

Preface to the Third Edition

It's very simple: This English edition is an updated translation of our *Cours de Physique*, Springer, Paris 1999, which was an expanded French translation of Stauffer & Stanley, *From Newton to Mandelbrot*, Springer, New York 1990 and 1996, which in turn was an expanded translation of Stauffer, *Theoretische Physik*, Springer, Heidelberg 1989 (in German language). The first expansion was Chap. 5 on Fractals, the second expansion Chap. 6 on Dynamical Systems and Chaos. The present version omits the diskettes added to the earlier version.

Chapters 1–4 contain the standard material of courses in theoretical physics and are supposed to accompany lectures at the university; thus they are rather condensed. They are supposed to fill 1 year of teaching. Chapters 5 and 6, in contrast, are written less condensed since this material may not be part of standard lectures and thus could be studied without the help of a university teacher. An appendix on elementary particles lies somewhere in between: It could be a summary of a much more detailed course, or studied without such a course.

Cologne, Germany
Boston, Massachusetts
Paris, France
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Preface to the Second Edition

With increasing age, some authors gain more and more weight, scientifically and gravitationally, and so do their books. Thus a new section on elementary particle physics has been added. Its emphasis on computer simulation and phase transition connects it with the end of the Statistical Physics chapter. In contrast to the first four chapters, it does not lead to complicated exercises and may be more suited to self-study; thus it is put into an appendix. The first four chapters, thought to accompany a course or to summarize previous lectures, now also answer the many questions at the end of each chapter; instructors may get solutions of the more complicated problems by internet (stauffer@thp.uni-koeln.de). For the interested reader, we added to the four chapters recent literature references wherever modern research aspects are touched upon in the text.

Some computer programs for the fractals in Chap. 5 are included in the diskette that accompanies this book. More on the general subject of teaching fractals can be found in the book *Fractals in Science*, edited by H.E. Stanley, E.F. Taylor, and P.A. Trunfio (Springer, New York 1994, ISBN 0-387-94361-7 and 3-540-94361-7). The programs on the IBM diskette were constructed primarily by S.V. Buldyrev, F. Caserta, A. Chandra, K. Shakhnovich, and E.F. Taylor while those for the Macintosh diskette were written mainly by J. Blandey, S.V. Buldyrev, T. Mekonen, R.L. Selinger, P. Trunfio, and B. Volbright. We thank these individuals for their contribution, and also thank H. Rollnik, F.-W. Eicke, F.W. Hehl, E.W. Mielke, and J. Potvin for their help with the additions to the book. We hope readers who note further imperfections, or in any way wish to make constructive suggestions, will communicate their thoughts to the authors.

Cologne, Germany
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This is not a book for theoretical physicists. Rather it is addressed to professionals from other disciplines, as well as to physics students who may wish to have in one slim volume a concise survey of the four traditional branches of theoretical physics. We have added a fifth chapter, which emphasizes the possible connections between basic physics and geometry. Thus we start with classical mechanics, where Isaac Newton was the dominating force, and end with fractal concepts, pioneered by Benoit Mandelbrot. Just as reading a review article should not replace the study of original research publications, so also perusing the present short volume should not replace systematic study of more comprehensive texts for those wishing a firmer grounding in theoretical physics.

The opening paragraphs of Chap. 5 benefitted from input by B. Jorgensen. We wish to thank G. Daccord for providing us with Plates 7 and 8, F. Family for Plates 1 and 15, A.D. Fowler for Plate 3, R. Lenormand for Plate 11, P. Meakin for Plate 14 as well as the cover illustration, J. Nittmann for Plate 13, U. Oxaal for Plate 10, A. Skjeltop for Plates 4, 9 and 16, K.R. Sreenivasan for Plate 5, R.H.R. Stanley for Plate 2, and P. Trunfio for Plates 6 and 12. We also thank A. Armstrong, A. Coniglio, J. Hajdu, F.W. Hehl, K.W. Kehr, J. Kertesz, A. Margolina, R. Selinger, P. Trunfio, and D.E. Wolf as well as many students—particularly L. Jaeger—who offered their feedback at appropriate occasions and A. Armstrong for translating Chaps. 1–4 from the original German edition published by Springer.

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From Newton to Mandelbrot

A Primer in Theoretical Physics

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