Operator theory is the branch of mathematics that treats the objects of analysis (numerical valued functions and their limiting properties) by the methods of modern topology and algebra. While, roughly speaking, the area 46 deals primarily with the objects (i.e., topological vector spaces) associated with the category of topological linear algebra, the area 47 deals with the morphisms between these objects (i.e., the mappings—both linear and nonlinear—between these spaces). Although functional analysis and operator theory developed as identifiable fields in the early part of this century they have seen tremendous growth in the past few decades and have found applications to diverse areas, both to purely mathematical areas and to other scientific disciplines. These volumes contain a wealth of information about linear operators, algebraic systems of linear operators, differential and integral operators, and nonlinear operators.

All the Mathematical Reviews entries having operator theory (MR classification number 47) as a primary or secondary classification between 1980 and 1986 appear in these volumes. Within each section, reviews are ordered by their MR number. Relevant cross-references are given with each review, and author and key indexes appear in the fourth volume.


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CATEGORIES IN COMPUTER SCIENCE AND LOGIC
John W. Gray and Andre Scedrov, Editors

Category theory has had important uses in logic since the invention of topos theory in the early 1960s, and logic has always been an important component of theoretical computer science. A new development has been the increase in direct interactions between category theory and computer science. In June 1987, an AMS-IMS-SIAM Summer Research Conference on Categories in Computer Science and Logic was held at the University of Colorado in Boulder. The aim of the conference was to bring together researchers working on the interconnections between category theory and computer science or between computer science and logic. The conference emphasized the ways in which the general machinery developed in category theory could be applied to specific questions and be used for category-theoretic studies of concrete problems. This volume represents the proceedings of the conference. (Some of the participants' contributions have been published elsewhere.)

The papers published here relate to three different aspects of the conference. The first concerns topics relevant to all three fields, including, for example, Horn logic, lambda calculus, normal form reductions, algebraic theories, and categorical models for computability theory. In the area of logic, topics include semantical approaches to proof-theoretical questions, internal properties of specific objects in (pre-) topoi and their representations, and categorical sharpening of model theoretic notions. Finally, in the area of computer science, the use of category theory in formalizing aspects of computer programming and program design is discussed.

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This volume contains the proceedings of the AMS-SIAM Summer Seminar on Computational Aspects of VLSI Design, held at the Institute for Mathematics and Its Applications at the University of Minnesota, in the spring of 1987. The seminar featured presentations by some of the top experts working in this area. Their contributions to this volume form an excellent overview of the mathematical and computational problems arising in this area.
Chaos and Fractals
The Mathematics Behind the Computer Graphics
Robert L. Devaney and Linda Keen, Editors

This volume contains the proceedings of a highly successful AMS Short Course on Chaos and Fractals, held during the AMS Centennial Celebration in Providence, Rhode Island, in August, 1988.

Chaos and fractals have been the subject of great interest in recent years and have proven to be useful in a variety of areas of mathematics and the sciences. The purpose of the Short Course was to provide a solid introduction to the mathematics underlying the notions of chaos and fractals. The papers in this book range over such topics as dynamical systems theory, Julia sets, the Mandelbrot set, attractors, the Smale horseshoe, calculus on fractals, and applications to data compression.

Aimed at beginning graduate students, college and university mathematics instructors, and non-mathematics researchers, this book provides readable expositions of several exciting topics of contemporary research.

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**MATHEMATICIANS AND EDUCATION REFORM**

Naomi Fisher, Harvey Keynes, and Philip Wagreich, Editors

(CBMS Issues in Mathematics Education, Volume 1)

Educational issues are receiving unprecedented attention in the broad mathematical sciences community, as mathematicians and other scientists have become concerned about the quality of instruction in the nation's schools, colleges, and universities. A mathematically literate population is crucial to supporting our increasingly technological society. In addition, the mathematical sciences community faces the challenge of increasing the number of students who are prepared to pursue a career in mathematics, science, or engineering. This challenge requires not only raising the quality of mathematics education, but also showing students the beauty and usefulness of the subject. In these ways, mathematical scientists can make crucial contributions to educational reform.

In response to these concerns, the Conference Board of the Mathematical Sciences has launched a new book series published by the American Mathematical Society in cooperation with the Mathematical Association of America entitled Issues in Mathematics Education. The purpose of this new series is to stimulate the flow of information among mathematical scientists, mathematics educators, and mathematics teachers about innovative efforts to revitalize the teaching of mathematics and statistics at all levels.

The present volume, Mathematicians and Education Reform, the first in this new series, contains the proceedings of the Mathematicians and Education Reform workshop held in July 1988, at the University of Illinois at Chicago. The workshop provided an opportunity for participants to share ideas about the various ongoing pre-college projects organized and directed by mathematicians and to reflect on the most effective ways that mathematicians can contribute to educational reform. The major part of the proceedings is devoted to in-depth articles that explore the process of designing an educational project. A section on issues and reactions presents a forum for exchanging ideas on more general issues. From practical information about organizing a program to exploration of the intellectual issues of educational reform, this volume presents a range of views on various aspects of the involvement of mathematicians in educational change. While it will prove especially useful for those considering involvement in an educational program, this book is also important reading for the entire community, for the issues explored here will be of increasing importance for the future of the mathematical sciences.

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The AMS is pleased to announce the University Lecture Series. This new book series provides a way for excellent, and sometimes inspired, lecture series to reach an audience beyond those able to attend the live lectures. Presented by the outstanding mathematicians of our day, these lectures will be important for their mathematical insight and depth, as well as for their historical and archival value. The inaugural volume in the University Lecture Series is described below.

Selected Applications of Geometry to Low-Dimensional Topology
Michael H. Freedman and Feng Luo
(University Lecture Series, Volume 1)

This book, the inaugural volume in the new University Lecture Series, is based on lectures presented at Pennsylvania State University in February 1987. The Lectures attempt to give a taste of the accomplishments of manifold topology over the last 30 years. By the late 1950's, algebra and topology had produced a successful and beautiful fusion. Geometric methods and insight, now vitally important in topology, encompass analytic objects such as instantons and minimal surfaces, as well as nondifferentiable constructions.

Keeping technical details to a minimum, the authors lead the reader on a fascinating exploration of several developments in geometric topology. They begin with the notions of manifold and smooth structures and the Gauss-Bonnet theorem, and proceed to the topology and geometry of foliated 3-manifolds. They also explain, in terms of general position, why four-dimensional space has special attributes, and they examine the insight Donaldson theory brings. The book ends with a chapter on exotic structures on $\mathbb{R}^4$, with a discussion of the two competing theories of four-dimensional manifolds, one topological and one smooth.

Background material was added to clarify the discussions in the lectures, and references for more detailed study are included. Suitable for graduate students and researchers in mathematics and the physical sciences, the book requires only background in undergraduate mathematics, and should prove valuable for those wishing a not-too-technical introduction to this vital area of current research.
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