Bibliographie

P. J. Cameron and J. H. van Lint, Graphs, codes and designs, London Math. Soc. Lecture Note Series 43, VII+147 pages, Cambridge University Press, Cambridge—London—New York—New Rochelle—Melbourne—Sidney, 1980.

The study of highly symmetric finite structures (block designs, finite geometries, latin squares, error-correcting codes, strongly regular graphs etc.) has been a fascinating field of combinatorial research for centuries. Characteristic of the subject is the abundance of extremely difficult problems. Is there a projective plane of order 10? Is there a 6-transitive non-trivial permutation group? One feels that such questions should be answerable by straightforward arguments; but in fact they are unsolved in spite of the efforts of a sizeable group of outstanding people working on them. As a matter of fact, after a few trivial steps virtually any progress assumes the introduction of surprising and ingenious methods, quite often involving modern advanced mathematics. Just a fraction of such methods would mean a breakthrough in most other fields of combinatorics.

This book is a considerably revised, updated and extended version of a previous work by the authors (LMS Lecture Notes Series 19). A chapter containing a brief introduction to design theory has been added, making the book more self-contained and easier accessible for non-specialists. After discussing strongly regular graphs, partial geometries, and other symmetric structures, the main weight is put on the study of codes. The authors discuss or sketch recent important results such as the inequalities of Ray-Chandhuri and Wilson, the linear programming bound by Delsarte, the Krein—Scott bound, and others. Cross-references betwen chapters, and references to further relevant publications make this excellent book a very interesting, informative and enjoyable reading for combinatorialists.

L. Lovász (Szeged)

R. E. Edwards, A Formal Background to Mathematics 2: A Critical Approach to Elementary Analysis, Universitext, XLVII+1170 pages, two volumes, Springer Verlag, Berlin—Heidelberg—New York, 1980.

The aim of the book is to face and clear up the most problematical points in elementary analysis in a half-formal framework and to treat some more advanced topics. Thus, it is "not intended for readers totally new to convergence, calculus, etc. but rather for those who have some informal working acquaintance with these matters and who wish to review their understanding and see links and contrasts with the formal background."

However, the necessity of this "link...with the formal background" is not quite convincing. Generally the study of elementary analysis precedes that of mathematical logic, furthermore a good informal treatment may be just as useful as a formal approach. These formal parts, comments, cross references etc. break the line of the book into pieces. By my count 60—70% of its text-part is an almost ordinary (and quite good!) presentation of analysis and the remaining part consists of remarks and comments which quite often do not help to understand the material.

The mentioned relation with formalism forced the author to decline from ordinary notation; to mention just one example, it hardly causes any problem in an elementary analysis book if the restriction of the function $x - a$ to the interval I is denoted also by $x - a$ and not by $j - a_I$.

The selected topics do not cover the usual college part of analysis, e.g. the multidimensional case is completely omitted. The way of the introduction of exp z for complex z is interesting; and we can only greet such themes as the irrationality of π, transcendental numbers, etc.

Volume 2 contains a number of more or less advanced exercises (on more than 300 pages) but many of them belong rather to logic than to calculus. Elements of advanced analysis are also incorporated in these exercises.

The book may be recommended to teachers or future reseachers of elementary analysis.

V. Totik (Szeged)

P. Hájek, T. Havránek, Mechanizing Hypothesis Formation Mathematical Foundations for a General Theory, Springer-Verlag, Berlin, Heidelberg, New York, 1978, XV+396 p.

The volume is devoted to a systematic formalization and development of one important aspect of scientific reasoning, the hypothesis formation. The authors themselves declare their aim as being a response to the challenging question: "Can computers formulate and justify scientific hypotheses?".

In organization the book follows a proposal by Gordon Plotkin. After an introductory chapter, the authors develop and investigate in details the so called "logic of induction" and "logic of suggestion", which are, according to the proposal, determined as "studying the notion of justification" and "studying methods of suggesting reasonable hypotheses", respectively.

Logic of induction presented in this volume (Part A) is a generalized version of Suppes's predicate calculus. The modifications are motivated by statistical considerations, using particular "quantifiers" such as

"for sufficiently many x, $P(x)$" and "the property $Q(x)$ is associated with $R(x)$",

can be viewed as an illustrative example.

Dealing with logic of suggestions (Part B), the authors define and study some GUHA (General Unary Hypotheses Automaton) methods.

Presentation of the matter is clear and completely logically oriented with an extreme stress on Tarskian semantics and computability (mechanizability).

The authors recommend their text to mathematical logicians and statisticians with computer scientific interest, and to students interested in interrelations among mathematical logic, statistics, computer science, and artificial intelligence.

P. Ecsedi-Tóth (Szeged)

Peter G. Hinman, Recursion-Theoretic Hierarchies, Springer-Verlag, Berlin, Heidelberg New York, 1978. XII+480 p.

