

# Preface

The first, second, and third editions of this book seem to occur at ten year intervals. The intent is to keep the book up-to-date. Many-body theory is a field which continually evolves in time. Journals only publish new results, conferences only invite speakers to report new phenomena, and agencies only fund scientists to do new physics. Today's physics is old hat by tomorrow. Students want to learn new material, and textbooks must be modified to keep up with the times.

The early chapters in this book teach the techniques of many-body theory. They are largely unchanged in format. The later chapters apply the techniques to specific problems. The third edition increases the number of applications. New sections have been added, while old sections have been modified to include recent applications.

The previous editions were set in type using pre-computer technology. No computer file existed of the prior editions. The publisher scanned the second edition and gave me a disk with the contents. This scan recorded the words accurately and scrambled the equations into unintelligible form. So I retyped the equations using LaTeX. Although tedious, it allowed me to correct the infinite numbers of typographical errors in the previous edition. The earlier typesetting methods did not permit such corrections. The entire book was edited sentence-by-sentence. Most old sections of the book were shortened by editing sentences and paragraphs.

I also contemplated removing entirely some old sections. Each time I did this, and told somebody, they always remarked that the deleted section was their favorite, and I simply could not remove it. While it is gratifying to have so many sections be everyone's favorite, it does make shortening the book somewhat hard! In the end I gave up, and no sections were removed. Many were rewritten to shorten them. Since many new sections were added, the book gets longer with each edition. The reference list was updated.

New sections include: Bethe lattice, different mean-free-paths, Hubbard model, Coulomb blockade, Landauer transport, and the Quantum Hall effect. The big problem is what to say about high-temperature superconductivity. Although much experimental information is available regarding this important topic, the theoretical picture is quite uncertain. There is no agreed understanding of the pairing mechanism which causes the high transition temperature. It is hard to write a text book on a topic for which there is little agreement regarding fundamental theory. In the end, I mentioned only some important experiments and their results, and added little new information on the theory mechanisms. The section on the gap equation was rewritten to use the modern method of solving it in complex frequency space, rather than the older method of real frequency space.

I thank Steve Girvin for his proofreading twice the various versions of the section on the Quantum Hall effect, and Koung-An Chao for teaching me about quantum dots. I also very much thank my wife Sally for letting me spend every evening and weekend for one year preparing this new edition.



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Mahan, G.D.

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