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Volume 165 Number 2 1994

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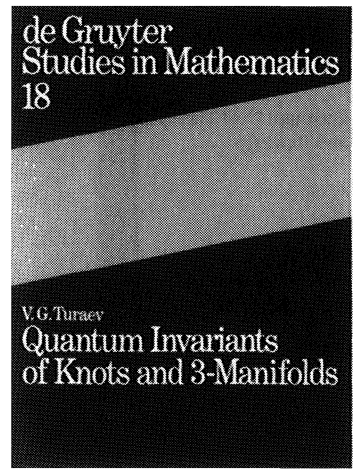

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de Gruyter Studies in Mathematics, Volume 18
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This monograph provides a systematic treatment of topological quantum field theories (TQFT's) in three dimensions, inspired by the discovery of the Jones polynomial of knots, the Witten-Chern-Simons field theory, and the theory of quantum groups. The author, one of the leading experts in the subject, gives a rigorous and self-contained exposition of new fundamental algebraic and topological concepts that emerged in this theory.
The book is divided into three parts. Part I presents a construction of 3-dimensional TQFT's and 2-dimensional modular functors from so-called modular categories. This gives new knot and 3-manifold invariants as well as linear representations of the mapping class groups of surfaces. In Part II the machinery of 6*j*-symbols is used to define state sum invariants of 3-manifolds. Their relation to the TQFT's constructed in Part I is established via the theory of shadows. Part III provides constructions of modular categories, based on quantum groups and Kauffman's skein modules.
This book is accessible to graduate students in mathematics and physics with a knowledge of basic algebra and topology. It will be an indispensable source for everyone who wishes to enter the forefront of this rapidly growing and fascinating area at the boarderline of mathematics and physics. Most of the results and techniques presented here appear in book form for the first time.

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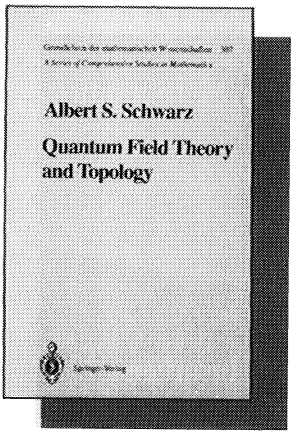

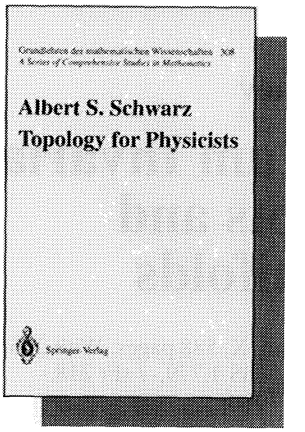

A.S. Schwarz

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Translated from the Russian by **E. Yankowsky, S. Levy**

1993. VIII, 274 pp. 30 figs.
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Part II is devoted to the applications of topology to quantum field theory.

Part III covers the necessary mathematical background in summary form.

The book is aimed at physicists interested in applications of topology to physics and at mathematicians wishing to familiarize themselves with quantum field theory and the mathematical methods used in this field.

A.S. Schwarz

Topology for Physicists

Translated from the Russian by **S. Levy**

1994. VIII, 296 pp. (A Series of Comprehensive Studies in Mathematics, Bd. 308) Hardcover DM 138,-
ISBN 3-540-54754-1

In recent years topology has firmly established itself as an important part of the physicist's mathematical arsenal. It has many applications, first of all in quantum field theory, but increasingly also in other areas such as condensed matter physics, theory of instantons, and gauge theory.

This book is devoted to the exposition of topology in a form easily accessible to physicists. It will also be useful to mathematicians who would like to apply topology in their work, without specialising in this discipline.

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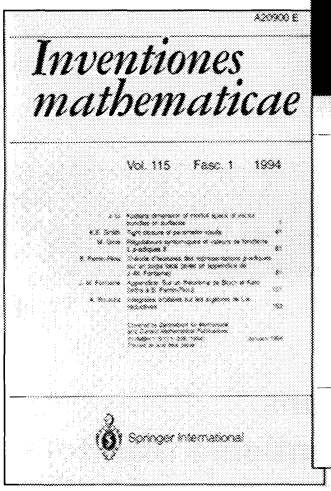

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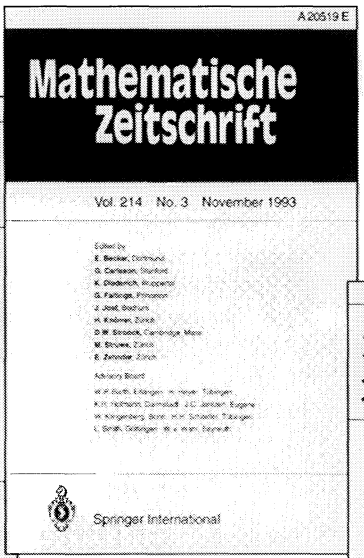

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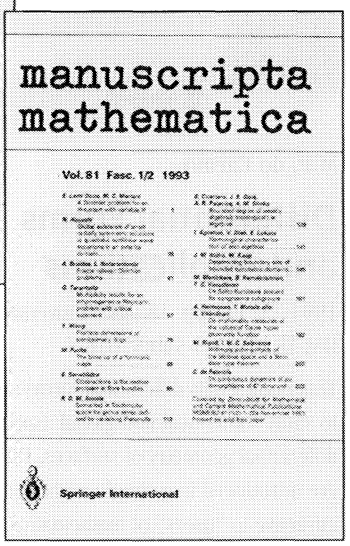

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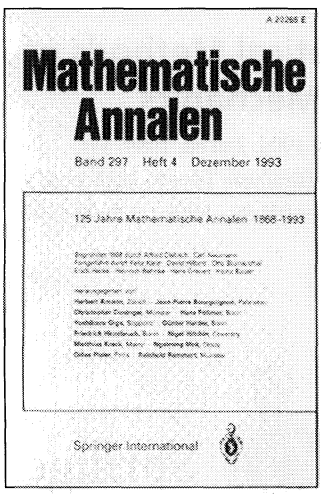

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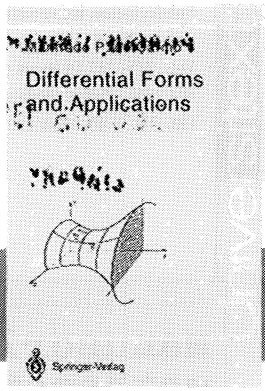

Authored by the winner of the 1992 Mathematics Prize of the Third World Academy of Sciences

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