Notions of definability are among the most popular, and of course, among the most importan topics of current research in mathematical logic. The book under review, published as the second volume of the noteworthy sequence "Perspectives in Mathematical Logic", is concerned with one aspect of definability. Central to the discussion in the book is "the classification of mathematical objects according to various measures of their complexity" into levels, that is, into a hierarchy in such a way that objects being in a higher level are more complex than those being in a lower one. In fact, this topic is common in different mathematical theories such as Descriptive Set Theory and (Generalized) Recursion Theory. Generally speaking, Descriptive Set Theory deals with explicit and constructive means (i.e. that do not require the Axiom of Choice) in analysis and is developed as the analytical counterpart of Cantorian set theory. Recursion Theory deals also with a kind of constructivity, the mechanical computability of certain mathematical objects. These two areas of "constructive mathematics" developed parallelly for decades until it was realized that they had a common generalization. This book presents the generalized theory in a clear and attractive manner pointing out how earlier results follow.

The volume is divided into three parts, each of them containing several chapters and sections, dealing with the basic notions of definability (background, ordinary recursion theory, hierarchies and definability with arithmetical and analytical hierarchies, inductive and implicit definability, arithmetical forcing etc.), the analytical and projective hierarchies (wellorderings, boundedness principle, Borel hierarchy, hyperarithmetical hierarchy, pre-wellordering, constructibility, projective determinancy etc.) and generalized recursion theories (recursion in Type-2 and Type-3 functionals, higher types, recursion on ordinals etc.) respectively.

The book is intended for a "student with some general background in abstract mathematics — at least a smattering of topology, measure theory, and set theory — who has finished a course in logic covering the completeness and incompleteness theorems". In fact, this excellently written volume can be recommended to everyone who is interested in definability or constructivity and, in particular, in (Generalized) Recursion Theory and Descriptive Set Theory.

P. Ecsedi-Tóth (Szeged)

D. L. Johnson, Topics in the Theory of Group Presentations (London Mathematical Society Lecture Note Series, 42) VII+311 pages, Cambridge University Press, Cambridge—London—New York—Melbourne, 1980.

This book is an extended version of the author's earlier contribution to this series. As before, the emphasis is on concrete examples of groups, demonstrating the pervasive connection between group theory and other branches of mathematics and bringing, this way, the material closer to the graduate and post-graduate students.

Chapter I starts with a proof of the Nielsen—Schreier theorem (every subgroup of a free group is free) and works out the elements of group presentations. In Chapter II presentations of some popular groups (such as the dihedral group, the generalized quaternion group and the symmetric group) and the presentations of Abelian groups are considered. Chapter III deals with groups with few relations, introducing some new examples of groups, which are already less well-known than those in the previous chapter, but are, on the other hand, most useful for the specialist of this theory. Chapter IV concerns presentations of subgroups. A geometric application is found in Chapter V, where tessalations of a plane by a triangle are described in each of the three different cases, the Euclidean, the elliptic, and the hyperbolic one. The main purpose of Chapter VI is to give a proof of the celebrated theorem of Golod and Šafarevič stating that, if a finite p-group G is minimally generated by d elements, then the minimal number of relations needed to define G is greater than $d^2/4$. Cohomology of groups plays an essential part in the proof. Chapter VII deals with small cancellation groups. Finally, Chapter VIII reflects the intimate connection between group theory and topology. This chapter deals with the classification theory of surfaces and the theory of knots.

"Such is the current rate of progress in combinatorial group theory that no attempt at completeness in feasible, though it is hoped to bring the reader to within hailing distance of the frontiers of research in one or two places."

This lecture notes can serve as a text for beginning research students and as an introduction for specialists in other fields.

A. P. Huhn (Szeged)

P. Koosis, Introduction to H_p spaces, London Math. Soc. Lecture Notes Series, 40, XV+376 pages, Cambridge, University Press, 1980.

This book contains the lectures on the elementary theory of H_p spaces held at the Stockholm Institute of Technology in 1977—78. It is a good introduction to the theory of H_p spaces. The details and long explanations help the reader in the understanding of the material very much. Much effort is made to enlighten the role of the theorem of the brothers Riesz. Beyond classical results quite recent developments are also treated: Marshall's theorem about the uniform approximation of H_∞ functions by Blaschke products; the maximal function characterization of RH_1, etc.

Chapter X contains a brief introduction of BMO. Finally, in the appendix Wolff's simple (?) proof of the corona theorem is given.

V. Totik (Szeged)

W. Rudin, Function Theory in the Unit Ball of C^n (Grundlehren der mathematischen Wissenschaften 241), XIII+436 pages, Springer-Verlag, Berlin—Heidelberg—New York, 1980.

This book contains a quite new and rapidly developing theory for functions on the unit ball in C^n. The subject is presented in an extraordinarily clear way. Domains different from the unit ball are almost completely omitted and this enabled the author to show the main ideals withouth the hard and very technical "side-dish" of the general theory.

Two further values of the book: 1. it is self-contained, 2. it is up to date, many results being dated from the late seventies. The publisher did also his best by the quick, well-ordered, and very accurate printing.

The main topics are the following: integral representations, boundary behaviour of Poisson and Cauchy integrals, measures related to the ball algebra, interpolation sets, invariant function spaces, analytic varieties, proper holomorphic maps, the $\bar{\partial}$-problem, the Henkin—Skoda theorem, tangential Cauchy—Riemann operators.

The book concludes with a series of open problems which will certainly stimulate further investigations.

It is highly recommended to anyone who wants to get acquainted with this beautiful part of complex function theory.

V. Totik (Szeged)