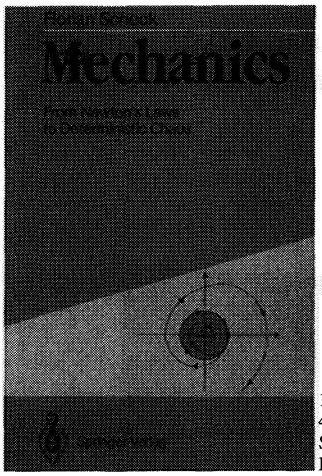
Textbooks on Theoretical Physics



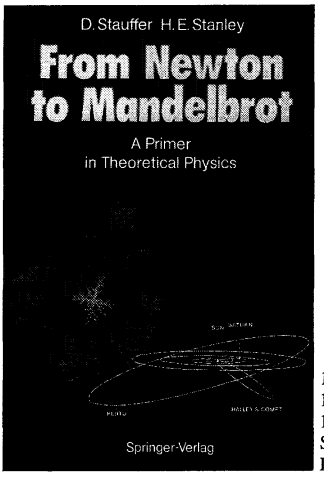
1990. XIV,
431 pp. 144 figs.
Softcover DM 68,–
ISBN 3-540-52715-X

F.A. Scheck, University of Mainz

Mechanics

From Newton's Laws to Deterministic Chaos

A course in mechanics is of primary importance in any physics teaching program. Scheck's book integrates the various aspects of classical mechanics, relativistic mechanics, and modern topics such as deterministic chaos.
Both the physical approach to mechanics and its mathematical foundations are emphasized. With elementary Newtonian mechanics as a starting point, the principles of canonical mechanics in Hamiltonian and Lagrangian formulations are outlined. Rigid bodies are treated in detail, and the basic concepts of special relativity are given. Particular emphasis is put on the geometrical aspects of mechanics, such as geometrical objects on manifolds. A chapter on stability and chaos concludes the book, introducing topics such as the long-time behavior of dynamical flows, deterministic chaos, and chaotic motion in celestial mechanics.



1990. IX,
191 pp. 50 figs.
16 colored plates.
Softcover DM 34,–
ISBN 3-540-52661-7

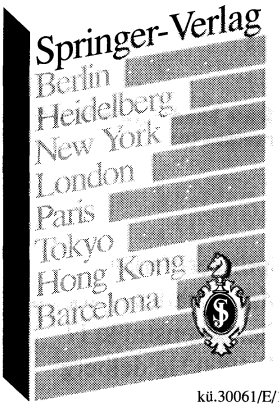
D. Stauffer, University of Cologne;
H.E. Stanley, Boston, MA

From Newton to Mandelbrot

A Primer in Theoretical Physics

Translated from the German by
A.H. Armstrong

From Newton to Mandelbrot takes the student on a tour of the most important landmarks of theoretical physics: classical, quantum, and statistical mechanics, relativity, electrodynamics, and, the most modern and exciting of all, the physics of fractals. The treatment is confined to the essentials of each area, and short computer programs, numerous problems, and beautiful colour illustrations round off this unusual textbook. Ideally suited for a one-year course in theoretical physics it will prove indispensable in preparing and revising for exams.



