Bibliographie

Automata, Languages and Programming. Proceedings of the 16th ICALP Conference held in Stresa, Italy, July 1989. Edited by G. Ansiello, M. Decani-Ciancaglini and S. Ronchi Della Rocca (Lecture Notes in Computer Science, 372), XI+788 pages, Springer-Verlag, Berlin—Heidelberg—York—Tokyo, 1989.

This volume contains the following five invited talks: C. Böhm: Subduing Self-Application; H. Ehrig, P. Pepper, F. Orejas: On Recent Trends in Algebraic Specification; D. Eppstein, Z. Galil: Parallel Algorithmic Techniques for Combinatorial Computation; D. Perrin: Partial Commutations; J. C. Reynolds: Syntactic Control of Interference, Part 2. As the reader may expect the majority of the 45 accepted contributions is more or less tied up with Complexity Theory. They range from adding tensor rank as a new item to the *NP*-completeness heap (J. Hastad), developing a systematic theory based on algebraic automata theory to analyse the inner structure of the complexity class NC^1 (P. McKenzie and D. Therien) to the papers of Allender and Hemachandra offering new oracle constructions and optimal lower bounds. Numerous other fields such as rewriting systems (e.g. Dershowitz, Kaplan and Plaisted's paper on infinite normal forms), factors of biinfinite words (Beauquier, Pin) are represented, too.

This book is a valuable source of information for specialists working in different branches of Computer Science.

J. Virágh (Szeged)

P. Bamberg—S. Sternberg, A course in mathematics for students of physics: 2, XVII+444 pages, Cambridge University Press, Cambridge—New York—Port Chester—Melbourne—Sydney, 1990.

Students with interest in physics need strong and well-organized knowledges in mathematics, as well. Most effective way to organize their mathematical education, is to present mathematics as a powerful resource and means of expression in solving and representing physical problems, result and discoveries.

This natural approach is the starting point and leading idea of Bamberg's and Sternberg's work. Second volume contains chapters based on algebraic topology, exterior differential calculus, theory of functions of complex variable. Connecting fields of physics are: electrical networks, electrostatistics, magnetostatistics, Maxwell-equations, classical thermodynamics.

The subject not only covers a course but it is suitable for individual studying: all the important topics are encountered, furthermore the volumes are self-contained. The reader finds detailed demonstrations, with well-motivated arguments at each step. Numerous figures are nice and clear, important statements and conclusion are conspicuous by logical emphasis, and typographical way, as well.

This new volume is an interesting reading for a mathematician, as well, who wants to strengthen or broaden his or her familiarity with physics.

J. Kozma (Szeged)

N. Bourbaki, Elements of Mathematics, Algebra II, Chapters 4—7, VIII+436 pages, Springer-Verlag, Berlin—Heidelberg—New York—London—Paris—Tokyo—Hong Kong, 1990.

This is a new and expanded (English) version of Bourbaki's Algebra Chapters 4—7 (translated from the French by P. M. Cohn and J. Howie). The English translation of the first three chapters of the Algebra was published in 1989 by Springer (see our review in the same *Acta* vol. **54**, p. 410).

Chapter 4 deals with polynomials, rational fractions and power series over commutative rings. New sections on symmetric tensors, polynomial mappings and symmetric functions have been added. The completely rewritten Chapter 5 is devoted to commutative fields and field extensions. After the Galois theory (with an application to finite fields) the transcendental extensions are studied (e.g. p-bases, separability criterions, regular extensions), which are not usual parts of textbooks. In Chapter 6 one can read on ordered groups and fields. The last, Chapter 7 deals with modules over principal ideal domains. New sections on semi-simple endomorphisms and Jordan decomposition have been inserted.

As usual in the volumes of the "Les structures fondamentales de l'analyse" each chapter ends with exercises and most of them also with historical remarks.

As a closing remark we repeat the last two sentences from our previous review on N. Bourbaki's Algebra I and Commutative Algebra: "The works of N. Bourbaki are not easy peaces of reading, but everybody can enjoy them, who likes the strict axiomatic treatment. In my opinion, these masterpieces must have places in every good mathematical library".

Lajos Klukovits (Szeged)

Victor Bryant, Yet another introduction to analysis, VIII+290 pages, Cambridge University Press, Cambridg—New York—Port Chester—Melbourne—Sydney, 1990.

Analysis is notoriously one of the most difficult subjects to present in the classroom. Suppose you have a definite conception on the introduction of analysis and you wish to find books having characteristic features similar to your conception. Although everyone believes that "a new introduction to analysis springs up every other day", the probability to find appropriate books is a surprisingly small positive number. The subject-matter is many-sided. Your task is not only to make clear some notions but at the same time to take preliminary steps towards deeper topics. Who has right to present a new introduction? In my opinion every experienced teacher having an original idea has right to write such an introduction. This in not a hopeless case because the theme is similar to classical music, e.g. Beethoven's Violin concerto, there exist several different but authentic performances. (However, sometimes you can hear really bad ones as well.)

I think that the author of this book has several greater and smaller ideas. (I liked his articles in Math. Gazette very much.) The most characteristic feature of the work is that the new notions are unsophisticated, the proofs are not only clear, but in several cases first you have a water proof, a sketch, then a water-tight proof. (You cannot find even the shadow of "deus ex machina".) Let us have only one characteristic example: After examples one obtains a guess, that any sequence will have either an increasing subsequence or a decreasing subsequence (or possibly both). The author declares the theorem, then he gives a water proof. The keystone of this proof is that the points (n, x_n) (where we assume that $x_n > 0$) represent people on the roots of their hotels on the Costa Bom, and each hotel with a sea-view will have a special symbol. Then we find an exact water-tight proof. The style is fresh and imaginative.

If you are going to enumerate the titles of the paragraphs you find questions only, e.g. in the fourth chapter (Calculus at last): How do we work out gradients? How does that lead to differentiation? How does that help us to find averages and approximations? Finally, the reviewer's question: Why do not you try this interesting "Introduction"? Surely you will have some answers.

L. Pintér (Szeged)

Category Theory and Computer Science, Edited by D. H. Pitt, D. E. Rydeheard, P. Dybjer, A. M. Pitts and A. Poigné (Lecture Notes in Computer Science, 389), Springer-Verlag, Berlin—Heidelberg—New York—London—Paris—Tokyo—Hong Kong, 1989.

This volume is the collection of 21 papers presented at the third conference on Category Theory and Computer Science held in Manchester, UK, September 5—8, 1989. The proceedings of the preceding two conferences in the series were published as volumes 240 and 283 of Springer LNCS. The following lines are from the introduction.

"One of the key ideas is the representation of programming languages as categories. This is particularly appropriate for languages based upon typed lambda calculi where the types become objects in a category and lambda terms (programs) become arrows. Conversions between programs are treated as equality, or alternatively, making the conversions explicit, as 2-cells. Composition is substitution of programs for free variables. Multiple variables are handled by admitting categories with finite products. This treatment enforces a stratification based upon the types of variables and expressions. For example, languages with type variables lead to indexed (or fibered) categories. Constructs in programming languages correspond to structure within categories, and categories with sufficient structure delimit the semantics of a language."

The volume can be recommended to theoretical computer scientists and graduate students with interest in semantics of programming languages or in foundational issues of computer science.

Z. Ésik (Szeged)

John B. Conway, A Course in Functional Analysis (Graduate Texts in Mathematics, 96) XVI + 399 pages, Springer-Verlag, New York—Berlin—Heidelberg—London—Paris—Tokyo—Hong Kong, 1990.

