, endowed with the weak or strong topology. The theory of compact semitopological semigroups has been intensively studied for the last 25 years. The present Lecture Notes give an introduction and a systematic treatment of this theory directed towards the intrinsic structural topological and algebraic approach, avoiding the use of methods borrowed from functional analysis. Chapter I is devoted to the basic facts of the semitopological theory. Especially the set $E(S)$ of all idempotents and the existence of minimal idempotents are investigated. Various methods for the construction of semigroups are introduced and used for the study of examples and counterexamples. Chapter II deals with the study of the subset of $S\times S$ for the semitopological semigroup S where the multiplication map $S\times S\to S$ is jointly continuous. Using these results various structural assertions are formulated. In Chapter III the semitopological compactifications of locally compact topological groups are investigated. These questions are closely connected with the theory of weakly almost periodic functions and the corresponding compactifications of topological groups. There are given interesting applications in this direction. Chapter IV is devoted to the study of the structure of semitopological semigroups with identity 1 defined on a compact connected subset of a Euclidean manifold such that 1 is an inner point. In an Appendix the author gives a survey on the most interesting actual open questions and problems of semitopological semigroup theory.

At the end of each chapter there is a summary of main results as well as additional comments and references.

The reader is supposed to be familiar with some basic knowledge in semigroup theory and general topology. We recommend these notes to everybody working in related fields of mathematics.

Péter T. Nagy (Szeged)

Seminar on Nonlinear Partial Differential Equations, Edited by S. S. Chern (Mathematical Sciences Research Institute Publications, Volume 2), 373 pages, Springer-Verlag, New York—Berlin—Heidelberg—Tokyo, 1984.

This book consists of 18 lectures held at a seminar organized by the Mathematical Sciences Research Institute for graduate students and mathematicians working in other branches of mathematics. But the lectures are instructive for users of partial differential equations too, e.g. for physicists, chemists and engineers.

Perhaps just the same is valid for the nonlinear partial differential equations that S. A. Antman says in the introduction of this lecture about nonlinear elasticity: "There are many reasons why nonlinear elasticity is not widely known in the scientific community: (i) It is basically a new science whose mathematical structure is only now becoming clear. (ii) Reliable expositions of the theory often take a couple of hundred pages to ge to the heart of the matter. (iii) Many expositions are written in a complicated indicial notation that boggles the eye and turns the stomach."

The lectures of this seminar — many of them are real gems — will surely win students and others over to partial differential equations. In general the lectures present the question, the essential results, problems and accurate bibliography. As is seen, the lecturers' aim is the clear exposition of ideas that lead the readers to the understanding of the results.

To give a short foretaste we enumerate the titles of some lectures: An introduction to Euler's Equations for an incompressible fluid (A. J. Chorin), A walk through partial differential equations (F. John), Remarks on zero viscosity limit for nonstationary Navier—Stokes flows with boundary (T. Kato), Free boundary problems in mechanics (J. B. Keller), Shock waves, increase of entropy and loss of information (P. D. Lax), Analytical theories of vortex motion (J. Neu), Applications of the maximum principle (M. H. Protter), Minimax methods and their application to partial differential equations (P. H. Rabinowitz), Equations of plasma physics (A. Weinstein).

L. Pintér (Szeged)

S. Shelah, Proper Forcing (Lecture Notes in Mathematics, 940), XXIX+496 pages, Springer-Verlag, Berlin—Heidelberg—New York, 1982.

The author's main concern here is to apply forcing techniques. Quoting his words: "We adopted an approach I heard from Baumgartner and may have been used by others: not proving that forcing works, rather take axiomatically that it does and go ahead to applying it. As a result we assume only knowledge of naive set theory (except some isolated points later on in the book). The idea of this approach is that otherwise when the student learns what is axiomatic set theory and how you can show by forcing that *CH* may fail (and that *CH* holds by learning something on *L*) the course is finished. But he has only a vague idea of the rich possibilities in forcing, and no idea how to use them".

Central to the discussions are independence results mostly on small uncountable cardinals; more generally, the volume concentrates on developing new methods for independence proofs, thus providing a good basis for further research in this important area of set theory.

The book is excellently written; in fact, it can be used in a number of different ways: as a text book on applications of forcing or as a source of recent results; it seems to be useful for experts and for (graduate) students of set theory. Moreover, I am quite sure, it is an enjoyable reading to everyone interested in modern independence research.

P. Ecsedi-Tóth (Szeged)

I. M. Sigal, Scattering Theory for Many-Body Quantum Mechanical Systems (Lecture Notes in Mathematics, Vol. 1011), IV+130 pages, Springer-Verlag, Berlin—Heidelberg—New York—Tokyo, 1983.

Quantum mechanical many body scattering theory is an important field from the practical point of view of physics. On the other hand it is an interesting application of the well elaborated spectral theory of Hilbert space self-adjoint operators. Though all the problems of scattering theory are far from beeing fully solved at present, this book — based mainly on the authors own work — summarizes some very important results: the existence and asymptotic completeness of the N particle scattering wave operators. The mathematical compactness makes this book comprehensive mainly for mathematicians working in the field of Hilbert space theory, one can miss only some remarks connecting the rigorous results with physical facts.

M. G. Benedict (Szeged)

I. Vincze, Mathematische Statistik mit industriellen Anwendungen, 502 Seiten (in zwei Bänden), Akadémiai Kiadó, Budapest, 1984.