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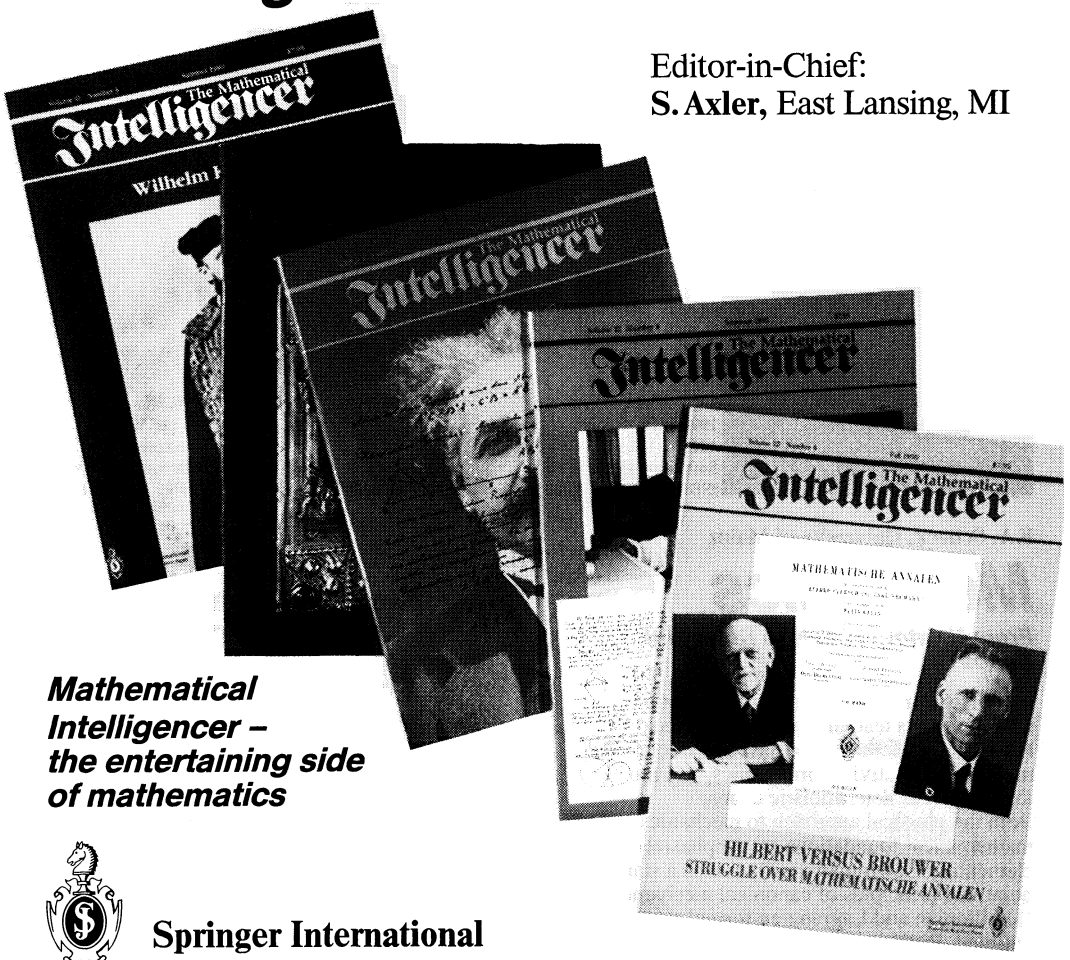

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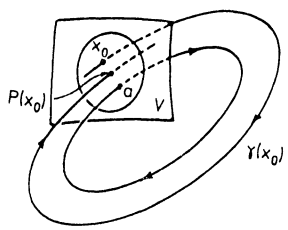
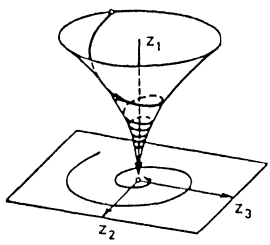
Differential Equations and Dynamical Systems

1991. XII, 403 pp. 177 figs. (Texts in Applied Mathematics, Vol. 7) Hardcover DM 78,-
ISBN 3-540-97443-1

The main purpose of the book is to introduce students to the qualitative and geometric theory of ordinary differential equations originated by Henri Poincaré at the end of the 19th century. It is also intended as a reference book for mathematicians doing research on dynamical systems.
There are several new features in this book such as the simplified proof of the Hartman-Grobman Theorem and examples illustrating the proof, map in the theory of limit cycles, an efficient method for obtaining the global phase portrait of two-dimensional systems, and the description of the behavior of a one-parameter family of limit cycles. The authors show the global qualitative theory of a nonlinear dynamical system leads to an understanding of the solution set of the nonlinear system that rivals the understanding that we have of linear flows.





Contents: Preface. - Linear Systems. - Nonlinear Systems: Local Theory. - Nonlinear Systems: Global Theory. - Nonlinear Systems: Bifurcation Theory. - Bibliography. - Index.

F. Verhulst, State University of Utrecht

Nonlinear Differential Equations and Dynamical Systems

1990. IX, 227 pp. 107 figs. 2 tabs. (Universitext) Softcover DM 38,- ISBN 3-540-50628-4

This text bridges the gap between elementary courses on differential equations and the research literature. Subject material from both the qualitative and the quantitative point of view is presented. Many examples illustrate the theory and the reader should be able to start doing research after studying this book.

Contents: Introduction. - Autonomous equations. - Critical points. - Periodic solutions. - Introduction to the theory of stability. - Linear equations. - Stability by linearisation. - Stability analysis by direct method. - Introduction to pertubation theory. - The Poincaré-Lindstedt method. - The method of averaging. - Relaxation oscillations. - Bifurcation theory. - Chaos. - Hamiltonian systems. - Appendices. - Answers and hints to the exercises. - References. - Index.

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