The text is divided into eleven chapters, and at the end of the book three Appendices can be found. The first two chapters introduce the basic concepts of Hilbert spaces and Hilbert space operators and develop the main theorems. Here the complete spectral theory of compact normal operators is worked out. Chapter 3 defines Banach spaces and presents the basic theorems, such as the Hahn—Banach theorem and the open mapping and closed graph theorems, Chapter 4 summarizes the essentials of the theory of locally convex spaces. The main objects of the study in Chapter 5 are the weak topology on a Banach space and the weak-star topology on its dual. Chapter 6 is devoted to the general theory of linear operators on a Banach space. Chapter 7 gives a glimpse into the theory of Banach algebras and spectral theory and applies this to the study of operators on a Banach space. In Chapter 8 the notion of a C^*-algebra is explored which is intimately connected with the theory of operators on a Hilbert space. It turns out that any C^*-algebra is isomorphic to a subalgebra of the algebra of bounded operators on a Hilbert space. Chapter 9 develops the spectral theory of bounded normal operators on a Hilbert space as an application of the representation theory of Abelian C^*-algebras. Chapter 10 generalizes the spectral theory for unbounded operators. Chapter 11 studies certain properties of operators on a Hilbert space, that are invariant under compact perturbations, and proves the basic properties of the Fredholm index. The appendices shortly summarize the notions of linear spaces and topology and determine the dual spaces of L^p and $C_0(x)$ spaces. There are, at the end of every sections, several exercises of varying degrees of difficulty with different purpose in mind.

The book is a pearl of the mathematical literature, and it is highly recommended to anybody interested in functional analysis.

L. Gehér (Szeged)

Robert Dautray—Jacques-Louis Lions, Mathematical Analysis and Numerical Methods for Science and Technology (Vol. 4 Integral Equations and Numerical Methods), X+465 pages, Springer-Verlag, Berlin—Heidelberg—New York—London—Paris—Tokyo—Hong Kong, 1990.

This is the fourth volume of the planned six volumes. The enumeration of the titles gives some information on the topics: Mixed Problems and the Tricomi Equation; Integral Equations: Part A. Solution Methods Using Analytic Functions and Sectionally Analytic Functions, Part B. Integral Equations Associated with Elliptic Boundary Value Problems in Domains in R^3; Numerical Methods for Stationary Problems; Approximation of Integral Equations by Finite Elements. Error Analysis; Appendix "Singular Integrals".

In general the discussion begins with physical introduction (or hypotheses), this is a clear treatment with references, if necessary. Then comes the equation with the corresponding conditions, and after this the various methods of solutions. The reader has a well-organized book with serious mathematical notions and procedures which are in the closest connection with important applications. The fascinating thing is that the investigation of this book goes "without tears". The methods seem to be natural and easy to understand. This reminds me of one of G. B. Shaw's play (Cashel Byron's Profession (not the best among the Shaw's works)) in which Cashel says that the real artistic work does not show any struggle with the theme (free interpretation). Such a natural lightness (which covers difficult problems) is the main characteristic feature of this work.

For a reader who has not seen the former volumes we cite their titles: Vol. 1: Physical Origins and Classical Methods, Vol. 2: Functional and Variational Methods, Vol. 3: Spectral Theory and Applications.

L. Pintér (Szeged)

B. A. Davey—H. A. Priestley, Introduction to Lattices and Order, VIII+248 pages, Cambridge University Press, Cambridge—New York—Port Chester—Melbourne—Sydney, 1990.

From the preface: "This is the first textbook devoted to ordered sets and lattices and to their contemporary applications. It acknowledges the increasingly major role order theory is playing on the mathematical stage and is aimed at students of mathematics and at professionals in adjacent areas, including logic, discrete mathematics and computer science."

I recommend this book to all mentioned above.

The treatment of Scott's information systems as algebraic semilattices, fixpoint theory with pointing out its role in computer science, Boolean algebras applied to a fragment of propositional calculus, and Priestley's duality theory between distributive lattices and certain topological spaces are some of the interesting parts of the book.

For those intending to apply the theory of lattices and ordered sets the most interesting chapter is perhaps the last one entitled "Formal Concept Analysis". Formal concept analysis was introduced by R. Wille, and the fast development of this recent field is mostly due to R. Wille and other members of his Darmstadt group. The starting point of concept analysis is so natural that it has applications not only in lattice theory but in many other sciences distinct from mathematics as well.

G. Czédli (Szeged)

The Dilworth Theorems (Selected Papers of Robert P. Dilworth), Edited by K. Bogart, R. Freese, J. Kung, XXVI+465 pages, Birkhäuser, Boston—Basel—Berlin, 1990.

This excellent book gives the reader much more than an almost complete collection of Dilworth's contributions to lattice theory, universal algebra and combinatorics. The book is organized into chapters, including Chain Partitions in Ordered Sets, Complementation, Decomposition Theory, Modular and Distributive Lattices, Geometric and Semimodular Lattices, and Multiplicative Lattices.

Besides Dilworth's reprinted papers these chapters contain related articles by leading experts of the field. Further, Dilworth himself has written backgrounds to each chapter. Thus each chapter not only shows how the present stage of a given research field includes and has developed Dilworth's ideas but it contains an up-to-date survay of the field.

The book is recommended to those interested in the theory of lattices and ordered sets. It gives an introduction to many fields of these theories, and it is useful to experts as well.

G. Czédli (Szeged)

Brian F. Doolin—Clyde F. Martin, Introduction to differential geometry for engineers, (Pure and applied mathematics, 136), XII+163 pages, Marcel Dekker, Inc., New York—Basel—Hong Kong, 1990.

This is a carefully written real introductory book for differential geometry. It is written mainly for the engineers and therefore it does not suppose a well prepared mathematical knowledge for the readers.

Its aim, to introduce the reader to this field of mathematics, is reached, in fact, through a very detailed and concrete treatment. Just this fact is why I recommend it not only to the engineers, who will certainly be grateful for this book, but also to the mathematician students who are just studying differential geometry. Although the book is short, all the really basic concepts of the topic are included.

The authors have no doubt about the book's purpose and in spite of the very much details they do not lose their way: only the necessary and important objects are enlightened in details. To collect only the essential concepts of the subject is really a good way for an introductory book. It makes the topic very natural and easily understandable.

In sum, we recommend this book to all who are interested in a basic introduction to the foundation of differential geometry.

Á. Kurusa (Szeged)

B. A. Dubrovin—A. T. Fomenko—S. P. Novikov, Modern geometry — Methods and applications. Part III. Introduction to homology theory, (Graduate texts in mathematics, 124), IX+416 pages, Springer-Verlag, New York—Berlin—Heidelberg—London—Paris—Tokyo—Hong Kong—Barcelona, 1989.

All the people, mathematicians, physicists and students, who read the first two volumes of the Modern geometry (Part I.: GTM 93; Part II.: GTM 104) know what a great experience were to read them. Therefore, it is not surprise that there were big expectations for the third volume, that is published now after five years in highly accessible language.

Nevertheless, all the expectations are now satisfied and the mathematician's and physicist's community has now a very valuable reference and text in the homology theory. This volume is written just as clearly as the first two were and also their style are the same. A lot of concrete examples and the descriptiveness characterize this book.

Since the abstract notions can easily cover up the real ideas in such an abstract topic like the homology theory, it is an advantage to use the abstract terminology only in the case it is necessary. In this way, the reader, by my opinion, can understand the ideas behind the abstractions more easily and the abstract notions appear more naturally. The authors chose successfully this heavier way and the book became marvellous.

For a short sum of the topics treated in the book here are the main titles: Homology and cohomology; Computational recipes; Critical points of smooth functions and homology theory; and finally Cobordisms and smooth structures.

In sum, this book must be on the shelf of all the students, mathematicians and physicists who have any interest in the homology theory.

