

Revised and Updated Edition,  
Now also Available in Paperback!

# Differential Forms in Mathematical Physics

by C. VON WESTENHOLZ, *Department of Mathematics, University of Zambia.*

STUDIES IN MATHEMATICS AND ITS APPLICATIONS, Vol. 3

1980. xvii + 560 pages Price: US \$87.75/Dfl. 180.00 (Hardbound)  
US \$34.25/Dfl. 70.00 (Paperback)

ISBN 0-444-85435-5 (Hardbound) 0-444-85437-1 (Paperback)

## A COMMENT FROM THE PRESS ON THE FIRST EDITION:

*"This is the first systematic textbook on methods of modern differential geometry in mathematical physics. The book gives a self contained detailed representation of analysis on manifolds and differential fibre bundles with applications in physics in the recent coordinate free formalism... The book is recommendable not only for self study but also as a base for a one-year course on the mathematics of non-quantum physics."*

**Zentralblatt für Mathematik**

During the past decade, the author of this volume has delivered lectures on differential forms and their applications in mathematical physics at various universities, to audiences consisting of mathematicians, mathematical physicists, theoretical physicists, mathematically inclined experimental physicists and engineers. This work constitutes an extended and improved version of the material presented in these lectures.

The main aim of the book is to develop an intuition and working knowledge of the subject "differential forms in mathematical physics" without insisting on an extremely high degree of mathemati-

cal rigour or precision. It shows the way in which new methods, i.e. intrinsic methods which derive from manifold theory, offer an alternative approach to mathematical physics.

This volume is designed as an introduction to research in mathematical physics and discusses how differential forms on manifolds provide a mathematical setting for classical and quantum mechanics, relativistic physics, electromagnetism, gravitational fields and unified field theories (weak and electromagnetic interactions, supergravitation). Due to the absence of literature in the area of gauge structures, the supplementary Chapter 14 of the revised and improved second edition fills this important gap.

**CONTENTS: Parts: I. Basic Concepts. Chapters:** 1. Topological Preliminaries. 2. Differential Calculus on  $\mathbb{R}^n$ . **II. Manifolds.** 3. Differentiable Manifolds. 4. Differential Calculus on Manifolds. 5. Lie Groups. 6. Fibre Bundles. **III. Differential Forms.** 7. Basic Concepts of Differential Forms. 8. The Frobenius Theory. **IV. Integration Theory on Manifolds.** 9. Integration of Differential Forms. 10. The de Rham Cohomology. **V. Theory of Connections.** 11. Connections on Fibre Bundles. **VI. Intrinsic Analytical Mechanics.** 12. Hamilton Mechanics and Geometry. **VII. Unified Field Structures.** 13. Theories of Gravitation. 14. Unified Field Structures.

# north-holland

P.O. BOX 211 / IN THE U.S.A. AND CANADA:  
1000 AE AMSTERDAM / 52 VANDERBILT AVENUE  
THE NETHERLANDS / NEW YORK, N.Y. 10017

The Dutch guildler price is definitive US \$ prices are subject to exchange rate fluctuations

1342 NH

Communications in  
**Mathematical  
Physics**

**Chief Editor** A. Jaffe, Cambridge, MA

**Editorial Board** H. Araki, Kyoto  
E. Brézin, Saclay  
R. Geroch, Chicago, IL  
J. Ginibre, Orsay  
J. Glimm, New York, NY  
R. Haag, Hamburg  
J. L. Lebowitz, New Brunswick, NJ  
E. Lieb, Princeton, NJ  
J. Moser, Zürich  
K. Osterwalder, Zürich  
D. Ruelle, Bures-sur-Yvette  
B. Simon, Princeton, NJ  
Ya. G. Sinai, Moscow  
R. Stora, Geneva

**Advisory Board** M. F. Atiyah, Oxford  
G. 't Hooft, Utrecht  
C. N. Yang, Stony Brook, NY  
S. T. Yau, Princeton, NJ

Responsible for advertisements

Springer-Verlag  
Printers  
Printed in Germany

L. Siegel, Kurfürstendamm 237, D-1000 Berlin 15  
Telephone: (030) 8821031, Telex 01-85411  
Berlin Heidelberg New York  
Brühlsche Universitätsdruckerei, Gießen  
© by Springer-Verlag Berlin Heidelberg 1980