Das ist die zweite, erweiterte deutschsprachige Auflage des Buches. Da der Umfang des Buches geringfügig vergrößert wurde, war es möglich, ein neues Kapitel über die Theorie der Entscheidungsfunktionen einzufügen, den Begriff der Robustheit und einige Probleme der Weibull-Verteilung zu besprechen und den Shapiro—Wilk-Test anzugeben.

In der Einleitung wird der Gegenstand der Wahrscheinlichkeitsrechnung angegeben und die wichtigsten Aufgaben der Wahrscheinlichkeitsrechnung und der mathematischen Statistik definiert. Im zweiten Kapitel werden die — später benötigten — wahrscheinlichkeitstheoretischen Hilfsmittel behandelt, wobei man neben den elementaren Begriffen auch die Grenzwertsätze und die Gesetze der großen Zahlen diskutiert. Einige wichtige Wahrscheinlichkeitsverteilungen sind auch angegeben. Im nächsten Teil werden die Grundlagen der Stichprobenentnahme behandelt. So werden z. B. einfache, zwei — und mehrstufige und sequentielle Verfahren verglichen, und die geordnete Stichprobe definiert. Anschließend werden die wichtigsten Stichprobenfunktionen und Ergebnisse (Satz von Gliwenko, die Kolmogorowschen und Smirnowschen Grenzverteilungsätze) angegeben.

Das vierte Kapitel beschäftigt sich mit der Theorie der statistischen Schätzungen. Besonders die Punktschätzungen werden sehr eingehend behandelt (die Begriffe der erwartungstreuen Schätzung, der Wirksamkeit der Schätzung, der konsistenten und stark konsistenten Schätzungen, der suffizienten Schätzungen werden definiert, die Cramer—Raosche Ungleichung ist angegeben und auch die wichtigsten Methoden zur Erstellung von statistischen Schätzfunktionen sind enthalten). Daneben wird auch die Intervallschätzung und die Robustheit noch kurz besprochen.

Das fünfte Kapitel ist den Fragen der Prüfung von statistischen Hypothesen gewidmet. Neben einer sehr überschaubaren Einleitung von Grundlagen (parametrische und nichtparametrische Methoden, Fehler erster und zweiter Art, Gütefunktion, Testvergleiche) findet man eine große Auswahl von Tests, die für verschiedenen Fragen ausgearbeitet wurden. Zu den meisten Methoden sind einfache Beispiele hinzugefügt; dadurch ist das Verstehen der Methoden erleichtert. Die nächsten zwei kurzen Kapitel geben die wichtigsten Aufgaben des sequentiellen Stichprobenverfahrens und die Grundbegriffe der Theorie der Entscheidungfunktionen an. Beide Gebiete gehören zu den wichtigsten Teilen der modernen Statistik, und so bilden diese Kapitel eine gute Ergänzung zu den klassischen Methoden.

Im zweiten Band des Buches findet man drei weitere Kapitel: eins über Varianzanalyse, eins über Korrelations- und Regressionsanalyse und eins über die statistischen Methoden der Qualitätskontrolle. Sowohl bei der Varianzanalyse als auch bei der Korrelations- und Regressionsanalyse werden mehrere Aufgabe gestellt, theoretisch gelöst und an praktischen Beispielen demonstiert. Das letzte Kapitel zeigt, wie man aus mehreren in Frage kommenden Methoden eine geeignete Wahl treffen kann oder zu einem sich in der Praxis ergebenden Problem eine geeignete Methode entwerfen kann. Die Forderung nach Wirtschaftlichkeit führt oft nicht zu den wirksamsten Methoden, besonders dann, wenn die Methode sehr häufig anzuwenden ist, z. B. in der statistischen Qualitätskontrolle.

Das Buch strebt eine mathematisch präzise Behandlung des Stoffes an. Eine große Anzahl der Methoden ist angegeben und mit praktischen Beispielen sehr verständlich veranschaulicht. Das Buch stellt eine gute Einleitung in die Statistik dar für all jene die die Grundmethoden dieses Fäches in der Praxis anwenden wollen.

J. Csirik (Szeged)

K. Yosida, Operational Calculus (A Theory of Hyperfunctions) (Applied Mathematical Sciences, 55), X+170 pages, Springer-Verlag, New York—Berlin—Heidelberg—Tokyo, 1984.

The operational calculus is known as a frequently applied and successful technique in solving linear ordinary differential equations with constant coefficients as well as the telegraph equation that includes both the wave and the heat equations with constant coefficients.

The rapid development of this technique started with O. Heaviside's work and was motivated by his research in electromagnetic theory. In the further development and exact mathematical foundation J. Mikusiński's contribution was fundamental mainly by inventing the theory of convolution quotients. His book: "Operational Calculus" is widely read and available in several languages.

As the author claims in the Preface: "The aim of the present book is to give a simplified exposition as well as an extension of Mikusiński's operational calculus". The simplification means mainly the presentation of a plain proof of the Titchmarsh convolution theorem and the fact that the author need not rely upon the Titchmarsh convolution theorem for solving linear ordinary differential equations with constant coefficients. The extension relates to the calculus itself as well as a new application to the Laplace differential equation. The part, devoted to the applications to partial differential equations, discusses a number of problems concerning physics and engineering.

The book is written in an elegant, concise manner, in a lucid style. A number of examples and exercises enlighten the abstract concepts. This book is warmly recommended to everybody (including both students and researchers) who is interested in this mathematical discipline as well as to physicists and engineers who want to apply this technique to their problems.

E. Durszt (Szeged)