Á. Kurusa (Szeged)

Ciprian Foiaş—Arthur E. Frazho, The Commutant Lifting Approach to Interpolation Problems (Operator Theory: Advances and Applications, 44), XIII+632 pages, Birkhäuser Verlag, Basel—Boston—Berlin, 1990.

In 1967 D. Sarason introduced an ingenious new method for solving classical interpolation problems. Actually, he proved that for every operator A in the commutant of the compression $T=P_M S|M$ of the simple unilateral shift S (to a semi-invariant subspace M) there exists a bounded analytic function φ on the unit disc such that $A=\varphi(T)$ and $\|A\|=\|\varphi\|_\infty$. Then he pointed out the way how the interpolation theorems due to Carathéodory and Nevanlinna—Pick can be derived from this description of the commutant. Shortly afterwards, in 1968 B. Sz.-Nagy and C. Foiaş extended Saranson's result proving that every operator A intertwining the arbitrarily chosen Hilbert space contractions T and T' can be lifted, in a norm-preserving manner, to an operator B intertwining the minimal isometric dilations V_+ and V'_+. This is the so-called Commutant Lifting Theorem which has been proved a powerful tool in handling different problems in mathematics.

The purpose of this monograph is "to present a unified approach, based on the geometric framework of the commutant lifting theorem, to solve many classical and modern interpolation problems arising in mathematics, engineering and geophysics". The subjects treated include, among others, the block versions of the Carathéodory, Nevanlinna—Pick, Hermite—Fejér interpolation problems in both their classical and tangential forms, the Adamjan—Arov—Krein representation of Hankel operators, the characterization of left and right inverses of Toeplitz operators, and a general Schur type fractional representation of the solutions in the commutant lifting theorem.

Explicit formulas and algorithms are provided. Several proofs are given for the fundamental commutant lifting theorem illuminating the different faces of this theorem. Separate chapters are devoted to the applications in H^∞ control theory and in connection with the layered medium model in geophysics.

The book is essentially self-contained, only some knowledge of elementary real, complex and functional analysis is assumed. A chart helps the reader showing the connection between the different chapters (which are also written as self-contained as possible).

This monograph can be warmly recommended to graduate students who want to get acquainted with this exciting, rich field of mathematics. At the same time it will certainly be an indispensable handbook for specialists in operator theory, interpolation theory, control theory and signal processing.

L. Kérchy (Szeged)

Bernard R. Gelbaum—John M. H. Olmsted, Theorems and Counterexamples in Mathematics (Problem Books in Mathematics), XXXIV+305 pages, Springer-Verlag, New York—Berlin—Heidelberg—London—Paris—Tokyo—Hong Kong, 1990.

In my younger years the authors' former book: Counterexamples in Analysis was one of my favourites. I have good reason to be thankful for its clear and ingenious way of enlightening ideas in analysis. Even now I have a copy of this work on my bookself and sometimes in my hands.

In the last thirty years the number of mathematical branches increases in great steps. (See e.g. the Subject Index of the *MR*.) One can survey only a small part of the new results. Some of the notions which were not "elementary" thirty years ago have become "elementary" by now. See for example the elementary problems in The American Mathematical Monthly. In the Preface the authors say: "The object of the body of the text is more to enhance what the reader already knows than to review definitions and notations that have become part of every mathematician's working context". In my opinion in this book one finds several interesting examples, results also in branches which are relatively unknown to the reader. Therefore he/she will inquire about these themes, too. For example Dantzig's simplex algorithm was not unknown for me. Moreover I have read L. Lovász's article: A new linear programming algorithm—better or worse than the simplex method? (The Math. Intelligencer vol. 2, no. 3, 1980), but the remarks on Smale's and Karmankar's work in this book were new for me and I would like to know more about them.

Naturally it is impossible to enumerate the examples which were interesting for me, but let us mention some of them. The first one is the Kakeya problem: "A unit line segment can be rotated through 360° within an arbitrarily small polygonal area." The presentation of this astonishing problem with the remarks is interesting in case you have heard about the Besicovitch's solution and about the Perron trees, too. The short history of the Bieberbach conjecture makes the reader eager to know more about this famous problem and the proof of the conjecture given by de Branges in 1985. (Perhaps Korevaar's and Pommerenke's refering articles could have been suggested to the reader.) Another famous conjecture can be found in paragraph "Exotica in differential topology" the Poincaré's conjecture. The results of Smale and Freedman are mentioned.

The book is warmly recommended to the general mathematical public. (Maybe it is because of prejudice on the part of the reviewer but he thinks that the Analysis is the best chapter of the work.)

L. Pintér (Szeged)

Geometry and Robotics, Workshop, Toulouse, France, May 1988, Proceedings, Edited by J.-D. Boissonat—J.-P. Laumond (Lecture Notes in Computer Science, 391), VI+413 pages, Springer-Verlag, Berlin—Heidelberg—New York—London—Paris—Tokyo—Hong Kong, 1989.

A lot of relatively distant fields of geometry enter into relation via their connection with robotics. Theory of curves, computational geometry, projective geometry, algebraic topology give rise of several questions in computer science especially in robotics. Furthermore they play a peculiar role in solving problems in recent times.

A workshop was held at Toulouse in 1988, scientific program of which was the base of this volume. It contains 20 contrubutions by French authors. The understanding of the papers do not presume any deeper preliminary knowledges of computer science or geometry, so it can be a useful reading for everyone interested in current topics of robotics.

J. Kozma (Szeged)

D. H. Greene—D. E. Knuth, Mathematics for the analysis of algorithms (Progress in Computer Science and Applied Logic, 1), VIII+132 pages, Birkhäuser, Boston—Basel—Berlin, 1990.

This book contains some fundamental mathematical techniques which are necessary for the analysis of algorithms.

Chapter 1 starts with binomial identities and afterwards inverse relations and the hypergeometric series are treated. Chapter 2 is devoted mainly to linear and nonlinear recurrence relations. Chapter 3 deals with operator method by means of which one can obtain such characteristics as expected values or variances from probability generating functions. The last chapter considers asymptotic analysis which is very useful tool especially for to average case analysis of algorithms (in detail the following methods and theorems are treated: Abelian theorem, Tauberian theorems, Stieltjes integration and asymptotics, Euler's summation formula, Darboux's method, residue calculus, the saddle point method).

For specialists the rich bibliography increases the value of the book, and both teachers and students will evaluate the appendices containing exam problems from which in this third edition further new ones are added).

The book is warmly recommended to all researchers, teachers, students interested in analysis of algorithms.

J. Németh—A. Varga (Szeged)

Grosse Augenblick aus der Geschichte der Mathematik, herausgegeben von Róbert Freud, 263 Seiten, Akadémiai Kiadó, Budapest, 1990.

Das ist die deutsche Übersetzung der ungarischen Originalausgabe von 1981. Mit diesem Buch laden die Leser die Autoren zu einer abenteuerlichen Reise in der Welt der Mathematik ein.

Dieser Band entsteht aus acht unabhängigen Kapitel, die sind die Folgenden:

1. Schon die alten Griechen haben das gewußt (von János Surányi).
2. Sind Gleichnungen lösbar (von Róbert Freud).
3. Wie ist die mathematische Analysis entstanden (von Ákos Császár).
4. „Aus dem Nichts habe ich eine neue, andere Welt erschaften." Was ist die Bolyai—Lobatschewskische Geometrie (von György Bizám).
5. Ideale Zahlen und die Fermatsche Vermutung (von Edit Gyarmati).

6. Wie sah Hilbert die Zukunft der Mathematik? (von Ákos Császár.)
7. Ein sonderbarer Lebensweg, Ramanujan (von Pál Turán).
8. Im Reich des Zufalls herrscht nicht mehr der Zufall (von István Vincze).

