Preface to the Second Edition

The second edition is an extended reprint of the first edition. In many chapters, a more detailed mathematical treatment of the various subjects is given. A section dealing with magnetic impurities and the Kondo effect has been added.

The author is grateful to Silvia Haindl and to Vladimir Kresin for detailed suggestions about expanding the book.

Tübingen

Rudolf P. Huebener
Only a few scientific–technical developments from the last century have affected our lives in such a powerful way as the spectacular advances in our knowledge of the electronic properties of solids. Many of the present achievements are intimately connected with these advances. To name only a few: the transistor and its extreme miniaturization in microelectronics, the electronic processing of data and highly developed and powerful computers, the mobile telephone and satellite communication, television and entertainment electronics, as well as numerous instruments and systems of medical technology.

In the final analysis, the theater of all these events of dramatic progress is the world of electrons in crystals, where the (quantized) vibrations of the crystal lattice continuously demonstrate their influence. The revolutionary advances in knowledge are due to many individual people. Frequently, a true paradigm change has been necessary in order to arrange and order the new perceptions properly. Hence, it is not surprising that, as a rule, the pioneers of these new ideas initially had to overcome great difficulties and rejection, before the new concepts slowly gained acceptance. Also, in certain cases, highly focused research in large industrial laboratories turned out to be the key to success. This is impressively illustrated in particular by the invention of the transistor in the American Bell Laboratories.

This book represents an updated and strongly extended edition of the book published by the same author nearly 10 years ago with the title *Electrons in Action*. In particular, the physical contents were pointed out more clearly by mathematically formulating the fundamentals. The book is aiming at students of the natural sciences, and in particular of physics and materials science, as well as at engineers, as an introduction to solid-state physics. It may serve as a motivating prestage and companion of the established and very detailed textbooks.
In addition to the physical contents, the book treats the important role played by many famous and often still very young scientists. The fundamental developments are supplemented by describing their scientific and historic environment.

Marius Orlowski, Virginia Polytechnic Institute, provided important advice.

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