

Preface

The motto of *connectivity and superconductivity* is that the solutions of the Ginzburg–Landau equations are qualitatively influenced by the topology of the boundaries. Special attention is given to the “zero set”, the set of the positions (usually known as “quantum vortices”) where the order parameter vanishes. The paradigm of connectivity and superconductivity is the Little–Parks effect, discussed in most textbooks on superconductivity.

This volume is intended to serve as a reference book for graduate students and researchers in physics or mathematics interested in superconductivity, or in the Schrödinger equation as a limiting case of the Ginzburg–Landau equations.

The effects considered here usually become important in the regime where the coherence length is of the order of the dimensions of the sample. While in the Little–Parks days a lot of ingenuity was required to achieve this regime, present microelectronic techniques have transformed it into a routine. Moreover, measurement and visualization techniques are developing at a pace which makes it reasonable to expect verification of distributions, and not only of global properties.

Activity in the field has grown and diversified substantially in recent years. We have therefore invited experts ranging from experimental and theoretical physicists to pure and applied mathematicians to contribute articles for this book. While the skeleton of the book deals with superconductivity, microneetworks and generalizations of the Little–Parks situation, there are also articles which deal with applications of the Ginzburg–Landau formalism to several fundamental topics, such as quantum coherence, cosmology, and questions in materials science.

The sequence of the chapters in the book follows similarity of subjects rather than authors’ disciplines, so that articles by physicists and by mathematicians are intermixed. We have made an effort to have all authors express themselves in a common language, but the reader will still identify differences in their styles.

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