Jedes Kapitel endet mit Aufgaben, dessen Lösung kann am Ende des Bandes gefunden werden.

Für dieses Buch soll nur eine geringe Vorbildung gehabt werden, die Mathematik, die in Ober- (Mittel)- schulen gelernt wird, ist ganz genügend.

Ich hoffe, daß jeder diese Abenteuer genießen wird, der die Mathematik für einen Teil der allgemeinen menschlichen Kultur hält.

Lajos Klukovits (Szeged)

Niccolo Guicciardini, The Development of Newtonian Calculus in Britain 1700—1800, XII+ 228 pages, Cambridge University Press, Cambridge—New York—Port Chester—Melbourne—Sydney, 1989.

Newton was one of the investors of differentiation and integration. It is very interesting that the development of the calculus in Britain and in other countries in Europe remained separated for over a century. This book is dealing with both the research and teaching of this calculus called the calculus of "fluxions", over the whole period. The book begins with an overture which contains the fundamental elements of Newton's calculus presenting Newton's published work on the calculus of fluxions. The first three chapters are devoted to the early diffusion of the calculus of fluxions from 1700 to 1730 and to the research in pure mathematics done by early Newtonians (Roger Cotes, James Stirling, Brook Taylor, Colin Maclaurin) and furthermore to the controversy on foundations of the calculus originated by Berkeley's Analyst (1734). The next three chapters deal with the middle period of the fluxional school from 1736 to 1785, considering the production of new treatises and improvements in applications of the calculus of fluxions and the attempts made by some British mathematicians to develop new techniques in the calculus. The last three chapters are devoted to the reform of the calculus from 1775 to 1820. This part of the book is based on completely unknown material.

The chapters are followed by six Appendices containing important information (textbooks, chairs of mathematics, military academies, subject index, manuscript sources) and finally the book ends with a rich bibliography containing more than 600 references.

I am sure that this book is very useful for science historians and philosophers studying this period, but it is recommended to any student or teacher of mathematics, too.

J. Németh (Szeged)

Domingo A. Herrero, Approximation of Hilbert space operators, Volume 1, Second edition (Pitman Research Notes in Mathematics Series, 224), 332 pages, Longman Scientific & Technical, England, 1990.

The approximation theory of Hilbert space operators is a rapidly developing field of the operator theory. This book gives a systematic study of approximation problems (in operator norm) related with operator classes which are invariant under similarity. More precisely, the problems considered here are to characterize the closure of such classes and to give exact formulas or at least estimates for the distance of operators from such classes. After giving an "apéritif" in finite dimension and developing the necessary technical means the cases of nilpotent, algebraic and polynomially compact operators are treated. Disregarding from the proofs of some fundamental theorems connected with C^*-algebras the book is self-contained.

The theory elaborated here is completed in the second volume by C. Apostol, L. A. Fialkow, D. A. Herrero and D. Voiculescu. The progress has been made since the publication of the second volume in 1984 is described in this second edition of the first volume in the form of additional Notes and Remarks at the end of the corresponding chapters and in an Appendix. This Appendix contains, among others, a metatheorem which asserts that the closure of a similarity invariant class of operators with "sufficient structure" can be described in terms of the different parts of the spectra of the operators.

This book can serve as an excellent introduction for beginners as well as a good reference for the experts in the operator theory.

L. Kérchy (Szeged)

R. W. Hockney—J. W. Eastwood, Computer Simulation using Particles, XXII+540 pages, Adam Hilger, Bristol and Philadelphia, 1988.

The combination of computer experiment, and theory proves much more effective in obtaining physically useful results than any one approach or pair of approaches. To obtain results, theory uses mathematical analysis and numerical evaluation, physical experiment uses apparatus and data analysis, and the computer experiment uses computer plus simulation program.

Covering all aspects of particle techniques of simulation — from mathematical models to simulation programs — this book presents case study examples in astrophysics, plasmas, semiconductors and condensed matter physics. The unifying aspects of the diversity of phenomena are similarities of the mathematical models of the physical systems and similarities of the numerical schemes used.

The secret of success in computer experiments is to devise the appropriate model. The best choice of model depends on the relevant physical length and timescales. There is a clear one-to-one correspondence between the physical and computer model particles in the molecular dynamics simulation. At the other extreme, the identity of the atomic building blocks in the vortex fluid simulation model is completely lost. A third type of particle model lies between the two extremes: dilute plasmas, galaxy, and microscopic semiconductor device simulations fall into this category.

Each steps of a computer experiment introduces constraints: Simplifying assumptions in the development of the mathematic description of physical phenomena in one hand and discretization of the continuous differential or integral equations of the mathematical model in order to allow solution on computers in the other hand.

The book is divided into the following chapters: Computer experiments using particle models; A one-dimensional plasma model; The simulation program; Time integration schemes; The particle-mesh force calculation; The solution of the field equations; Callisionless particle models; Particle-particle-particle-mesh (P^3M) algorithms; Plasma simulation; Semiconductor device simulation; Astrophysics; Solids, liquids, and phase changes.

This book was originally written as a textbook for a final-year undergraduate course in scientific computing at Reading University. The material is of wider interest, and the book can be recommended equally to graduate students and computational scientists and engineers.

I. K. Gyémánt (Szeged)

Roger A. Horn—Charles R. Johnson, Matrix Analysis, XIII+561 pages, Cambridge University Press, Cambridge—London—New York—New Rochelle—Melbourne—Sydney, 1990.

This book is reprinted and corrected edition of its first published edition in 1987. It contains nine chapters and an appendix. Two views of matrix analysis are reflected in the choice and method of topics in this book. One of them is pure algebraic, and the other one prefers those topics in linear algebra that are important for the applications in mathematical analysis, such as differential equations, optimization and approximation theory. The text starts with an usual introductory part defining and discussing the basic concepts and results of linear algebra, including determinants, eigenvalues and eigenvectors, the characteristic polynomial, similarity, unitary equivalence and canonical forms of matrices. Then Hermitian matrices are introduced. Here variational methods for investigating eigenvalues of Hermitian matrices are emphasized. In normed vectorspaces the algebraic, geometric and analytic properties of matrix norms are discussed. The perturbation theory of Hermitian matrices in some detail is treated. Positive definite matrices and the polar and singular value decompositions and their applications to matrix approximation problems are considered. The last chapter discusses componente-wise nonnegative and positive matrices which arise in many applications in probability theory, economics, engineering etc. At the end of the text an Appendix can be found presenting some basic theorems which are used in the book. A lot of exercises and problems are given in the book. The problems are listed at the end of every sections, they are of various difficulties and types.

The text can be easily understood for students, too, and is highly recommended to anyone having some background in linear algebra and mathematical analysis.

L. Gehér (Szeged)

Taqdir Husain, Orthogonal Schauder Bases, (Monographs and Textbooks in Pure and Applied Mathematics, 143), XVII+283 pages, Marcel Dekker, Inc., New York—Basel—Hong Kong, 1991.

The general theory of Schauder bases in topological vector spaces particularly in Banach spaces is very well-known. The basic importance of this theory is originated in representation of certain functions by Fourier series.

It is well known fact that each separable Hilbert space has a Schauder basis, but it is true that a separable Banach space need not have a Schauder basis, furthermore it can be proved that a Banach space with Schauder basis is reflexive iff its basis is shrinking and boundedly complete. The author of this monograph and some of his colleagues were motivated by questions arisen in the bases theory in topological algebras. From this direction of research a lot of very interesting results have been developed in the theory of Schauder bases.

The main goal of this monograph is to give complete overview on the research done so far on this subject during the last several years. Most of the results presented here are already published but new material also can be found.

The chapter headings are: Rudiments of Topological Vector Spaces; Elements of Topological Algebras; Orthogonal Bases in Topological Algebras; Unconditional Orthogonal Bases; Continuity of Homomorphisms and Functionals; Orthogonal M-Bases; Multipliers of Topological Algebras.

At the end of the book an Appendix containing introductory material of set theory, abstract algebra and topology can be found; furthermore complete bibliography with 85 references enriches the monograph. The style of the book is clear, the theorems and proofs are presented in easily understable manner.

This monograph is highly recommended to functional and mathematical analysts, algebraists, and applied mathematicians and graduate students, too.

J. Németh (Szeged)

Inequalities (fifty years on from Hardy, Littlewood and Pólya), Edited by W. Norrie Everitt (Lecture Notes in Pure and Applied Mathematics, 129), IX+283 pages, Marcel Dekker, Inc., New York—Basel—Hong Kong, 1991.

London Mathematical Society organised an International Conference on Inequalities in July 13—17, 1987, at the University of Birmingham, England. The aim of the Society was not only to encourage the study of inequalities in mathematics but also to express the indebtedness of the subject to the work of G. H. Hardy, J. E. Littlewood and G. Pólya in writing the book Inequalities, which was first published by the Cambridge University Press in 1934. Of the 14 plenary lectures given to the Conference, 13 are presented in this volume and listed below:

Variational Inequalities (Calvin D. Ahlbrandt); The Grunsky Inequalities (J. M. Anderson); Hardy—Littlewood Integral Inequalities (William Desmond Evans and W. Norrie Everitt); Inequalities in Mathematical Physics (Jack Gunson); Inequalities and Growth Lemmas in Function Theory (Walter K. Hayman); Norm Inequalities for Derivatives and Differences (Man Kam Kwong and Anton Zettl); Bounds on Schrödinger Operators and Generalized Sobolev-Type Inequalities with Applications in Mathematics and Physics (Elliott H. Lieb); Inequalities Related to Carleman's Inequality (E. Russell Love); Some Comments on the Past Fifty Years of Isoperimetric Inequalities (Lawrence E. Payne); Operator Inequalities and Applications (Johann Schröder); Rearrangements and Partial Differential Equations (Giorgio G. Talenti); Inequalities in the Theory of Function Spaces: A Tribute to Hardy, Littlewood and Pólya (Hans Triebel); Differential Inequalities (Wolfgang Walter).

J. Németh (Szeged)

I. M. James, **Introduction to Uniform Spaces,** (London Mathematical Society Lecture Note Series, 144), IV+148 pages, Cambridge University Press, Cambridge—New York—Port Chester—Melbourne—Sydney, 1990.

The book essentially consists of two parts. The first unit includes classical approach with basic results: uniform structure uniform spaces, induced and coinduced uniform structures, uniform topology, completeness and completion.

Chapter 5 is devoted to the notion of topological groups. It leads through theories, discussed in the second unit (Chapter 6—8) which covers the theory of uniform transformation groups, uniform spaces over a base, uniform covering spaces.

As regards such kind of treatment, the author meditates on it, as follows: "Although it has been recognized from the start that topological groups can be regarded as uniform spaces, I do not believe it has been fully appreciated that it is possible to develop a theory of uniform transformation groups." And we have to agree with him.

This arrangement of the subject may be hardly supported by the fact that (in the presented form) the material can properly cover a (one-semester) course on uniform spaces.

Above mentioned intrinsic demand appears in three other aspects, each of them is perfectly realized. Firstly, exercises can be found at the end of the book which help the reader to conceive the subject. Secondly, the author explains and refers some new results (e.g. theory of uniform spaces over a topological base space, the fiberwise uniform spaces, uniform spreads). Thirdly, the author confines himself to present a brief and coherent treatment, which is the main merit of the volume at the same time.

The notion of uniform space is presented without the need of any topological background in Chapters 1—2. It makes possible to observe basic concepts and results of the theory in a self-contained way: taking uniform space out of the standard material of general topology. The only necessary rudiments are concepts in connect with filters, which can be found in the Appendices.

J. Kozma (Szeged)

K. Jänich, Analysis für Physiker und Ingenieure (Springer Lehrbuch), 2. Auflage, XI+419 pages, Springer-Verlag, Berlin—Heidelberg—New York—London—Paris—Tokyo—Hong Kong—Barcelona, 1990.

This is a book for science and engineering students. It consists of three main parts: Function theory (complex analysis), ordinary differential equations and special functions of mathematical physics.

The basic ideas and methods are explained slowly in various forms just as in the best lectures. Taking into account the students one of the problems of the authors of similar works is to find the adequate phase of mathematical rigor. Whether this corresponds to your taste you can decide after reading the presentation of Cauchy's integral theorem.

Clear and careful exposition characterizes the whole work. Every chapter (we have fourteen ones) ends with a test containing ten examples. The right answers can be found at the end of the book. Well chosen exercises (with hints) help the student. The number of figures are unusually great and they are of first class.

This work is a great step for students in engineering and physics and makes them interested in further mathematical studies which are necessary to their profession.

L. Pintér (Szeged)

Klaus Jänich, Topologie (dritte Auflage), IX+215 pages, Springer-Verlag, Berlin—Heidelberg—New York—London—Paris—Tokyo—Hong Kong—Barcelona, 1990.

The main purpose of this book is to give a glance into the methods of general topology to anyone who can use topology in his special study or research. The text is divided into ten chapters. The first three chapters discuss the basic concepts and theorems concerning topological spaces, topological vectorspaces and quotient topology. The fourth chapter is devoted to metric spaces, the embedding theorem for metric spaces into complete metric spaces is worked out both in cases of general metric spaces and normed linear spaces. Chapter 5 introduces the concepts of homotopy, category and functors. Chapter 6 gives the two countability axioms and investigates their rules in special theorems. In Chapter 7 simplicial complexes, cell complexes and *CW*-complexes are examined, Chapter 8 is devoted to the classical extension theorems for continuous functions and partition of unity on paracompact spaces. In Chapter 9 covering spaces and fundamental group are treated. In the last chapter the Tychonoff theorem and its applications can be found. At the end of the text a short glimpse into set theory is given.

L. Gehér (Szeged)

H. F. Jones, Groups, Representations and Physics, XIV+207 pages, Adam Hilger, Bristol and New York, 1990.

This is an introductory text on groups and their linear representations intented primarily for advanced undergraduates and postgraduates in solid state atomic and elementary particle physics.

The first four chapters deal with the basic concepts of groups and representations, such as, for example, subgroups, conjugacy classes, cosets, characters, Schur's lemmas and properties of irreducible representations. The notions and proofs are illustrated on a number of examples, using finite groups. This first part of the book is completed by a chapter treating some important physical applications of finite groups in solid state and molecular physics.

The second part of the book is devoted to continuous (Lie) groups, concentrating on aspects important in physical applications. The rotation group $SO(3)$ and angular momentum theory, the special unitary groups $SU(N)$ and their use in describing elementary particles and their interactions, the fundamental role of the Poincare group and its representations in relativistic physics are among the subjects dealt with by the author here. Additional topics, for example Dirac's notation in quantum mechanics and the invariant measure for $SO(3)$, are treated in the five appendices.

The book is self-contained and clearly written. Its main text is complemented by a list of problems added at the end of each chapter, with solutions sketched at the end of the book. It should provide the interested student of physics or mathematics with a firm grounding in the basics of group theory and its physical applications.

László Fehér (Szeged)

Wilbur Knorr, Textual Studies in Ancient and Medieval Geometrie, XVII + 852 pages, Birkhäuser, Boston—Basel—Berlin, 1989.

This is an important study in the documentary history of ancient and early medieval technical texts and the first attempt to give a complete survey of the existing evidence from antiquity on three special problems: the cube duplication, the angle trisection and the circle quadrature.

At each problem W. Knorr critically examines the extant manuscripts to determine those that appear the most trustworthy (not necessarily the earliest). Through their collation one seeks to construct a text that is the closest possible approximation to the original form, but, where the evidence is questionable, to identify among the variants those most likely to be candidates for the original reading.

In this book he traces out the transmissions and development of a specific set of ancient mathematical works connected to these three problems. Among the works by ancient Greek commutators of particular interest in this study are the following: Hero, Menelaus, Pappus, Theon and Hypatia (all) of Alexandria, Proclus, Eutocius of Askalan, John Philoponus and Simplicius.

Parts I and III are based on these commentaries and use some Hebrew traditions and translations, too. The complete Part III is devoted to a single work, Dimension of the Circle by Archimedes.

Part II deals with Arabic geometric texts and their ancient sources connected with cube duplication and angle trisection due to Abû Bakr al-Haravi, Ahmed ibn Mûsâ, Thabit ibn Qurra, al-Sijzî, Abu Sahl al-Quhi and Abu Ja^{c}far.

There are several texts in Greek and Arabic in the book, some of them in facsimile (these later are Arabic).

We recommend this volume to those who are interested not only in the history of science (ancient and early medieval geometrie) but can enjoy a careful philological examination of the ancient texts.

Lajos Klukovits (Szeged)

D. König, Theory of Finite and Infinite Graphs, 426 pages, Birkhäuser, Boston—Basel—Berlin, 1990.

In the first chapter the author introduces the basis concepts. He is dealing with the connected graphs, walks, components in details. The second chapter is an overview on the Euler trails and Hamiltonian cycles. Examining the problem for finite, undirected graphs König makes a transition to directed and infinite graphs as well. The next part of the book gives different solutions (Wiener's, Tremiaux', Tarry's) for the Labirinth Problem. Acyclic Graphs are considered in Chapter 4. The inquiring reader can find more details about the centers of trees in the next chapter. Basis concepts of the infinite graphs and the directed graphs have been introduced in Chapters 6—7.

Logic, theory of games and group theoretical applications of the directed graphs are mentioned in Chapter 8. Directed and undirected cycles and stars are considered with their compositions in the subsequent two chapters. Factorizations are examined in the remaining part of the book for different type of graphs (regular finite and infinite graphs).

Commentaries of W. T. Tutte and a "Biographical Sketch" of T. Gallai complete the book. It is a special pride that a lot of professors are mentioned by König from Szeged (L. Fejér, T. Grünwald, A. Haar, L. Kalmár) who discussed the content of this book by D. König.

Gábor Galambos (Szeged)

K. Königsberger, Analysis 1 (Springer-Lehrbuch) XI+360 pages, Springer-Verlag, Berlin—Heidelberg—New York—London—Paris—Tokyo—Hong Kong—Barcelona, 1990.

This textbook is a very good introduction to real analysis. The material presented here much more than the subject of a usual "calculus book". Its building and style is very clear. Every chapter contains in necessary measure fundamental facts, definitions, statements, proofs and beautiful applications and finally each chapter ends with rich collection of examples.

After the foundations of numbers (real and complex) the concept of functions, sequences, series are treated. Later the theory of continuous functions and its application for the exponential function is developed. The next chapter (differential calculus) is followed by introduction of trigonometric functions and linear differential equations with constant coefficients. The second part of differential equations is treated after the integration of functions. The last four chapters deal with such very important subjects of analysis as local and global approximation of functions (Taylor polynomials, Bernoulli-polynomials, approximation theorem of Weierstrass) Fourier series (pointwise convergence, Bessel-approximation, L^2 convergence) and the investigation of the gamma-function.

This excellent book is warmly recommended to teachers, who can find in it a lot of ideas, beautiful proofs and examples and to students who will surely find the enjoy of discovery in this book.

J. Németh (Szeged)

Mathematics and Cognition: A Research Synthesis by the International Group for the Psychology of Mathematics Education, Edited by P. Nesher—J. Kilpatrick, (ICMI Study Series), 180 pages, Cambridge University Press, Cambridge—New York—Port Chester—Melbourne—Sydney, 1990.

Are there any significant difference with respect their efficiency between verbal interaction and reading mathematics texts? What can a teacher do in order to eliminate the difficulties or to make a best of advantages and, after all, to make a synthesis of these methods?

All the mathematics teachers and educators have to face the problem of cognition during his or her every-day educational work. Such problems in the process of teaching and learning call the attention to scientific analysis of mathematics and cognition.

This book is not purely a collection of interesting studies, but is a real "Research Synthesis", as the subheading promises it. Indeed, the reader finds a homogeneous presentation of different aspects of the problem indicated in the title.

The introductionary essay (by E. Fischbein) gives a brief survey of the history of researches devoted to psychological aspects of mathematics and education. Self-evident fact is that this is the history of the International Comission for Mathematics Instruction (ICMI) and the International Group for the Psychology of Mathematics Education (PME).

The seven studies are written on the same uniformly high level: Epistemology and Psychology of Mathematics Education (G. Vergnaud), Psychological Aspects of Learning Early Arithmetic

(J. C. Bergeron and N. Herscovics), Language and Mathematics (Colette Laborde), Psychological Aspects of Learning Geometry (R. Hershkowitz), Cognitive Processes Involved in Learning School Algebra (C. Kiernan), Advanced Mathematical Thinking (T. Dreyfus), Future perspectives for Research in the Psychology of Mathematics Education (N. Balacheff).

Each of them besides the author(s) has some contributors. They all belong to a group which had started the work on selected topics in Montreal (1987), and contained it in Veszprém, Hungary (1988). That's why the mindful reader gets familiar with theoretical and practical aspects, the classical and new results of the respective topics at the same time. An example: Euclidean geometry plays an important role in mathematics education in two respects as well. It is the science of the surrounding space on one hand, and a tool which is especially suitable to demonstrate mathematical structures, on the other hand. A lot of problems of mathematical imagination are presented via concrete geometric concepts, and ramifying theories respond to the practical questions of teaching geometry (e.g. visualization, deductive proofs).

This volume should be a pleasure for mathematicians and mathematics teachers interested in these exciting problems of education of high level.

J. Kozma (Szeged)

Neville de Mestre, The Mathematics of Projectiles in Sport (Australian Mathematical Society Lecture Series 6), XI+175 pages, Cambridge University Press, Cambridge—New York—Port Chester—Melbourne—Sydney, 1990.

When I was about 15 years old football and table-tennis were my favourite sports. Especially in table-tennis we had problems without solutions (then). We knew from experience how to shot a low ball if we wish it to bounce on the opponent's side of the table. (The success was not complete in every case.) The trajectories of the shots were sometimes unexpected. Several similar problems on the motion of projectiles take its origin in various games. A representative collection of them is contained in Chapter 8. Some of them: Shot-put and hammer throw; Basketball; Tennis, table-tennis and squash; Badminton; Golf; Cricket; Baseball; Soccer; Discus, frisbeee and flying ring; Long jump, high jump and ski jump; Boomerangs.

The first seven chapters contain the basic principles in mechanics and dynamics and the necessary mathematical techniques. Chapter headings are: Motion under gravity alone; Motion in a linear resisting medium; Motion in a non-linear resisting medium; The basic equations and their numerical solution; Small drag or small gravity; Corrections due to other effects; Spin effects; Projectiles in sport and recreation.

The concept of mathematical modelling of real problems is attractive in every case but especially here because the sports are "near" to the students. This is a book for almost everyone because only basic knowledge of classical dynamics, calculus, differential equations and their numerical solution is assumed. The problems in the text are presented in such a way that arouses the reader's interest. I found that, like most good texts, those topics which appeared difficult to grasp at the beginning of the book had become easy by the time I had reached the end. It is a pity that this book did not exist forty years ago.

L. Pintér (Szeged)

P. J. Nicholls, The Ergodic Theory of Discrete Groups (L.M.S. Lectures Note Series, 143) XI+221 pages, Cambridge University Press, New York—Port Chester—Melbourne—Sydney, 1989.

Denote by B the unit ball in R^n and by S the unit sphere. A point $\xi\in S$ is a limit point for a discrete group Γ of Möbius transforms preserving B if for every point $x\in B$ the orbit $\Gamma(x)=$

$\{\gamma(x)\colon \gamma\in\Gamma$ accumulates at $\xi\}$. The subset $\Lambda(\Gamma)$ of S of limit points is the limit set of Γ. This book presents an introduction to the theory of measures on the limit set of discrete groups which has recently been developed by S. J. Patterson, D. Sullivan and others and which has emerged as one of the most powerful tools in the theory of discrete groups. The book assumes a working knowledge of graduate level analysis and topology; the particular results of ergodic theory needed for applications are fully developed from the classical ergodic theorems. The chapter headings are: Preliminaries; The Limit Set; A Measure on the Limit Set; Conformal Densities; Hyperbolically Harmonic Functions; The Sphere at Infinity; Elementary Ergodic Theory; The Geodesic Flow; Geometrically Finite Groups; Fuchsian Groups.

L. I. Szabó (Szeged)

Alfredo M. Ozorio de Almeida, Hamiltonian Systems, Chaos and Quantization (Cambridge Monographs on Mathematical Physics), IX+238 pages, Cambridge University Press, Cambridge—New York—New Rochelle—Melbourne—Sydney, 1988.

The theory of classical dynamical systems has undergone a rapid development in the last few decades. Out of the several branches of this field the author deals only with conservative systems. The preservation of volume in phase space — though it might seem a great simplification in the description of the qualitative behaviour of the solutions — does not make the problem much easier. A lot of beautiful and very deep mathematical results have been achieved concerning only Hamiltonian systems. The first part of the book provides a simple and nontechnical introduction to the fundamental notions of chaotic motion: structural stability, normal forms and KAM theory. Its language is rather the one of theoretical physics, but the important theorems of Hartman and Grobman, Peixoto, Smale, Birkhoff, Moser, Kolmogorov and Arnold are outlined and their proofs are explained in simple terms.

The second part of the book is devoted to the question of chaos in semiclassical quantum mechanics. While classical Hamiltonian dynamics is well developed, its quantum counterpart is still in its "physical period". The results are formulated in less rigorous terms, conjectures based on empirical results from computer calculations are not rare. The deeper structure of this part of the theory is much less understood, compared with the classical case. Nevertheless there are many interesting achievements in this field as well, mainly due to M. V. Berry and the Bristol group. Having been published in the physical literature, the quantum mechanical results are much less known to mathematicians. The systematic elaboration of these problems is in a somewhat chaotic phase, and it is a great merit of the second part of this book, that it provides an order in this many sided topic. According to the reviewer's opinion, this is the more valuable part of the volume, because there are a number of excellent books on classical systems, while — as far as I know — comprehensive monographs on quantum chaos have not been published so far.

M. G. Benedict (Szeged)

Reminiscences about a Great Physicist Paul Adrien Maurice Dirac, Edited by B. N. Kursunoglu and E. P. Wigner, XVIII+297 pages, Cambridge University Press, Cambridge—New York—Port Chester—Melbourne—Sydney, 1990.

No doubt, Paul Dirac was one of the greatest physicists of the century and all times. The first formulation of the structure of quantum mechanics, the quantum theory of radiation, the relativistic theory of the electron, the prediction of antimatter, the theory of magnetic monopoles, the statistics of half integer spin particles known as Fermi—Dirac statistics, are the most celebrated results of him. His book on the principles of quantum mechanics has been the fundamental textbook for generations of physicists. The principal features of the Hilbert space structure of quantum mechanics were laid down first in this book (without mentioning the name of this concept, of course). It was then criticised by von Neumann for its incorrect use of "continuous bases", and it has been proposed that the spectral decomposition theorem had to be used instead. This latter variant, however, has never become popular among physicists. It is well-known, that to the contrary, it was the Dirac formulation, that gave rise to L. Schwartz's theory of distributions. Interestingly enough, a more recent development of functional analysis, the introduction of the notion of the rigged Hilbert space by I. M. Gelfand and others, presents itself essentially the rigorous mathematical variant of the original Dirac method of quantum mechanics. In his equation for the relativistic electron Dirac used a special Clifford algebra and introduced spinors. The theory of the magnetic monopole is a construction of a nontrivial fibre bundle etc. Thus it is difficult to exaggerate the influence of Dirac on XX-th century mathematics.

The book contains personal reminiscences of colleagues, friends and pupils of Dirac, his wife, Margit Wigner, Eugene Wigner, R. Peierls, F. Hoyle, N. Mott, A. Salam, W. Lamb are among the authors. The book is very enjoyable, with several anecdotes about the man with a reputation of silence. It is recommended to everybody who is interested in the personality of an extraordinary great man, and in the history and development of physics and science of our century. Let us close this review with one of Dirac's famous sentences: "It is the essential mathematical beauty of the physical theory, which I feel is the real reason for believing in it."

M. G. Benedict (Szeged)

Reinhold Remmert, Theory of Complex Functions (Graduate Texts in Mathematics, 122), XIX+453 pages, Springer-Verlag, New York—Berlin—Heidelberg—London—Paris—Tokyo—Hong Kong, 1990.

This book is a translation of the second edition of Funktionentheorie I, Grundwissen Mathematik 5, Springer-Verlag 1989, but it should be noted that several valuable improvements are made.

The book is consisting of three parts. The main topic of the first one is an introduction to the theory of complex variable (complex numbers, continuous functions, differential calculus, holomorphy and conformality, modes of convergence in function theory, power series, transcendental functions). The title of the second part is: "The Cauchy Theory" and the complex integral calculus, the integral theorem, integral formula, power series development are treated. The Cauchy—Weierstrass—Riemann theory is the main topic of the last part including for example the fundamental theorems about holomorphic functions, the fundamental theorem of algebra, Schwarz' lemma, isolated singularities, meromorphic functions, Laurent series and Fourier series and finally the residue calculus and its applications. At the end of the book short biographies of Abel, Cauchy, Eisenstein, Euler, Riemann and Weierstrass can be found. The book includes many examples and practice exercises.

Very useful parts of the book are the discussions of the historical evolution of the theory, biographical sketches of important contributors and citations (original language together with English translation) from their classical works.

I am sure that any teacher and student will enjoy reading this book because they will find in it not only very interesting historical remarks but many beautiful ideas and examples, too.

J. Németh (Szeged)

Konrad Schmüdgen, Unbounded Operator Algebras and Representation Theory (Operator Theory: Advances and Applications, 37), 380 pages, Birkhäuser Verlag, Basel—Boston—Berlin, 1990.

This monograph provides a thorough treatment of *-algebras of unbounded operators, and that of *-representations of general *-algebras. The main discussion is divided into two quite independent parts, consisting of Chapters 2—7 and 8—12, respectively. Chapter 1 is of introductory nature.

The main topics discussed in Part I are O^*-algebras and related topologies. An O^*-algebra is — roughly speaking — a *-algebra of unbounded operators acting on a dense common domain $\mathscr{D}$ in a Hilbert space, provided that this algebra contains the identity and each element leaves $\mathscr{D}$ invariant. The related topologies are considered on $\mathscr{D}$ or on the algebra itself, or even on space of associated sesquilinear forms. Among others, generalised Calkin algebra and one more special type of *-algebras are discussed in detail. The first part is finished by studying commutants of O^*-algebras.

Part II deals with *-representations of *-algebras by unbounded operators in a Hilbert space. After detailed discussion of general *-representations, some particular cases are considered. Special attention is paid to infinitesimal representation associated with unitary representation of a Lie group. The last chapter is devoted to the decompositions of closed operators and *-representations.

This book is a monograph of a theory having been rapidly developed in the last two decades. Besides the essential contribution to this developement by research papers, the author often improves the original proofs and results in this book. He introduces new concepts, unifies the terminology and the notation, and enlights the general theory from several points of views by giving examples and counter-examples. The theme of this comprehensive treatment is connected also with physics (e.g. quantum field theory).

The book is written in concise, lucid style. "Symbol Index" and "Key Index" help the reader to orient himself in the material. Each chapter ends with "Notes", where historical and bibliographical comments are presented.

The reader is often referred to textbooks, monographs, lecture notes and research papers listed in the rich "Bibliography". He/she has to be familiar with functional analysis (applying some topology) and operator theory. At any rate, one who wants to study (by learning or by doing research work) any branches of the theme indicated in the title, hardly can do without this book.

E. Durszt (Szeged)

TAPSOFT '89. Proceedings of the International Joint Conference on Theory and Practice of Software Development, Barcelona, Spain, March 1988 (LNCS, 351), Edited by J. Diaz and F. Orejas) X+383 pages, Springer-Verlag, Berlin—Heidelberg—New York—Tokyo, 1989.

TAPSOFT '89 consisted of three parts: Advanced Seminar on Foundations of Innovative Software Development; CAAP (Colloquium on Trees in Algebra and Programming); CCIPL (Colloquium on Current Issues in Programming Languages).

The current Volume 1 of the Proceedings includes the four most theoretical invited papers of the Seminar plus the 20 CAAP contributions.

The invited talks were given by C.A.R. Hoare (The Varieties of Programming Language), J. L. Lassez and K. McAlloon (Independence of Negative Constraints), P. Lescanne (Completion Procedures as Transition Rules+Control), M. Wirsing, M. Broy (A Modular Framework for Specification and Information).

The CAAP papers can be grouped according to the following four major topics: Logic Programming, Prolog and its derivatives; Term Rewriting Systems; Graph Grammars; Algebraic Specifications.

This book may be a useful tool both for software experts with a stronger theoretical interest and computer scientists working on related fields.

J. Virágh (Szeged)

Toeplitz Operators and Spectral Function Theory. Essays from the Leningrad Seminar on Operator Theory. Edited by N. K. Nikolskii (Operator Theory: Advances and Applications, 42), 425 pages, Birkhäuser Verlag, Basel—Boston—Berlin, 1989.

As the editor remarks in the Preface: "the volume contains selected papers on the Spectral Function Theory Seminar, Leningrad Branch of Steklov Mathematical Institute. The papers are mostly devoted to the theory of Toeplitz and model operators."

The first article consists of an introductory and the first chapters of N. K. Nikolskii's publication to be published elsewhere. The present part is a survey of general properties of multiplicities and maxi-formulae. A maxi-formula is a formula of type $\mu(\mathfrak{A})=\sup_k \mu(\mathfrak{A}|X_k)$ where $\mathfrak{A}$ is a subalgebra of $L(X)$, $X=\text{span}\{X_k\colon k\geqq 1\}$ and the X_k's are invariant subspaces for $\mathfrak{A}$.

The investigation on multiplicities is continued by B. M. Solomyak and A. L. Volberg in two joint papers. The first one contains the computation of the multiplicity of a Toeplitz operator with symbol analytic in the closed unit disc. The obtained formula is generalised for matrix symbol case in the second paper.

Using the Sz.-Nagy—Foiaş model theory, V. I. Vasyunin computes the multiplicity of a contraction with finite defect indices.

V. V. Peller discusses the following question: Under what conditions belongs the operator $f(T_\varphi)-T_{f\circ\varphi}$ to the Schatten—von Neumann class S_p or, in particular, to the trace class?

D. V. Yakubovich deals also with Toeplitz operators. Applying Riemann surfaces, he construts a similarity model for certain Toeplitz operators.

S. R. Treil' presents some recent results concerning the spectral theory of vector valued functions.

The reader holds in his hands a new outlet of the known workshop, where operator theory and complex analysis have been handled in a fruitful unit. This collection provides a good survey of the discussed area, presents new results and lists a great number of references. One, whose field of interest meets Toeplitz operators and/or multiplicity theory, surely is going to have a look at this work. And then, he/she will certainly read (at least the majority of) the articles.

E. Durszt (Szeged)

V. S. Varadarajan, An introduction to harmonic analysis on semisimple Lie groups (Cambridge studies in advanced mathematics, 16), X+316 pages, Cambridge University Press, Cambridge—New York—Port Chester—Melbourne—Sydney, 1989.

The well-known author, V. S. Varadarajan, of this book gives a very nice introduction to the subject of harmonic analysis on semisimple Lie groups. The book is intended to advanced undergraduates and to beginning graduate students.

Therefore it deals mainly with the simplest nontrivial semisimple Lie group $SL(2, \mathbf{R})$. In this way, the author can keep the requirements minimal contrary to a general treatment of the subject when a deep level algebra, geometry etc. would be needed. Since all the major themes come naturally up in the case of $SL(2, \mathbf{R})$ the reader can understand then easily the general statements and their proofs also.

Well, one could think now that this book is a variant of S. Lang's well-known book but only the approach is the same. A number of topics are included in this book that is not treated in Lang's book such as the Schwartz space, wave packets and so on.

It is worth noting that the book begins with a brilliant introductory chapter. Reading this chapter the reader will have a great mind to learn all of this subject. We note also that appendices on functional analysis and Lie groups are included offering the reader some basic definitions and results of the indicated subject.

In sum, we warmly recommend this book to all who want to learn the basics of harmonic analysis on semisimple Lie groups and especially to students interested in this subject.

Á. Kurusa (Szeged)

E. B. Vinberg, Linear Representations of Groups (Basler Lehrbücher, A Series of Advanced Textbooks in Mathematics, Vol. 2), (translated from Russian by A. Iacob), VII+146 pages, Birkhäuser Verlag, Basel—Boston—Berlin, 1989.

This nice book is an excellent introductory work into the linear representation of groups. The treatment is in good accordance with the intrinsic structure of the topic. It is divided into four chapters and (0+)11 sections. In the preliminary (0th) section with the aid of examples basic concepts of representation theory are introduced: exponential function, matrix representation and linear representation, action of a group.

Chapter I is devoted to the simplest results of the theory: from invariant representations to the complexification.

Chapter II and III deal with the representation of finite and compact groups, while Chapter IV is about representation of Lie groups.

The book satisfies all the requirements of a university textbook. As a consequence of its conciseness the reader can concentrate the logical treatment. Most important cases and examples are especially stressed (e.g. "A very important example"). Proofs take a prominent part of the material. They are presented not only for completeness reasons. Passing them, one loses a lot of niceties which play significant role in the explanation.

Problems and questions which do not need immediate presentation and solution are gathered at the end of each section. However, it is worth dealing with them in order to obtain a wider knowledge of the topic (answers and hints are also given).

Four appendices contain important technical details: presentation of groups by means of generators and relations, tensor products, the convex hull of a compact set, conjugate elements in groups.

The book is recommended to mathematics students of undergraduate as well as graduate courses.

J. Kozma (Szeged)